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Spring 2019

The official magazine of the Manitoba Association of School Superintendents



Celebrating Learning in Mathematics

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On the cover: At École Guyot, a French immersion elementary school in Winnipeg, Manitoba, students absorb numeracy learning by playing games and incorporating the subject in a wholesome and fun way. These girls, in Grade 1, were all smiles as they played a math-related dice game. Photo by Alexandra Kozub.





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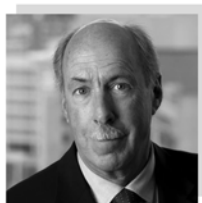
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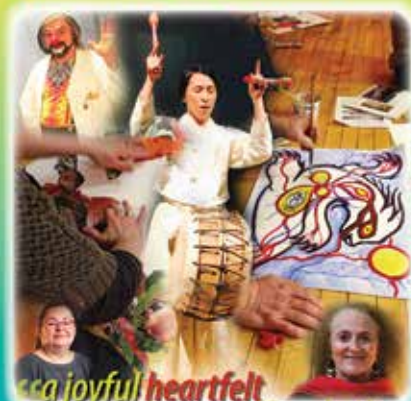
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Being numerate means having the confidence and competence to engage with quantitative information on a daily basis.



As president of the Manitoba Association of School Superintendents (MASS), I am pleased to present our spring 2019 *MASS Journal* focusing on numeracy. In this edition, you will learn about pedagogical approaches to numeracy, hear what it means to “do” mathematics and better understand how learners construct mathematical brains. You will see numeracy as integral to analytical thinking and reasoning, problem solving, spatial thinking and communicating.

Being numerate means having the confidence and competence to engage with quantitative information on a daily basis. It means seeing ourselves as mathematicians and believing we have the ability to understand and work with numbers. To achieve this, children and young people need to learn about numbers in multiple contexts not just in math class. They need to recognize that mathematics permeates the world around us. They need to view and interact with numbers through patterns and relationships in art and nature, rhythm and ratios in music, geometry in architecture, statistics and probability in athletics, calculations related to finance and money, timelines in history, and measurement in geography and science.

Traditional classrooms treated numeracy as an isolated subject; teachers taught mathematics and focused on algorithmic calculations. Classrooms today are using the ubiquitous nature of numeracy, inspiring and compelling learners to see mathematics everywhere and apply it to everything. We are intentional about cultivating mathematical habits of mind through visualization, purposeful questioning and creating connections.

The articles in this edition will inspire and inform. They feature schools and classrooms where learners are exploring their environments, making meaningful connections that promote their ability to make sense of mathematical ideas and to reason mathematically. They highlight classrooms grounded in the belief that constructing numerical learning occurs both inside and outside of the classroom. I encourage you to read the articles in this journal and take the time to discuss and share the ideas presented with other educators within our system. Enjoy.

Cyndy Kutzner
President of MASS
Assistant Superintendent, Western School Division

En tant que présidente de l'Association des surintendants d'écoles du Manitoba, j'ai le plaisir de vous présenter notre publication du printemps 2019 du *MASS Journal* qui porte sur la numératie. Dans ce numéro, vous découvrirez les approches pédagogiques de la numératie, entendrez ce que signifie «faire» des mathématiques et comprendrez mieux comment les apprenants construisent des cerveaux mathématiques. Vous considèrerez la numératie comme faisant partie intégrante de la pensée et du raisonnement analytiques, de la résolution de problèmes, de la pensée spatiale et

de la communication.

Connaître le calcul, c'est avoir la confiance et la compétence nécessaires pour s'engager quotidiennement dans la collecte de données quantitatives. Cela signifie que nous nous considérons comme des mathématiciens et que nous croyons avoir la capacité de comprendre et de travailler avec les nombres. Pour y parvenir, les enfants et les jeunes doivent apprendre les nombres dans des contextes multiples et pas seulement en classe de mathématiques. Ils doivent reconnaître que les mathématiques imprègnent le monde qui nous entoure. Ils ont besoin de voir et d'interagir avec les nombres à travers des modèles et des relations dans l'art et la nature, le rythme et les ratios en musique, la géométrie en architecture, les statistiques et la probabilité en athlétisme, les calculs liés aux finances et à l'argent, les lignes du temps en histoire et la mesure en géographie et science.

Les classes traditionnelles traitaient la numératie comme une matière isolée; les enseignants enseignaient les mathématiques et se concentraient sur les calculs algorithmiques. De nos jours, les salles de classe utilisent la nature omniprésente de la numératie, inspirant et contraignant les apprenants à voir les mathématiques partout et à les appliquer à tout. Nous avons l'intention de cultiver des habitudes mathématiques de l'esprit par la visualisation, le questionnement et la création de connexions.

Les articles de ce numéro vous inspireront et vous informeront. Ils mettent en vedette des écoles et des salles de classe où les apprenants explorent leur environnement et établissent des liens significatifs qui favorisent leur capacité de comprendre des idées mathématiques et de raisonner de façon mathématique. Ils mettent l'accent sur les salles de classe fondées sur la croyance que la construction de l'apprentissage numérique se fait à la fois à l'intérieur et à l'extérieur de la salle de classe. Je vous encourage à lire les articles de cette revue et à prendre le temps de discuter et de partager les idées présentées avec d'autres éducateurs de notre système. Amusez-vous bien.

Cyndy Kutzner
Présidente du MASS
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Mission:

MASS provides leadership for public education by advocating in the best interests of learners and supports its members through professional services.

MASS believes that our mandate is to be leaders of learning, in our local school systems and in the broader domains of provincial, national and global public education. MASS believes a quality education empowers the whole child to constructively participate in global society.

We model learning that is:

- Active and visible;
- Based on robust research;
- Tested through purposeful application in the field; and
- Evaluated using a wide range of meaningful data.

We take responsibility for our own continuous learning and the learning of everyone we lead:

- Creating and fostering safe, supportive, inclusive and challenging environments;
- Ensuring essential learning for each and every child; and
- Preparing others to go beyond our own learning.

We are guided by our learning in shaping policy and practice to achieve what is best for the children in our care.

MASS believes that improved achievement and well-being for all of our students requires a shared commitment to raising both equity and quality.

- A conscious and persistent commitment to equity, system-wide and across sectors, leads to poverty reduction, greater inclusion and an appreciation for the riches that diversity brings.
- A purposeful and sustained commitment to quality education for every student increases the capacity for teaching, learning and leading throughout the system.
- A strong grounding in literacy and numeracy and a rich learning experience involving inquiry, curiosity, creativity and artistic expression enables all students to achieve success and to flourish in life, academics and career.
- A respect for and openness to authentic youth voices and support for meaningful student action are critical for building capacity and self-efficacy in our students.

MASS actively works towards equity and quality throughout the public education system, with a special focus on three action areas:

- 
- » **Early Learning**
 - » **Indigenous Education**
 - » **Mental Health and Well-Being**



The **Early Learning Committee** will take leadership to ensure that MASS:

- Advocates for full implementation of the Calls to Action in the MASS position paper on Early Childhood Education.
- Participates actively on the Provincial Educaring Committee.

The **Indigenous Education Committee** will take leadership to ensure that MASS:

- Builds capacity in MASS and school divisions to address the Truth and Reconciliation Calls to Action.
- Promotes ever increasing academic achievement, graduation, school completion and positive life outcomes for Indigenous students, informed by collective inquiry into evidence
- Actively supports the teaching of Indigenous perspectives, corrective history and culture and the use of Indigenous languages.

The **Mental Health and Well-Being Committee** will take leadership to ensure that MASS:

- Advocates for an implementation of a comprehensive provincial Children and Youth Mental Health Strategy.
- Collaborates with The Education for Sustainable Well-Being Research Group at the University of Manitoba and Manitoba Education and Training to develop tools and indicators for assessing the well-being and well-becoming of students in schools.
- Pursues inter-sectoral liaisons with public and mental health organizations and agencies.
- Contributes to a national voice on mental health through CASSA and through input into the Canadian Mental Health Strategy.
- Promotes Mental Health Literacy in mental health for all educators and pre-service educators.
- Renewing MASS Mental Health position paper and calls to action.

Residency Approach to Numeracy Instruction in Sunrise School Division

By Leanne Peters and Allan Stevenson, Sunrise School Division



Part of the residency included watching how students interacted and reacted to the lessons.



Students say that they feel safer now when it comes to taking numeracy risks and making mistakes.

Sunrise School Division, located east of Winnipeg, spans 7,200 square kilometers. The 19 schools serve over 4,600 students and employ approximately 300 teachers. The division has four learning priorities, one of which is numeracy.

Background

The road leading to conducting residencies in schools began when Sandra Herbst (a noted system leader, author, speaker, coach, consultant and educator) provided professional learning to Sunrise School Division's Leadership Team from 2015-2017. She highlighted and shared stories of her own experiences using a residency model to support teacher development. This, along with the Literacy Program Leader talking about her experiences with a similar model and some of the work that she has done over the years, sparked Allan Stevenson's (Numeracy Program Leader for Sunrise School Division) interest. In Sunrise School Division, the Program Leaders report directly to the Assistant Superintendent, Learning and Instruction Development. Planning and strategy implementation to further divisional goals are co-constructed in Sunrise.

When digging into 2017-2018 school plans and reviewing schools' established goals for numeracy, a clear pattern emerged. Several schools recognized problem-solving as an area of growth for their teachers. The Numeracy Program Leader shared the observation of the common numeracy goals at a Principals' meeting and asked if anyone wanted to engage in a residency model, as described by Herbst, in their schools. Three schools immediately expressed an interest and the planning for residencies began.

What are residencies?

Residencies are opportunities for a system leader to work in a single school for a stretch of time, anywhere between three to five days in a row, multiple times a year. Sunrise has experimented with this model, based on the different contexts and needs of our schools, and has also tried what we refer to as “mini-residencies.” These “mini-residencies” involve five, one-day sessions with time between each session to implement, apply and practice some of the learning. Although different, this model holds many of the same characteristics of a multi-day residency.

