Inquiring into Professional Practice: Narratives of Educators of Mathematics

A Resource for Initial and Continuing Teacher Education
October 2018

Ontario College of Teachers
Ordre des enseignantes et des enseignants de l'Ontario

Professional Practice

Members apply professional knowledge and experience to promote student learning. They use appropriate pedagogy, assessment and evaluation, resources and technology in planning for and responding to the needs of individual students and learning communities. Members refine their professional practice through ongoing inquiry, dialogue and reflection.

The *Standards of Practice for the Teaching Profession - Professional Practice*

Acknowledgments

The Ontario College of Teachers would like to thank the dedicated educators who shared their narratives of professional practice that comprise this standards-based resource. Their commitment to ongoing professional learning and the sharing of their lived experiences illuminate how the standards come alive in practice and provides a foundation for critical inquiry, exploration and reflection.

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Introduction

Inquiring into Professional Practice through Mathematics is a narrative based standards resource that has been developed to facilitate professional inquiry into the standards through mathematics. Educators are invited to reflect on their professional practice through the narratives and inquiry questions within this resource.

Initial teacher education and Additional Qualification (AQ) courses are key professional contexts for inquiring into the standards of practice and ethical standards, as well as deepening understanding related to one's professional beliefs, assumptions, biases and values related to mathematics.

The narratives have been written by members of the profession and are authentic examples of experiences in professional practice related to mathematics.

It is hoped that this resource will facilitate deep professional inquiry, reflection and dialogue into the many dimensions of professional practice related to mathematics and the standards.

Ethical Standards and Standards of Practice for the Teaching Profession

The ***Ethical Standards for the Teaching Profession*** (Ontario College of Teachers, 2006a) and the ***Standards of Practice for the Teaching Profession*** (Ontario College of Teachers, 2006b) provide a framework of principles that describe the professional knowledge, skills, values and practices inherent within the lived experiences of members of the Ontario teaching profession.

The ethical standards and standards of practice represent a vision of professional practice, guide ethical decisions and actions, and convey the collective ethical professional responsibilities and commitments of the teaching profession.

Ethical Standards for the Teaching Profession

"At the heart of a strong and effective teaching profession is a commitment to students and their learning." (Ontario College of Teachers, 2016, p. 7)

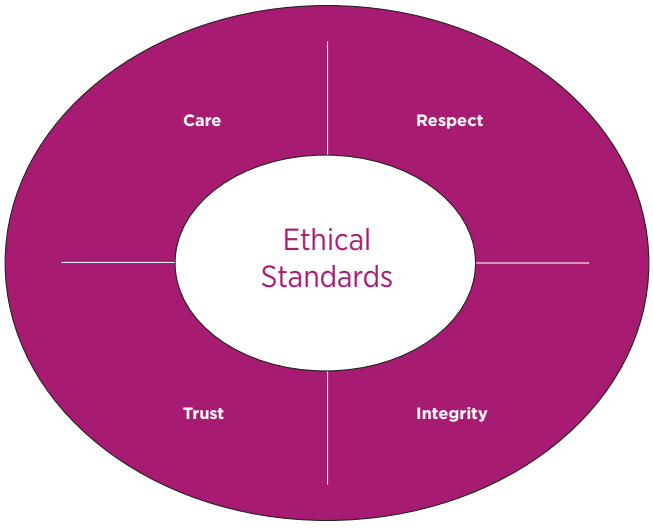
The Ethical Standards for the Teaching Profession are:

Care
The ethical standard of ***Care*** includes compassion, acceptance, interest and insight for developing students' potential. Members express their commitment to students' well-being and learning through positive influence, professional judgment and empathy in practice.

Respect
Intrinsic to the ethical standard of ***Respect*** are trust and fair-mindedness. Members honour human dignity, emotional wellness and cognitive development. In their professional practice, they model respect for spiritual and cultural values, social justice, confidentiality, freedom, democracy and the environment.

Trust
The ethical standard of ***Trust*** embodies fairness, openness and honesty. Members' professional relationships with students, colleagues, parents, guardians and the public are based on trust.