All the initial residencies in 2017-2018 were three phases in nature. The first phase included a half day “kick-off” spent with participating teachers. This was followed by one-week spent at each school with four days to model lessons with students while participating teachers observed in designated classrooms. For these four days, there was an initial meeting with teachers where the lesson they were about to observe was set up, where specific learning outcomes were determined, where observation criteria was introduced, and where resources and materials were discussed.

The initial planning meeting was followed by a one-hour session where the lesson was modelled with a classroom of students. Following that, there was an opportunity for a 30-minute debrief where teachers were able to share what they observed about the lesson, including components that stood out both about the lesson itself and their students’ response to the lesson. Depending on the number of teachers participating, this may have repeated in the afternoon with a different group of teachers in a different grade level classroom.

The rich discussions that took place before and after the lessons were powerful learning moments for the participating teachers. When asked for feedback, the participating teachers stated that the opportunity to share dialogue with their colleagues was one of the more powerful components of their learning through the residency model.

Phase two was a repeat of phase one but it occurred several months later. The wrap up, phase three, was

organized for spring. One week was set aside where each school selected one final day to spend together. On this day, Stevenson and the school principals participated in walk-throughs of the classrooms of some teachers who were part of the residency. Several teachers chose to demonstrate their learning as it related to their students’ needs and their learning goals. Each teacher also had an opportunity to provide feedback on the entire, three-phase process, express ideas for improvement and establish next steps.

Separating the residency into these purposeful phases allowed teachers, in all three schools, the time to intentionally focus on their individual learning goals. Teachers were also asked to gather evidence that supported their own and their students’ learning in between phases. This evidence was brought to the group and discussed during their next designated time.

A residency is a partnership and a commitment by those involved to fully participate in all three phases. As part of the evolution of these residencies, the work ahead for Sunrise School Division includes clarifying the expectations of the Program Leader, school principals and participating teachers before, during and after the residencies. For example, principals need to be aware of, and make time to, participate in this process with their teachers. Teachers need to gather evidence of student learning in between phases and the Program Leader needs to be aware of the school’s goals and the teachers’ needs in relation to those goals and their students.

For one school, the residency was adapted to work without release time. The school created a schedule whereby the Program Leader taught in all seven participating teachers’ classrooms twice during the four days. The teachers observed their own class of students rather than being able to see other classes in action. They took notes and photos of the lessons that were taught. At the end of the week, there were substitutes brought in and the teachers gathered with the Program Leader to debrief. While the timeliness of an immediate debrief did not occur, it still had a positive impact on teachers.

There is not a “one size fits all” model for residencies. Flexibility and the ability to adapt to specific school circumstances was important for their success. Teachers and principals appreciated that it was not a completely prescribed model but rather allowed them some voice to say what would suit their school’s needs in the best way possible.

The impact of residencies

An important component of the learning around residencies was collecting feedback from principals, teachers and students about the experience. This feedback has driven a new series of residencies and the enthusiasm has been contagious with more schools asking to participate. Participants in the residencies included early career teachers as well as experienced teachers. The data gathered from the feedback was clear—this experience provided new learning and changes to pedagogy for all the teachers who were involved, regardless of their years of experience.

To measure impact, teachers were asked to complete a pre- and post-survey about their understanding of problem-solving pedagogies. The questions focused on such topics as: teaching problem-solving in isolation, engaging students in productive struggle, being aware of the difference between routine and non-routine problems, and the use of manipulatives and assessment practices. In their reflections, most teachers spoke about the pressure and the accountability alongside ongoing support as reasons why they viewed this type of learning as sustainable.

One early years teacher commented on previous participation in one-day professional learning sessions. The teacher followed up from these days by implementing one or two of the ideas, but they did not become embedded in classroom practice. Following the residency, however, this teacher was able to fully implement the new pedagogies in part because of seeing them demonstrated with their own students, removing the argument that the strategies would not be effective for certain students. The teacher has embedded these strategies into programming.

Students also provided feedback after their participation and a large number of them remarked on the opportunity to have more time to talk about their mathematical thinking with each other. This was one of the strategies that was modelled each day in classrooms. When students were able to understand that there were multiple strategies that they could consider, this helped them to become more flexible thinkers.

Students also commented that they felt safer about taking risks and

making mistakes. They were not aware that making mistakes (and learning from them) was a positive practice and helped them to grow. Having students say this in front of their teachers helped the teachers involved to understand the importance of modelling a growth mindset, where mistakes are celebrated as opportunities to learn.

One Grade 5 student who requires regular enrichment in order to have her learning needs met said that the residency weeks were the highlight of

her year because she described her brain as “being stretched” and having real opportunities to think.

One of the greatest measures of impact was having teachers ask, on their own initiative and desire, to share their learning and experiences with colleagues who were not able to participate in the residency at that time. Their enthusiasm and passion for the residency experience was contagious and has helped to build capacity in and across schools.

Next steps

The schools that participated in residencies in 2017-2018 participated in three “check-ins” during the 2018-2019 school year, which provided them with ongoing support. These check-ins were flexible and based on teachers’ needs and goals, and included conversations, opportunities for co-teaching, modelling, and further observations.

In 2018-2019, additional schools were added and residencies continue to evolve organically based on the teachers’ learning needs and schools’ numeracy goals. For example, one school has chosen a half-day model with half the number of teachers participating to engage their teachers. Plans are in place to continue to offer numeracy residencies for Sunrise schools in the 2019-2020 school year.

Conclusion

In Sunrise School Division, numeracy residencies have been one strategy for supporting teachers’ growth in changing their pedagogical practices to better meet the needs of each and every student in their classrooms. As a division we look forward to continuing this practice to ensure that every learner is successful. ■

Leanne Peters is the Assistant Superintendent, Learning Instruction and Development, in Sunrise School Division. She can be reached at lpeters@sunrisesd.ca. Allan Stevenson is the Numeracy Program Leader for Sunrise School Division. You can follow him on Twitter @SunriseMathMan or at astevenson@sunrisesd.ca.

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Creating Productive Mathematics Discussions



Figure 1. This diagram, created by Laura Wheeler, illustrates Smith and Stein's 5 Practices for Orchestrating Productive Mathematics Discussions.

By Andy McKiel, St. James-Assiniboia School Division

As educators, we all want our students to achieve their learning goals and experience success. In our classrooms and schools, we set the bar high for our students and we support them in meeting our expectations. With the diverse learning needs that exist in all of our classrooms, we know that some students require far more support than others. As a result, we must be skilled at utilizing a range of strategies to meet the needs of all learners.

In St. James-Assiniboia School Division, we're working hard to unlock the mystery of assuring student success. There are many obstacles that we are constantly striving to overcome so we can ensure that we have great schools for growing and learning. We constantly challenge ourselves to improve upon our practice so that all of the students in our care experience success. We know that the key to meeting the diverse learning needs of our students is

The 5 Practices approach is leading to more purposeful and intentional instruction in many of our early years, middle years and senior years' classrooms.

to provide support for our teachers. To develop our collective teacher efficacy, we share tools and techniques that support best practices in the classroom.

Focusing on the problem

When it comes to numeracy instruction, our provincial assessment results and divisional report card data indicate that problem solving is our greatest area of need. Over the last several years,

we've provided targeted supports for teachers that are specifically related to problem solving. This intentionality has led to many positive outcomes, including improved student performance, positive mathematical mindsets (in both students and teachers) and increased sharing of resources between teachers.

Professional learning opportunities have been an integral aspect of our

divisional focus on problem solving. Dozens of teachers from all grade levels have participated in various learning cohorts to connect and collaborate with their colleagues. These conversations have shed some light on how problem solving has traditionally been taught within our classrooms and schools.

Many of our teachers face similar challenges when teaching students to problem solve. *Where can I find good problems to use with my students? What does proficiency look like? How can I get my students to persevere with a problem?*

How much time should I give my students to solve a problem? Can my students solve problems collaboratively? These are just some of the many concerns that teachers have raised about teaching problem solving. When we set out to tackle this problem, we knew that we had to be deliberate about addressing all of these challenges.

Where do we begin?

When we identified problem solving as a divisional area of focus, we wanted to work toward the development

of common instructional practices. While we're consistently informing our instruction through current research and all of the latest, greatest professional readings, we've grounded our work in the "5 Practices." Based on Smith & Stein's 2011 book called *5 Practices for Orchestrating Productive Mathematics Discussions*,¹ we feel that the 5 Practices are equipping us with a framework that can, and should, be used across all grade levels when engaging students in problem solving tasks. Through the 5 Practices, we're developing our pedagogical practices and uncovering meaningful opportunities for our teachers to connect and collaborate.

A number of teachers within St. James-Assiniboia School Division are now utilizing the 5 Practices approach. Their students typically work collaboratively to solve complex problems in a variety of ways. The desire to use open problems that contain multiple solutions has led our teachers and numeracy coaches to develop and share many "rich tasks" that are being used as common assessments within and across our schools.

We refer to these rich tasks as "low floor, high ceiling" problems because they have multiple entry points so that all learners can be successful. However, these rich tasks can also extend to allow some students to demonstrate much more complex thinking and understanding. A well-designed rich task can be used across multiple grade levels without requiring significant adaptations.

Figure 1 was created by Laura Wheeler, a Canadian sketchnote artist and high school teacher in Ottawa, Ontario.² This visual highlights the 5 Practices that our teachers are utilizing to orchestrate rich mathematical discussions in their classrooms. These five steps will lead to more productive conversations in any math class.

What are the 5 Practices?

One, Anticipate: The first step, and arguably the most important step, requires the teacher to take some time to work through the problem before presenting it to their students. This enables teachers to see the many



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ways their students might approach the problem and also allows them to uncover some of the more challenging aspects of the problem.

Two, Monitor: While students are engaged in the problem solving process, the teacher circulates through the room collecting observations and having conversations with students about their thinking. This serves to clarify understanding for students and also allows the teacher to provide nudges for students who may be struggling.

Three, Select: As the teacher monitors student progress during the activity, they can quickly record anecdotal notes about the strategies being utilized. The teacher should select several examples that contribute to the learning goals of the task. Examples that are selected can range from simple to complex.

Four, Sequence: Toward the end of the activity, the teacher asks selected groups of students to share aspects of their solution. The teacher chooses a sharing sequence that serves to address their goal for the lesson. This is where much of the direct teaching takes place as the teacher can intentionally select examples that include similar or contrasting approaches to the solution, or can even highlight some of the common misconceptions.

Five, Connect: The last step is to make connections between the various solutions that are shared by students. The connecting of ideas helps students to connect the dots between their prior knowledge and the skills that they've developed through participating in the rich task. By connecting these concepts at the end of the lesson, the teacher can efficiently and effectively demonstrate how the solutions that are presented build upon one another to scaffold the learning for their students.

When I think back to my own experiences as a Grade 4 teacher, I can still recall all of those hands that shot up into the air when I asked students to share their problem-solving solutions with the class at the end of a lesson. I'd often see the same hands raised and would know who to call upon to hear the correct solution being shared. Quite often, the students who shared would

have all used the same strategy to solve the problem or had all arrived at the same solution.

Had I been aware of these 5 Practices years ago, there would have been so much more intentionality behind this sharing and, therefore, a lot more learning taking place within my classroom.

What does our professional learning look like?

The 5 Practices approach is leading to more purposeful and intentional instruction in many of our early years,

middle years and senior years' classrooms. We've tapped into the support of our three divisional numeracy coaches and we've also reached beyond our school division to work with Dr. Martha Koch from the University of Manitoba. Dr. Koch has supported our work by modelling the use of the 5 Practices for us and helping to facilitate conversations with our teachers so that they feel equipped to incorporate the 5 Practices in their own classrooms.

Over the last few years, we've bought dozens of copies of Smith & Stein's



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5 Practices for Orchestrating Productive Mathematics Discussions and brought teachers together to participate in professional learning book clubs. Until this year, each of our levelled learning cohorts has followed the same model. Participating teachers would come together three times over the course of a school year. Each time the cohort met, Dr. Martha Koch would guide teachers, as learners, through a rich task. She would debrief the experience based on the 5 Practices and justify her actions and decision-making during the

rich task. Dr. Koch would then challenge teachers to return to their own classrooms and assign their students the same rich task. When their cohort gathered again, all participants were able to connect and share with one another based on their common experiences.

This year, our work with Dr. Martha Koch has led to her visiting classrooms in several of our middle schools to work directly with students. All of the math teachers in each school gather to observe as the classroom teacher and Dr. Koch co-facilitate the rich task.

Following the lesson, we gather to debrief the lesson and highlight the strengths, challenges and next steps in supporting student learning.

On many occasions, the school administrators have joined their teachers to observe the rich task and/or participate in the discussion that ensued. Much of the feedback we've received about this "in situ" professional learning has been overwhelmingly positive as our educators are seeing firsthand what the teaching and learning looks like in other classrooms. These opportunities are paving the way for continued collaboration amongst our teachers within their schools and across our division.

Where do we go from here?

These professional learning opportunities have served St. James-Assiniboia School Division very well as all of our schools have had the opportunity to see several teachers participate in these shared experiences. Furthermore, because this experience has impacted ALL of our schools, we've worked closely with our school administrators to raise their awareness of the 5 Practices as instructional leaders within their buildings. As our principals and vice principals walk through their schools and visit classrooms, they are looking for evidence that the 5 Practices approach is alive and well—not just in their math classrooms, but in all of their classrooms.

After all, aren't all of our classrooms math classrooms? ■

Andy McKiel is a Curriculum Coordinator in St. James-Assiniboia School Division. In this capacity, Andy works with teachers, administrators, coordinators and coaches to support the priorities of the school division.

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Bringing Numeracy to the Forefront in the Portage la Prairie School Division

By Patricia Lawrence and Pamela Garnham, Portage la Prairie School Division

For many years we have heard conversations about literacy at professional development (PD) sessions, staff meetings and even in the hallways. Literacy has been embedded into our schools, and embraced by all.

Numeracy, however, has remained a topic that people seem to shy away from. Too often people say that they don't like math, don't do math or don't have a "math brain"...as if that is an acceptable mindset. This is why the creation of a Numeracy Coach—with the prime goal of changing the attitude of students, teachers and even parents—has been so important in our division. Since the creation of a full-time Numeracy Coach position four years ago, the change in mathematical mindsets has begun to shift, to one of "I can" and "I like."

Now, as you walk through the hallways of any school within the Portage la Prairie School Division, you notice how numeracy has become part of everyday conversation. Some teachers are choosing to use math games to motivate and challenge students. Math word walls are found in many classrooms. Some schools are holding school-wide math day events, while others are doing coding in technology. Some teachers even choose to incorporate math elements and principles into their art classes, which can teach students the laws of perspective, symmetry, points and lines; just to name a few.

We are proud to say that cross-curricular connections are being made more than ever in our schools. One Home Economics teacher had her class plan meals for a week, based on a budget, for a family of four. Teachers are having success in getting students to see math in everything that they do by bringing real life contexts to their lessons.



Math word walls, like this one, are found in many of the division's schools.



A teacher works with students on numeracy in small and interactive groups.



One common thread among the teachers in our division is the intentional use of mathematical vocabulary. When visiting different classrooms, you will not only see math word walls, but students communicating their learning using mathematical terminology. It's wonderful to listen to teachers and students talking like mathematicians. The divisional lending library has both professional books and math story books for teachers to borrow. Integrating math literature has become very popular in some classrooms. Teachers have created units and lessons around literature. It's fun to watch students interact with the books being read to them in class. Some see number problems, while others see patterns. Literature has so many opportunities for students to become engaged in mathematics.

The use of mathematical manipulatives in all grades has also increased over the years. For far too long, manipulatives sat on the shelf because teachers did not know how to use them. We have found success with offering professional development opportunities for teachers on the use of specific manipulatives. Teachers attend sessions and receive training on how to use the manipulative. They are also provided with a set for their classroom. This allows the teacher to go back to their classrooms and implement the manipulative immediately while they are excited about their learning. Whenever possible, presenters are encouraged to incorporate the use of manipulatives in their sessions.

We are very fortunate in our division to have a professional development fund that is managed by a Professional Development Committee. LaVerendrye School (Grades K to 8) chose to do a math residency during the 2017-2018 school year. John and Jane Felling, from Box Cars and One Eyed Jacks, came and worked with the staff and students. In mid-November they spent a week at the school and on the first day the entire staff was able to attend professional development sessions; John worked with the middle years' teachers and Jane worked with the early years' teachers. The next three days they worked in various classrooms modelling different strategies, lessons and the proper use of manipulatives. Teachers had the opportunity to watch them model lessons in their rooms, visit other classrooms to observe and to debrief with them. With the remaining funds from the residency, the school was able to purchase class sets of the materials that were used during the modelled lessons.

LaVerendrye hosted a Family Math Night during the residency. Over 25 families attended, each receiving a package of books and materials to take home. The Fellings demonstrated several of the games found in the books while the families had the chance to play the games. It was an excellent opportunity to build positive community relationships as well as getting everyone to have fun with math. Staff circulated around the tables and answered questions, and sometimes

they even joined the games! It was a great learning opportunity for our division. The Numeracy Coach has since held Family Math Mornings and after school events at different schools.

Since the residency, several teachers from LaVerendrye school have volunteered their time and expertise with other teachers from the division. Their confidence in presenting is evident with their enthusiasm and willingness to share. The school held another Math Night in March this year using a slightly different format from last year. Instead of gathering as a whole in the gym, families travelled to different classrooms throughout the evening to learn different games.

Over the last few summers the school division has been bringing in other math professionals to offer professional development for the teachers. Some of the topics have included math games focusing on math facts, fractions and place value, as well as Guided Math. Teachers welcome the opportunity to see different professionals and they enjoy trying out new ideas.

It has been exciting to watch different ideas flourish from these summer sessions. With the support of the Numeracy Coach, many small topic groups have been created for interested teachers who have wanted to look deeper into concepts, strategies or do book studies; just to name a few. Witnessing some of these groups willingly meet after school, and even on the odd Sunday, showcases the enthusiasm and dedication for math that is coming to the forefront.

Guided Math has become quite popular with many teachers in our division. Several small groups have been started where teachers meet to work on planning, creating and learning about the many different components, as laid out in Laney Sammons book, *Guided Math: A Framework for Mathematics Instruction*. Teachers work together to help mentor each other. They share ideas and materials, or watch a lesson being modelled. There is such a wealth of knowledge that can be shared among colleagues.

Students enjoy the opportunity to learn through math workstations. They often do not perceive it as work. Students work together to create, solve and play.

They are able to communicate their learning through journaling, pen and paper tasks, building and talking. If you stop and ask questions, they are always eager to explain what they are doing. So much evidence of learning is demonstrated every day in so many different ways.

Some schools have been quite creative combining both literacy and numeracy. École Crescentview School held "Elf Interviews" during the weeks leading up to Winter Break this year. The Grade 4 English teachers had their students apply for different elf positions at the North Pole. They were required to write resumes and cover letters. The Numeracy Coach played the role of Mathematician Elf and interviewed several of the students. It was fun to see the students discover that the Baker Elf position would require measuring tasks, and the Caretaker Elf would need to be able to calculate the area or perimeter in order to build stables for the reindeer.

Over the last four years, our division has been part of an action research project with the Manitoba Rural Learning

Consortium. The action research project has allowed for some common practices among teachers and they all use the same pacing guides and assessments. When offering divisional PD sessions, the project is always referenced. When meeting in PLC's to discuss RTI, the project is also referenced. Currently, all the Grade 6 and Grade 9 teachers in our division participate in the project and we are piloting the project in two schools for Grades 7 and 8. The plan is to roll out divisionally in the next few years.

The most positive change for our teachers in the division has been the implementation of pacing guides in the Grades 6 to 9 classrooms. Part of the project includes the use of pacing guides to ensure that all math outcomes are taught and that time for reach back is built into their year. Teachers who have not participated in the project are interested and asking for the pacing guides. Teachers have expressed the importance of having their year paced out. It still gives them flexibility should they need more/less time for an outcome, but they can see the whole

year at a glance. As a result of the pacing guides, a need for year-long math at the Grade 9 level became evident and has been implemented. The Grade 9 math attainment credit has increased significantly as a result.

In the past four years there has been so many exciting changes in our schools. The conversations about numeracy have increased in our division and teacher collaboration is on the rise. You can often hear stories of successes in the staff rooms. Teachers are rethinking assessment and looking towards common assessments. The mathematical mindsets are starting to change in both staff and students. We will continue to work towards engaging all students in math. Whether it's through a math game, using technology or seeing problems as puzzles, math is everywhere. Everyone can be a mathematician. ■

Patricia Lawrence is the Numeracy Coach for the Portage la Prairie School Division. Pamela Garnham is the Assistant Superintendent of the Portage la Prairie School Division.



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Fin

L'amélioration en numératie est un marathon axé sur la recherche et la persévérance

Par René Déquier, Division scolaire franco-manitobaine

La recherche ouvre la voie à l'amélioration de résultats en numératie et nous aide à identifier des stratégies gagnantes pour effectuer un changement durable. Un tel changement exige de la ténacité et dépend de la concertation de plusieurs forces. Voici des exemples de cette concertation dans la Division scolaire franco-manitobaine (DSFM).

Si nous nous disons engagés à assurer la réussite des élèves, il est impossible de ne pas être inquiet des résultats des évaluations en numératie du Programme international pour le suivi des acquis des élèves (PISA) et le Programme pan-canadien d'évaluation (PPCE).

Quand l'information ne semble pas positive, il faut creuser davantage afin de comprendre les enjeux et d'identifier les forces et les défis. L'amélioration des résultats exige de savoir ce qu'il faut changer et ce qu'il faut conserver. Afin de mieux comprendre ces résultats, la DSFM a choisi de créer des outils de mesure en numératie. L'Évaluation *de numératie* en maternelle, en 4^e et en 8^e (EDNm, EDN4 et EDN8) fut développée en collaboration avec des enseignants, un expert externe et des coordonnateurs de la Division. Le processus débute par une revue des dernières recherches en enseignement de la numératie de Van der Waal, du travail de Marian Small et de la trousse PRIME.

Le but premier de l'outil est d'offrir aux équipes-écoles une rétroaction objective et précise sur la réussite de leurs élèves. L'objectif est de créer les conditions favorisant l'imputabilité interne selon la description de Micheal Fullan dans son texte *Cohérence*.

La gestion des données est assurée par un outil (Powerschools-School Net) conçu selon la recherche sur l'évaluation de Damian Cooper.

L'analyse des données se fait en suivant le modèle de Laura Lipton et Bruce Wellman. Le processus doit être suivi afin d'explorer minutieusement les causalités possibles. Les données quantitatives et les données qualitatives mènent à des stratégies d'amélioration à appliquer dans la salle de classe.

Les écoles suivent le processus dans un document de planification annuelle, le Plan d'amélioration continue (PLAC), fondé sur *Le pilotage du changement* de Pierre Colletette. Ce processus reconnaît que le changement exige de 3 à 5 ans pour passer les phases d'éveil, de changement et de maintien, et permettre un apprentissage de la part du personnel.

Le processus, bien suivi, peut mener à une plus grande Efficacité collective des enseignants (Collective Teacher Efficacy- traduction libre) décrite par Jenni Donohoo et classée au premier rang des facteurs d'efficacité identifiés par John Hattie.

Début

Si la réussite est axée sur la recherche, elle exige aussi de la persévérance. Les données n'ont aucune valeur si elles ne sont pas fiables. La vigilance est de mise pour faire en sorte que tous les élèves soient suivis et que les données soient objectives et comprises. Dans un territoire aussi grand que la province du Manitoba, la tâche ressemble bien plus à un marathon qu'à un sprint pour la DSFM. La diversité des communautés, la faible population des régions, la mobilité de certains centres exigent plusieurs années pour dégager des tendances fiables.

Les tendances indiquent des forces et des défis récurrents. Des stratégies de redressement sont développées et appliquées.

Le projet Analyser, Réfléchir et Communiquer (ARC) est une stratégie qui répond aux défis de nos élèves en matière de résolution de problèmes.

Pour que les stratégies soient mises en œuvre aussi fidèlement que possible, un accompagnement est élaboré avec une équipe d'Enseignants Leaders Pédagogiques (ELP). Dans un contexte où il est difficile de libérer les enseignants pour des ateliers de formation, les ELP se rendent dans la classe pour modéliser les stratégies, et donner et recevoir des rétroactions sur l'efficacité des stratégies.

Le processus d'analyse exige une discipline afin d'explorer à fond les causalités et dégager les hypothèses justes. L'idéal est que cette analyse soit faite par l'équipe-école, mais peut être guidée par un appui externe. Le tout pousse les participants dans une zone d'inconfort sans menacer la sécurité psychologique. Temps et patience sont au rendez-vous.

Tous ont un rôle à jouer, et par souci d'efficacité, les intervenants doivent se limiter à leur rôle mais le jouer à fond. La commission scolaire consulte la communauté pour élaborer le plan stratégique. Elle le suit annuellement avec les Résultats spécifiques visés et un système de monitoring. L'administration doit avoir une bonne compréhension du fonctionnement du système et assurer le respect des rôles. Avec l'équipe pédagogique, elle doit mettre en place des mécanismes

pour assurer la fiabilité des résultats et la qualité des stratégies d'appui. Les écoles, sous le leadership des directions, doivent appliquer les stratégies pédagogiques qui s'appuient sur la recherche et participer à l'analyse des données quantitatives et qualitatives qui permettent d'améliorer la mise en œuvre de ces stratégies.

Plus près de la ligne d'arrivée du marathon, la DSFM voit des améliorations. Nos résultats font état d'une amélioration importante, le nombre d'élèves qui réussissent à la résolution

de problèmes de l'EDN8 ayant augmenté de 47,6 % entre 2013 et 2018. La fin de ce marathon sera marquée par des célébrations bien méritées. Elle apportera aussi le plan pour la réussite du prochain défi. ■

René Déquier est directeur général adjoint de la Division scolaire franco-manitobaine depuis l'automne 2010. Ancien enseignant et directeur d'école, il est responsable des services éducatifs et supervise une dizaine d'écoles.




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Math as an Entry Point for Continuous Improvement in Evergreen

By Roza Gray and Scott Hill, Evergreen School Division

We might have started anywhere. Literacy, or career education, or any number of other subject areas could have served as our entry point for focused school and divisional improvement. In Evergreen School Division, we chose math as the primary focus for continuous improvement in student learning.

More specifically, we chose to invest in our teachers—their practice, the support they receive and their professional learning—because, as Steven Katz (2018) states, “teacher practice is at the heart of all school improvement processes because... it’s the single biggest predictor of student outcomes.”¹

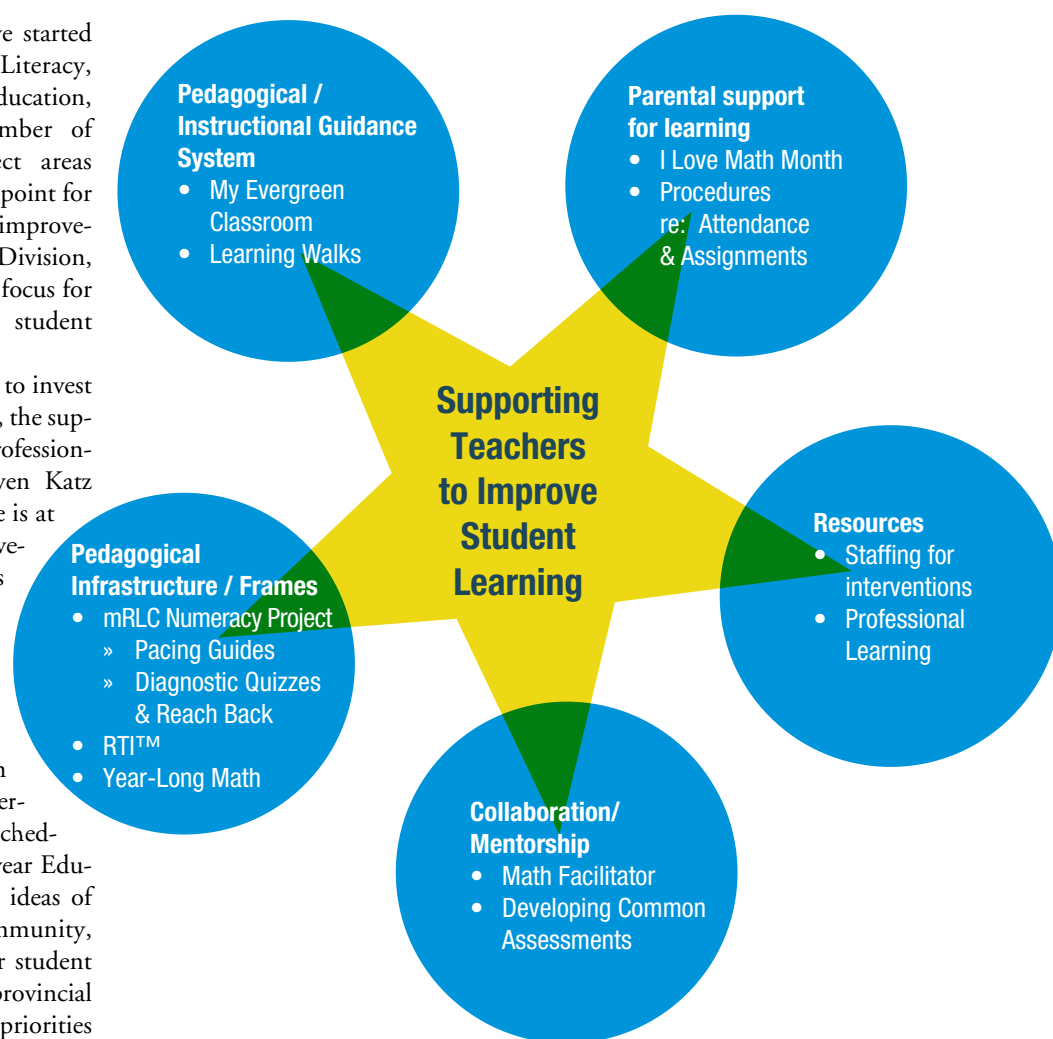
When we began in our new roles in divisional leadership (as Superintendent and Assistant Superintendent) in 2015, it was timely that Evergreen School Division was scheduled to develop a new multi-year Education Plan. In exploring the ideas of the staff, students and community, and with consideration of our student achievement data and the provincial priorities, we chose as our priorities literacy, numeracy and well-being.

In reflecting on student learning data, it was particularly clear that math needed increased attention and focus. Although math results in early and middle years were acceptable, high school results revealed a concerning pattern of performance regarding Grade 12 standards exam scores.

Inquiring into the results with principals, teachers and students revealed different perspectives regarding the reasons for poor student achievement.

Principals talked about problematic student mindsets and anxiety around the subject of math. Teachers referenced

some very real and troubling challenges with student attendance. Students told us that negative behaviours in the classroom distracted from the learning. Other causes for concern included assignment completion and negative student perspectives regarding the importance of math.



Clearly, we needed to change the culture around math learning. We decided to leverage a variety of strategies to invest in teachers and support their efforts to improve student learning.

In reflecting on this variety of strategies, what has emerged for us is a framework (see Figure 1) that places teacher practice in the centre of our improvement efforts. Key categories of support include:

- A pedagogical / instructional guidance system (adapted from the *Ontario District Effectiveness Framework*).
- Pedagogical infrastructure.
- Collaboration and mentorship.
- Resources (staffing and professional development).
- Cultivating parental support for learning.

This article will provide a brief description of some of the strategies undertaken within these key categories of support.

A pedagogical / instructional guidance system

In order to support efforts to enhance instruction, we engaged teachers and students in developing *My Evergreen Classroom*.² This document describes effective instruction and is critical to our observations and reflective conversations related to teaching practice. Further, this document serves as a reference point for principal and peer walk-throughs, which we call “Learning Walks” in Evergreen.

Critical to our learning walks is adopting what Sandra Herbst³ refers to as “the stance of a learner” (personal communication, November 2017). This requires that the visitor to the classroom comes with curiosity as opposed to judgment, and through meditative questions opens up a reflective experience for the educators.

As we have been intentional about alignment and coherence, we have developed parallel learning walk structures at all levels of the system. For example, teachers observe student learning while circulating in class, and these observations inform the teacher’s next learning step and next pedagogical move. Principals visit classrooms

during learning walks to determine next steps in their own learning and actions in support of teachers and students. Superintendents visit schools to learn more about the work of principals and teachers, so that we can continue to learn how to better support schools. These parallel processes reinforce the importance of observations and reflective conversations that will “feed the learning forward” (Herbst).

Pedagogical infrastructure / frames

As a complement to the division’s descriptors of teaching effectiveness, we have adopted some structural “frames” to further support enhanced instruction.

Like many rural school divisions in Manitoba, we participate in the mRLC’s Numeracy Achievement Project, which provides teachers with common assessments, pacing guides and diagnostic quizzes. This partnership has been transformative for our schools. According to Jim Gibbs, Principal at Dr. George Johnson Middle School, “Participating in the mRLC Numeracy Achievement Project has saved us years of work... With the assistance of the mRLC math project, our work in math has become a data-informed system built on a culture of collective efficacy and accountability for student learning.”

Similarly, we have put in place an RTITM framework⁴ of tiered interventions in each of our schools. In the words of Jessica Heminger, a high school resource and math teacher, this means that, “We can use our assessment data to teach students what they know and don’t know, can make action plans moving forward, and do corrective instruction in effective and efficient ways.”

In our high schools, the opportunity to plan and implement interventions has been enhanced by year-long scheduling of some math courses (September to June). “This scheduling allows us the opportunity to analyze student needs more effectively and to implement appropriate ‘reach back’ in support of math literacy,” states Leona Groot, Principal of Gimli High School.

Collaboration and mentorship

It became clear that to provide direct support to classroom teachers, we needed a highly credible math facilitator to provide mentorship and to facilitate collaboration. Laureen Grimolfson fills this role in Evergreen School Division by supporting teams, activating professional learning, modeling and co-teaching in the classroom with teachers, and mentoring early-career teachers.

Grimolfson describes her intentions as seeking to empower her colleagues. She says, “I try to put instructional efficacy in the forefront of teachers’ thoughts.”

This support has been critical to our teachers, who report, “Laureen is a driving force in classrooms,” and, “She has been able to help me grow in my own math knowledge to help with conceptual understanding for me and my students.”

In addition to supporting teachers in the classroom, Grimolfson has also led collaborative work to develop common math assessments at a variety of grade levels. Teachers involved in this work report that, “the process of creating common assessments was valuable professional development in itself. It generated discussion among teachers regarding methods of instruction, cognitive levels of test questions, equity in assessment, and formative and summative assessment.”

Resources

According to Steven Katz, “Research tells us that many teachers are good at knowing where students are struggling (Katz, Earl, & Ben Jaafar, 2009). The challenge is in knowing what to do for each student in the face of these learning gaps” (Katz p. 4). The division has dedicated staffing allocations at each school to provide targeted small-group or one-to-one support to students who struggle. This allocation, along with our enhanced access to diagnostic assessments, has improved our level of success with tier two and tier three interventions.

In support of enhancing instruction as described by My Evergreen Classroom, we have invested in

highly effective professional learning for math teachers. For example, our teachers explain that, “I see improved engagement as I use and adapt methods to create a *thinking classroom*,” and “The Peter Liljedahl professional development has transformed the way I teach. It has created a community in my classroom—students work together to create a common goal and are excited to work alongside their peers to learn a new concept.”

Building parental support for learning

In an effort to more deeply engage parents in support of student learning, we created an “*I Love Math month*” in November. Every week, parents received information from the division, highlighting the importance of math, how to help with homework and how to reframe mindsets around math. This is important to teachers who have observed, “We do a lot of expectation and growth mindset talk, and we’re getting away from the stigma that ‘math is hard,’ which I’ve noticed has really changed students’ attitudes.”

Further, we have worked to clarify processes and secure parent support for higher expectations of students in attendance, behaviour and assignment completion. As a teacher confirms, “Divisional support is greatly appreciated... students have to be held to high standards and accountability in their actions and choices throughout the course.”

Reflections

Although a variety of strategies are underway, the essence of our framework reveals two pathways for improvement. The first pathway is through enhanced pedagogy, policy and practice that supports what happens in classrooms every day. This is a pathway that begins with inputs and research-based practice, described with clarity and supported collaboratively. The second pathway is through informed analysis and response to student data in support of improved learning. This is a pathway that starts with credible evidence of student achievement and effective means by which to analyze and respond.

It is our hope that, with the use of a framework focused on supporting teacher practice, and through these two pathways toward improvement, we will realize significant gains, not only in math results, but in strengthening a culture of continuous improvement in Evergreen School Division. ■

Roza Gray is Superintendent & CEO of Evergreen School Division. Scott Hill is Assistant Superintendent of Student Services & Curriculum in Evergreen School Division.

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To Infinity and Beyond: The Early Days of a Numeracy Journey

By Tyler Moran, Interlake School Division

“We have a very, very talented staff.” This quote was offered by a colleague in a recent conversation and made me smile while inviting hope for our work. Our lived experience, combined with significant evidence, clearly identify that building collective efficacy in our schools is critical to providing high-quality learning experiences for students.

We do have a very talented staff; to build on and from that talent is the commitment the Interlake School Division (ISD) has made to our communities. Our numeracy journey begins from a position of strength. Perhaps the road forward is not as complicated as it might seem.

Planning for continuous improvement

The Interlake School Division is in the early days of a new plan for continuous improvement which aims to provide, “high-quality experiences for students through intentional teaching and learning for literacy, numeracy and wellness.” Our plan is carefully crafted to engage us in constant consideration of three key questions:

1. What do our students need?
2. What do our staff need?
3. What do our communities need?

These questions drive our work and embody the voices of our school division.

The process of gathering voice and analyzing evidence in order to arrive at



The Interlake School Division's Plan for Continuous Improvement.

divisional statements with language of *high-quality experiences for students* and *intentional teaching and learning* was robust and, admittedly, a blend of fun and frustration. Perhaps unsurprisingly, the agreed upon focus areas of literacy, numeracy and wellness are not unique to the ISD. The uniqueness of the ISD's story is found by examining, in a time of divided attention, what it might look like to participate in an

intentional, system-wide pursuit of a singular area of focus.

Going “all-in” on numeracy

Amid the constant push and pull for our time and resources, many involved in planning processes long for an opportunity to home in on a singular area of focus, to be permitted to commit fully to a system-wide approach and to build strength in a

Family Game Nights, Take-Home Math Challenges, November Numbers and March Mathness have all entered our vocabulary as approaches for engaging our communities and act as a site for sharing our strategies for numeracy instruction.

particular area. Through the support of the voices engaged, the ISD's continuous improvement plan names numeracy as the focus for kindergarten to Grade 8 in year one (2018-2019). Teaching and learning for literacy and wellness have been identified as divisional areas of focus in addition to numeracy, but the decision was made to go "all-in" on numeracy in year one.

What does going "all-in" on numeracy look like? The answer is surely different depending on where the question is asked. For the Interlake School Division, it was necessary to begin by drawing together our artifacts and evidence of learning to arrive at a collective understanding of what numeracy is, why numeracy matters and the current state of numeracy in the division. Further, a reconsideration of traditional structures and a commitment to test novel approaches was in order. To those who read the *MASS Journal*, we humbly offer a snapshot of learning from the early days of our numeracy journey, including how we plan for learning, how we learn together and how we make our learning public.

How we plan for learning

Within the year one focus area of numeracy at kindergarten to Grade 8, we have applied our best thinking to build, publish and communicate divisional statements which formalize our most up-to-date sense of what numeracy is, why numeracy matters and the current state of numeracy in the division. We were required to reflect openly and honestly on existing divisional and school-based structures as well as our most recent and longitudinal student

achievement data. This course of reflection and analysis was critical to providing a foundation for our work.

With foundational statements in place, we engaged in divisional collaboration to make sense of how to support our people. Specifically, this meant crafting and making public a divisional perspective on what students need, what staff need and what communities need. These published statements act as a primary filter for decision-making; they delineate the projects we will tackle and persuade us to defer on projects that, while otherwise intriguing, do not advance our focus area. We acknowledge that the what, why and where will change as our work unfolds and might look markedly different in year two than in year one. A commitment to vulnerability was critical in acknowledging that we had to say something. Until someone says something, we have nothing to talk about.

A refresh of divisional and school planning templates was undertaken to support the creation of the impactful documents we aspire for our plans to be. School plans in the ISD include the typical questions of who was involved in the planning process, the data sources used, and the important processes employed in the development of the plan. After the opening bits, schools are invited to make critical decisions about their school-based areas of focus. A requisite focus on numeracy forms part of all kindergarten to Grade 8 school plans; schools are invited to consider naming literacy and/or wellness as additional areas of focus. Each school has made decisions which align with the needs of their community.

How we learn together

Building collective efficacy within and among the staff in our schools is the most critical factor in our success, so the development of a focused divisional professional learning plan (PLP) is a primary action statement for the ISD. In anticipation of a change to the culture of our PLP, the 2017-2018 school year saw engagement of all kindergarten to Grade 12 staff in a series of seminars focused on making our teaching and learning practices more public. The teaching and learning seminars of 2017-2018 included an opening session for all staff, followed with a half-day session for defined grade bands (kindergarten to Grade 4, Grades 5 to 8, and Grades 9 to 12), and rounded out with full-day sessions for each individual grade level at kindergarten to Grade 8 and subject area at Grades 9 to 12.

In addition to the teaching and learning seminars, a group of teachers began work on a numeracy project intended to review and renew existing initial assessments in numeracy. This work was based on design theory in which participants had multiple points of contact with one another throughout the year to build prototype resources, field-test in classrooms, and refine the prototypes based on feedback from the field. The successes of the teaching and learning seminars and the numeracy project provided an exemplar for a model of professional learning that has amplified and flourished in year one of the continuous improvement plan.

The 2018-2019 divisional PLP for kindergarten to Grade 8 staff is devoted entirely to numeracy. The PLP consists of four, half-day sessions beginning with a large group session in October, complemented by grade-banded sessions in November (Kindergarten, Grades 1 and 2, Grades 3 and 4, Grades 5 and 6, and Grades 7 and 8), and is further supported with single-grade sessions in February and March.

Guided by the principle that all teachers are teachers of numeracy, school leaders, resource, guidance and specialty teachers are included. Space is made to learn shoulder to shoulder with colleagues and also to collaborate separately on numeracy, adding unique perspectives to our focus. Sessions evolve in content and structure from one to the next based on intentionally collected and published participant feedback. The iterative design requires ongoing planning

to ensure the system-level goals of the PLP are being met in harmony with participant feedback.

How we make learning public

Implementation of a new continuous improvement plan has provided an opportunity to make learning public in a number of ways, including the design of leadership team meetings, presentations to the Board of Trustees, and community-based information sessions. Each of these venues provide time for sharing and reflecting upon our progress, opportunities to practice the skills required to lead conversations about our work, and reminders of our areas of focus.

Leadership team meetings in the ISD occur four times per year and half of each full-day session is committed to working with and sharing school plans through a variety of protocols. In addition, school leaders from Kindergarten to Grade 8, and Grades 9 to 12, meet separately four times per year. Each meeting includes a presentation from one or more schools as well as a collective “data dive” into sources of evidence named in the continuous

improvement plan. The resulting conversations provide leaders with an opportunity to share the story of their school with trusted colleagues and to practice leadership skills to be enacted at the school and community levels.

Each school engages with the Board of Trustees at a public meeting throughout the school year. Though this practice is longstanding in the ISD, the request of Kindergarten to Grade 8 schools is to ensure their presentation is focused on numeracy. The structure provides a forum for schools to share their work and to engage Trustees in hands-on learning. Where presentations from previous years would often highlight a “program-of-the-day,” the revised structure keeps numeracy directly in focus.

Family Game Nights, Take-Home Math Challenges, November Numbers and March Mathness have all entered our vocabulary as approaches for engaging our communities and act as a site for sharing our strategies for numeracy instruction. The blend of school-based and divisional sessions also provide an opportunity to convey the importance of community in developing

numeracy citizens. Opportunities for face-to-face interaction with community members is an additional attempt to build collective capacity.

To infinity and beyond

The ISD is truly in the early days of a numeracy journey. Our plan for year two will be shaped by the feedback we receive, evidence of learning and student achievement data. A series of community information sessions are upcoming and will provide yet another opportunity to share our learning with community members and to build upon the partnerships critical to our success.

Perhaps the road forward is not as complicated as it might sometimes seem. We have very, very talented staff. We have community members deeply invested in, and supportive of, the work that we do. Most importantly, we have students arriving at our schools each and every morning. The math is in our favour. ■

Tyler Moran is the Assistant Superintendent for the Interlake School Division.



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Growing Student Confidence in Math: What Does it Take?

By Lynda Matchullis, Manitoba Rural Learning Consortium (mRLC); Jonathan Toews, Border Land School Division, and mRLC; and Dan Ward, Mountain View School Division

What factors need to be in place to ensure accelerated student achievement in mathematics? Divisions that committed to participating in the Numeracy Achievement Project believe they know. As a result of two years of continuous, collaborative professional learning in the project, classroom practices have been altered with dramatic results. Now teachers better understand how students learn math and have become more confident in teaching math.

Through the use of baseline assessments, there is clear evidence showing that the gap between students who did well and those who struggled has narrowed. As a result, divisions have pushed to expand the project into more classrooms. In this article, two divisions will share their perspectives illustrating the broad impact of the project—from divisional numeracy planning, to coach and teacher practice, and to student learning.

The Numeracy Achievement Project (NAP) teachers worked collaboratively to implement strategies and processes that included pacing and sequencing, which provided the framework for beginning the year with foundational outcomes before moving on to the remaining curricular outcomes, identifying first point of error and then reaching back to the foundational outcomes.

Through a series of formative quizzes, teachers have learned to sharpen their instructional decision making in responding to student learning gaps revealed by the quizzes. Over two years, coaches, teachers and facilitators met eight times to provide real-time professional learning linked to data collected in the quizzes. By continually practicing with a range of research-based strategies and bringing back classroom experiences to analyze, cohort members have built their collective professional judgement and instructional skill set. Follow-up in divisions by coaches has proven invaluable.

Each June, Grade 6 and Grade 9 summative baseline assessments have been



Grade 8 students at École Parkside School reflect on their numeracy learning.

administered in partner divisions. A tool has been developed to aggregate data and identify trends. In Grade 6, the mean score increased 19 per cent after the students'

System implementation

In the spring of 2016, with the support of 14 rural school divisions, the Manitoba Rural Learning Consortium (mRLC) launched a two-year numeracy research project. These divisions were aware of the recent successes that schools in Prince Edward Island had experienced in improving student math achievement through targeted professional learning and they wanted to see how such an approach could be replicated in Manitoba.

In cooperation with the mRLC, which provided professional learning for teachers, coordinated data collection and analyzed project results, participating divisions provided financial and human resources and worked collaboratively with the mRLC in shaping the growth of the numeracy project.

Grade 6 Student Achievement after One or Two Years of Professional Learning in the mRLC Numeracy Achievement Project

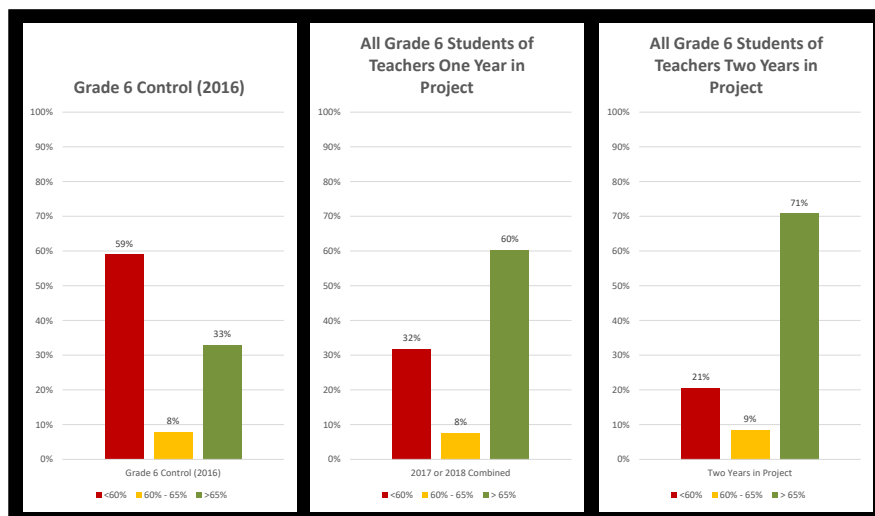


Figure 1. Grade 6 Student Achievement.

math teachers had two years of professional learning in the project (see Figure 1). The change was 10 per cent for Grade 9 (see Figure 2). Students scoring above 65 per cent also increased over the two years, by 33 per cent to 71 per cent in Grade 6 and by 28 per cent to 47 per cent in Grade 9, respectively.

In addition to quantitative data, teacher efficacy was determined by interviews conducted with teachers, principals and coaches. By the fall of 2018, the project had expanded into Phase 2, focusing on Grades 7 and 8, with much of the professional learning provided regionally by divisional coach-facilitators. Teachers from 185 schools, representing 23 divisions, are currently involved in the NAP.

Systems leaders responsible for leading continuous improvement in rural Manitoba face challenges due to limited access to curriculum consultants and research opportunities. The NAP aided participating rural divisions by providing high-quality professional learning with a range of strategies, which has since strengthened math instruction. Having educators work on an initiative that is bigger than a school or divisionally-based project has led participants to consider how their local efforts have contributed to numeracy achievement at a provincial level.

Teacher perspective

Participating teachers took risks and allowed themselves to be vulnerable as they shared their assessment results

regularly with the NAP group. Trust was established early in the endeavour. Chad Cowan, a Grade 5/6 teacher at Roblin Elementary School within Mountain View School Division, appreciated that the project focused on everyday mathematics. He shared that the reach back assessments used relevant examples to which students could relate and identified areas for small group or individual instruction, such as fractions and long division.

He stated, “I found the pacing guides helpful as they provided structure in identifying essential outcomes.”

As the project progressed, he placed a greater focus on the foundation outcomes in a more organized and intentional manner. Cowan claimed that involvement in the project was some of the best professional development he has experienced in his career thus far. He emphasized the importance of collaboration within the mRLC cohort as the project facilitators worked with educators to consistently identify foundational outcomes and discuss methods to improve student learning. Within the cohort, participants worked on deconstructing the identified outcomes and looked at ways to introduce concepts step-by-step.

Ardena Shrader, also a Grade 5/6 teacher at Roblin Elementary, found the project helpful as the reach back assessments provided valuable data in identifying student needs. She was in her first year of teaching Grade 6 when the NAP

was implemented in 2016. After dealing with the initial demands of teaching a new grade and starting a significant project at the same time, she said that she recognized value in participating in the project and liked the fact that the NAP provided a starting point in Grade 6 mathematics. The project tools also provided her with a guide on how much time to dedicate to specific concepts while still allowing for the flexibility required to introduce topics in a variety of ways.

Shrader feels that the project had a positive impact on learning as students recognized what concepts were important to know well. She provided greater focus on areas that needed to be emphasized, which led to better student retention of foundation outcomes. Students were encouraged to look at concepts from multiple angles as the reach back assessments provided opportunities for students to share their understanding in various ways.

Coach perspective

Nicole Vinet, a Numeracy Coach in Border Land School Division, emphasizes that the numeracy project has been instrumental in helping her develop relationships with teachers based on clear, focused numeracy goals. Through learning together about the project and thinking about how assessment, instruction and curriculum work together, teachers are now speaking the same language across the division.

When working with teachers, whether in the classroom or in planning professional learning, thinking about numeracy through the lens of the project has strengthened collaboration. Based on divisional baseline data, which captures student achievement each June, questions can be posed which lead to more effective planning of appropriate next steps.

More specifically, the data can be used to understand struggles and successes of students, and to evaluate the impact of various instructional strategies. Vinet states, “I know when I am going into a classroom approximately where teachers will be in the pacing guide so I can think ahead of time about how best to support them on a particular concept.”

Across the division, teachers are better able to share knowledge and engage in conversations based on a common data

Grade 9 Student Achievement after One or Two Years of Professional Learning in the mRLC Numeracy Achievement Project



Figure 2. Grade 9 Student Achievement.

set as well as a consistently used set of tools and strategies.

For Vinet, a key part of her professional growth has been the mentorship and support of project lead, Laura Brake. Collaborating with fellow coaches alongside the guidance of Brake has been key to bringing the project to scale across the division. To promote math instruction based on quality research is a priority for Vinet. She emphasizes that the structure of the project has allowed her to sort through the wealth of available math resources and determine how each fits within the framework of the numeracy project.

Student perspective

Students in Border Land School Division share a similar sense of positivity towards their participation in the numeracy project. A group of Grade 8 students who first encountered the project in Grade 6 highlighted that “reach back”—a strategy to deliberately review outcomes throughout the school year—has strengthened their math skills. Students articulated that reach back helps them

connect previously learned concepts to outcomes they are currently learning as well as to refresh their learning and “keep in mind what you already know.” Students also talked about the value of “whiteboard work,” a strategy where they deconstruct their work with the goal of identifying and correcting errors.

While math still causes stress, when asked to summarize their feelings about math in a single word, students used words such as “challenging, breezy, positive, confident and calm.” Students attributed their positive feelings about math to their teacher’s clarity of language, focus on specific outcomes, systematic progress through the curriculum and consistent use of reach back to review previously-learned content; all important concepts that teachers involved in the project have learned.

For students at École Parkside School, math has become a more positive part of their school experience. As one student shared, “I never liked math...going into Grade 8, I am more confident in math.”

In an era of tightening budgets, finding meaningful, impactful and

embedded professional learning is an ongoing challenge for many systems leaders in our province. To bring about genuine numeracy improvement is not something that occurs accidentally. Such an initiative requires networking, intentional planning, teacher expertise, and attention to data, all of which have been provided through the Numeracy Achievement Project. ■

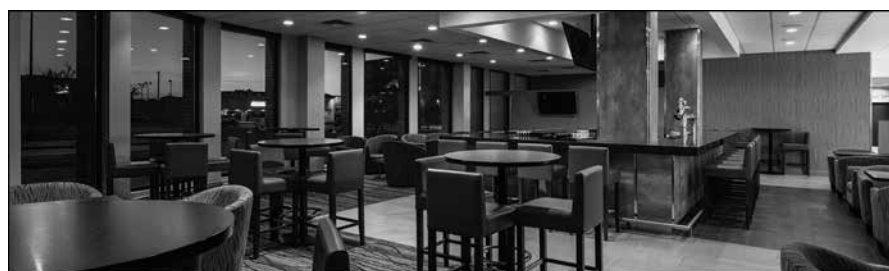
Lynda Matchbullis is the Numeracy Director for the Manitoba Rural Learning Consortium (mRLC). Jonathan Toews is the Assistant Superintendent with Border Land School Division and he is also Board Chairperson for mRLC. Dan Ward is the Assistant Superintendent with Mountain View School Division.

Teacher, Coach and Principal Comments

“This program is changing practice.”

“This was the missing piece. We now know what to do with small group instruction!”

“This program has improved teacher quality. My math teacher is a really good teacher but she is better now because of the pacing guide and reach back. A few years ago, she didn’t know how to fit in reach back. Having reach back is a really good thing.”



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Overcoming Math Anxiety through Rich Professional Learning

By Jeff Anderson, École Guyot, and Lauren Mitchell-Lawson, Louis Riel School Division

Numeracy has been the focus of rich professional learning in the Louis Riel School Division (LRSD). Building the capacity of teachers to deliver quality math instruction translates into deeper, lasting learning for our students.

Marian Small Fellowship

Following a two-year process centred on a divisional definition and cross-curricular connections to numeracy, LRSD entered into a Fellowship with Dr. Marian Small, a leading Canadian mathematics educator. As part of this project, Dr. Small intensively supported six elementary schools in the division to better understand the big ideas in mathematics instruction. She encouraged teachers to make math thinking a predominant classroom strategy, use open-ended questioning and intentionally consolidate big ideas in every lesson.

Each time Dr. Small visited the division, the structure of the professional learning was for her to lead a day of learning with the large group of approximately 120 teachers, K to Grade 8, and then spend the following days in classrooms co-teaching and demonstrating for small groups of teachers, at a particular grade level. These classroom visits, where the learning was job-embedded, were the most beneficial for teachers. They had the opportunity to observe how Marian and the classroom teacher interacted with students in real time, solving problems that the students were able to access at many entry points. Teachers could hear the questions that Marian would ask students to help surface misconceptions or push them to deeper thinking if they had determined an answer.

Shannon Burns was one of the teachers who invited Dr. Small into her Grade 4 classroom at École Guyot. She found the experience working with Marian beneficial in that she could, “see students thinking beyond the correct answer. They



These Grade 1 students, from École Guyot in Winnipeg, Manitoba, learn from (and love!) the various math-related games available that are part of their every day numeracy learning journey.

were pushed to think for themselves and take what they already knew on the topic and look for a different way to apply it.”

The message that teachers heard many times over was that we want students to *think* math, not *do* math.

Riding high on enthusiasm for math pedagogy, following the Marian Small Fellowship, teachers at École Guyot expressed a desire to continue improving their instructional methods. Efforts focused on reducing math anxiety and improving automaticity of basic facts.

Math anxiety

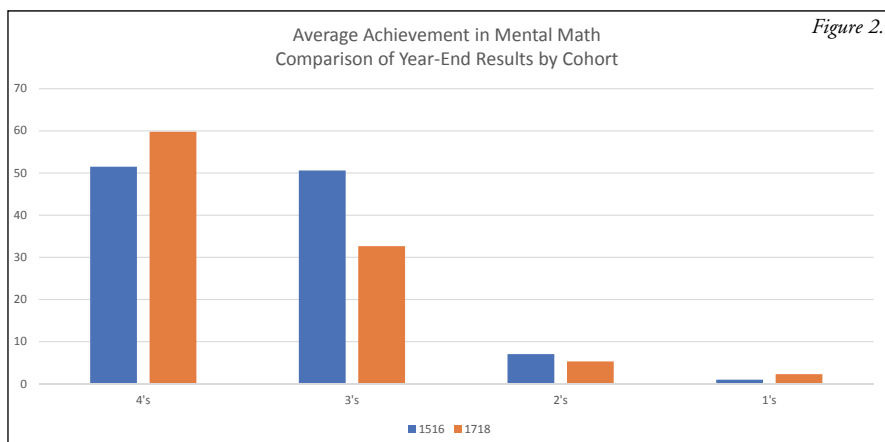
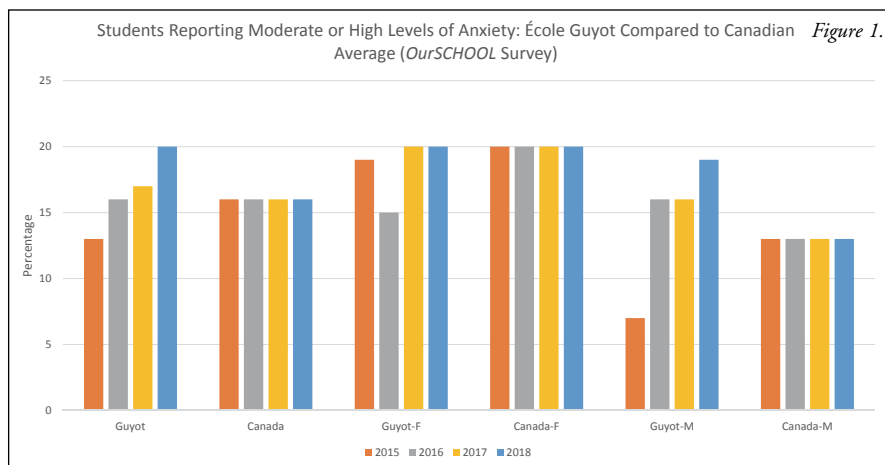
Data from the *OurSCHOOL* survey show that students at École Guyot report moderate to high levels of anxiety at rates higher than the Canadian average. What's more, the tendency has grown year-over-year, particularly among boys (see Figure 1 on page 30).

While the results from the *OurSCHOOL* survey relate to general experience, teachers also observed anxiety among certain students during math. To address this concern, teachers implemented strategies from Jo Boaler's *Mathematical Mindsets*, which promotes the adoption of a growth mindset and dispels the popular myth of a “math brain.”

Boaler denounces the memorization of basic facts and the use of timed tests, recommending instead repeated exposure to basic facts in multiple, low-threat, high-interest contexts—small group math centres targeting students' proximal zone of development are a perfect fit.

Automaticity of basic facts

To create hands-on learning centres targeting understanding and automaticity of basic facts, teachers found inspiration in resources from Susan O'Connell and John



SanGiovanni. Teachers in Kindergarten to Grade 2 focused on *Mastering the Basic Facts in Addition and Subtraction*, while their Grade 3 to 6 colleagues focused on *Mastering the Basic Facts in Multiplication and Division*.

Working in grade-level teams, teachers shared the centres they developed in order to adapt instruction to meet the needs of students with lagging or advanced skills. The resources also led staff to modify their sequence of instruction of basic facts to match current research. Data collected from year-end report cards show an overall increase in mental math achievement among cohorts of students before and after school-wide implementation of hands-on basic math centres (see Figure 2 above).

Critical learning outcomes

Data, such as those featured in Figure 2, show that teachers at École Guyot are generally successful in promoting math achievement among their students. A number of students continue to lag behind, however. It is with these students in mind that teachers moved into the next

phase of our numeracy project, inspired by John Hattie's *Visible Learning for Teachers*,¹ Laura Brake's work on improving math achievement² and the "Four Critical Questions" from Dufour and colleagues' *Learning by Doing*.³

1. What is it we expect kids to learn?
2. How will we know when they have learned it?
3. How will we respond when they don't learn?
4. How will we respond when they already know it?

Working in grade-level teams, teachers were challenged to identify critical math learning outcomes at their grade-level; that is, outcomes critical to students' success in math later the same year or in subsequent years. The task was deceptively difficult and led to rich professional dialogue on the precise meaning of specific outcomes. As a result, teachers were left with a better common understanding of program expectations.

Teachers were then challenged to develop an instructional sequence that would see critical outcomes taught in the first half of the school year. This then

provided an opportunity for intervention in the last half of the year by spiralling back to critical outcomes with which students struggled. Teachers still covered all outcomes, just in a different, more strategic sequence than by following the curriculum as a checklist. To support this work, teachers have now begun developing common assessments and intervention strategies.

Personalized professional learning

As part of their numeracy work, two École Guyot teachers have engaged in LRSD's Personalized Professional Learning (PPL) initiative to complete this work. PPL involves teachers from around the division working toward a personal pedagogical learning goal that connects to the achievement data they collect from the students in their class(es). They are supported by a collaborative learning partner—an itinerant teacher who is a member of the divisional Instructional Support Team.

This learning partnership is fostered throughout the school year with three intensive learning days and classroom visits. The classroom teacher and their collaborative learning partner will co-plan, model, co-teach and co-reflect on the pedagogical strategies that they use with students in the classroom. Other École Guyot teachers are benefitting from this work, as their colleagues share their learning and newly-developed resources.

A new divisional initiative

This year, the division has embarked on a similar initiative to that of École Guyot with the aim of building teacher capacity, starting with the big ideas we learned from Dr. Marian Small. We are also using research from John Van de Walle, Jo Boaler, and Peter Liljedahl, and the work from Laura Brake in Prince Edward Island, to inform our decision-making processes.

A small pilot group of teachers from Kindergarten to Grade 9 have come together on a monthly basis to build a conceptual framework around mathematics pedagogy, the big ideas and connections to the Manitoba curriculum. They are working towards developing a *Responsive Instructional Guide* that will eventually be shared with all teachers in the division.

This intensive work has resulted in many productive, influential learning conversations between colleagues.

Moving forward over the next couple of years, this group will pilot the *Responsive Instructional Guide* and build their own arsenal of high-impact strategies that will be shared to support teachers as we work toward a collective improvement in mathematics instruction. In the third year of the project, we will be asking this pilot group to open their classrooms to their colleagues to share some of their most effective teaching strategies; we have seen the greatest change in instruction as a result of job-embedded observations and interactions.

Subsequent waves of teachers will go through a similar three-year journey, beginning with research-based learning, moving to understanding the *Responsive Instructional Guide* and finally to implementation of intentional, effective classroom strategies.

We believe the steps we are taking to increase teacher capacity both at École Guyot and divisionally will result in capable, more confident students who can think critically and apply their learning to new situations. ■

Lauren Mitchell-Lawson is the Instructional Support Coordinator for the Louis Riel School Division. She directs a team of eight itinerant teachers who support teacher learning in the areas of literacy, numeracy and assessment. Jeff Anderson is in his fourth year as principal of École Guyot. He previously served as principal at École Varennes and École Henri-Bergeron. Earlier in his career, he taught math at Grades 7, 8 and 10.

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Developing a Criteria for Decision Making in Math Leadership

By Jerrold Wiebe and Monaliza Vianzon, Pembina Trails School Division



As divisional math leads, we often have opportunities to review resources and pedagogical strategies that claim to support the teaching and learning of mathematics. A criteria or standard for making informed decisions is crucial. Analysis of proven resources and pedagogical practices can provide the framework for this process.

The use of vertical non-permanent surfaces (VNPS) is gaining popularity in math classes across the country. Math leaders, such as Peter Liljedahl, Jon Orr and Kyle Pearce, model the effective use of these VNP surfaces. The impact on engagement and learning is clearly evident in our schools.

Liljedahl's work extends beyond the use of VNPS as a tool. He outlines 13 other pedagogical considerations necessary in order to create what he calls the, "thinking classroom framework."¹ This classroom-based research framework has been shown to impact teaching, engagement and learning in ways worthy of note. Although we are excited by this, the purpose of this article is not an attempt to endorse the use of VNPS, the thinking classroom framework, or the work of one individual. Rather, the question for us is whether the attributes which make the thinking classroom successful

are definable and applicable as a metric against which other resources/models could be measured.

From a divisional leader's perspective it is intriguing to try to discern what it is that makes this framework and the work of Orr and Pearce so impactful to teaching and learning. In classes where thoughtful implementation of these practices is the norm, several key indicators are evident to us:

Teaching and learning begins with inquiry

Teaching through problem solving is not a new idea, yet many teachers struggle with the practice. Problem solving or inquiry has traditionally been something done after the skills were taught, seldom the vehicle for learning. The aforementioned math leaders have shown us that inquiry can be the hook that engages students and allows for the development of all strands of mathematical proficiencies.²

- Conceptual understanding: Comprehension of mathematical concepts, operations and relations.
- Procedural fluency: Skill in carrying out procedures; flexibly, accurately, efficiently and appropriately.
- Strategic competence: The ability to formulate, represent and solve mathematical problems.
- Adaptive reasoning: The capacity for logical thought, reflection, explanation and justification.
- Productive disposition: Habitual inclination to see mathematics as sensible, useful and worthwhile, coupled with a belief in diligence and one's own efficacy.

Increased discourse in the classroom

This practice promotes rich discussion and interaction among stakeholders as opposed to a "call centre" model where the default is for students to interact with the math in isolation. Rich discussion

provides a window to student thinking which can expose gaps and misconceptions.

Teacher facilitates educational decisions

Many resources, particularly digital, actually remove one of the most important aspect of a teacher's job. By scaffolding the level of concepts based on responses, these resources make decisions on behalf of a student based on what the student can do, not necessarily on what the student understands. Further to this, many resources remediate in areas where a student appears to struggle. On the surface this sounds appealing. However, many times this remediation is in the form of a "here's how to do" recipe format. Instead, in a thinking classroom, teachers³:

- Anticipate likely student responses to challenging mathematical tasks.
- Monitor students' actual responses to the tasks (while students work on the tasks in small groups).
- Select particular students to present their mathematical work during the whole-class discussion.
- Sequence the students' responses that will be displayed in a specific order (scaffold).
- Connect different students' responses and connect the responses to key mathematical ideas.

From this framework, we have derived three questions that we use when evaluating the merit of classroom math resources.

1. Does it increase classroom discourse?
2. Does it promote teaching through inquiry?
3. Does it support the teacher in making informed pedagogical decisions?

Conclusion

Ultimately, the questions must be answered using the lens of the local goals of math education. In most provinces, these goals are clearly outlined in the front

matter of the curriculum documents. What follows is taken from Manitoba's math curriculum.⁴

The main goals of mathematics education are to prepare students to:

- *Communicate and reason mathematically.*
- *Use mathematics confidently, accurately, and efficiently to solve problems.*
- *Appreciate and value mathematics.*
- *Make connections between mathematical knowledge and skills and their applications*
- *commit themselves to lifelong learning.*
- *Become mathematically literate citizens, using mathematics to contribute to society and to think critically about the world.*

References

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Grounded in local mandates and supported by the criteria of thoughtful informed practice, we have been able to use this framework to make decisions around supports that can greatly impact the teaching and learning in our schools. Clearly other considerations (such as cost) must be taken into account, however, from a pedagogical perspective we have found this to be a great beginning. ■

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What is a thinking classroom?

"The thinking classroom framework approach is teaching as an active process where small random teams of students work on non-permanent surfaces to solve a series of carefully selected problems. Instead of acting as the gatekeeper of knowledge, the role of the teacher becomes that of a facilitator; managing the flow of activity with a series of practical tool sets."⁵ – Peter Liljedahl

For more information on VNPS and the Thinking Classroom:

- <http://www.peterliljedahl.com/publications/building-thinking-classrooms>
- <http://makemathmoments.com>



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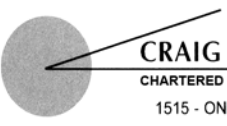


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