Integrity
Honesty, reliability and moral action are embodied in the ethical standard of ***Integrity***. Continual reflection assists members in exercising integrity in their professional commitments and responsibilities.



Reflecting on the Ethical Standards for the Teaching Profession

Consider the following inquiries as you reflect on the narratives in this resource:

- Reflect on how diverse mathematical processes and pedagogies can illuminate the ethical standard of ***Care*** within professional practice.
- Explore how the ethical standard of ***Trust*** can support educators' professional efficacy in mathematics.
- Reflect on how innovation, creativity, inclusion and social justice in mathematical teaching can support the ethical standard of ***Respect*** within professional practice.
- Critically explore how the ***Integrity*** of professional practice can be illuminated through transformational learning.

Standards of Practice for the Teaching Profession

"The Standards of Practice for the Teaching Profession provide a framework of principles that describes the knowledge, skills and values inherent in Ontario's teaching profession." (Ontario College of Teachers, 2016, p. 11)

The Standards of Practice for the Teaching Profession are:

Commitment to Students and Student Learning
Members are dedicated in their care and commitment to students. They treat students equitably and with respect and are sensitive to factors that influence individual student learning. Members facilitate the development of students as contributing citizens of Canadian society.

Professional Knowledge
Members strive to be current in their professional knowledge and recognize its relationship to practice. They understand and reflect on student development, learning theory, pedagogy, curriculum, ethics, educational research and related policies and legislation to inform professional judgment in practice.

Professional Practice
Members apply professional knowledge and experience to promote student learning. They use appropriate pedagogy, assessment and evaluation, resources and technology in planning for and responding to the needs of individual students and learning communities. Members refine their professional practice through ongoing inquiry, dialogue and reflection.

Leadership in Learning Communities
Members promote and participate in the creation of collaborative, safe and supportive learning communities. They recognize their shared responsibilities and their leadership roles in order to facilitate student success. Members maintain and uphold the principles of the ethical standards in these learning communities.

Ongoing Professional Learning
Members recognize that a commitment to ongoing professional learning is integral to effective practice and to student learning. Professional practice and self-directed learning are informed by experience, research, collaboration and knowledge.

Reflecting on the Standards of Practice for the Teaching Profession

Consider the following inquiries as you reflect on the narratives in this resource:

- Explore the ***Professional Knowledge*** needed to enhance mathematical understanding within your context.
- Reflect on how ***Leadership in Learning Communities*** can collectively facilitate a school's mathematical learning journey.
- Identify ***Ongoing Professional Learning*** processes for advancing the mathematical knowledge of all members of a school community.
- Explore how a ***Commitment to Students and Students Learning*** through mathematical teaching can support the development of students.
- Critically inquire into how ***Professional Practice*** can be informed through narrative inquiry.

Narrative 1: Unlearning and Relearning...

The most challenging and fulfilling time in my career has occurred in the last few months in my role of math coach. I started this new role with a fixed mindset and hyperventilating with nervousness.

My journey in math coaching began as a learner. I wanted to "unlearn" the way I was taught math and embrace what our school board calls "the comprehensive math program". This approach takes into consideration the individual learner, the learning environment and pedagogical practices.

In my undertaking of re-learning math instruction and math in general, I discovered a lot about myself. I learned about what I used to value (results and accuracy) and what I now value (collaboration and the journey towards understanding). This learning experience led me into coaching mathematics.

When I first stepped into the role of a math coach, I figured I would primarily be working with individuals new to teaching math or looking for ways to help them change their practice. I did not think that I would be facilitating math learning sessions for a room full of elementary educators with 20-plus years of experience who are well versed in math education, pedagogy and life in general. What would a 30-year-old, teaching for only seven years, bring to the table? How could I make an impact on these seasoned veterans in the field? It was intimidating and I didn't know where to begin. I was reluctant and found myself watching *Mr. D* instead of prepping for the upcoming professional development (P.D.) session. However, I knew I had to get down to work, so I did some deep breathing, said a silent prayer and hoped for the best.

I went into the first P.D. session with the seasoned vets, having a direction and focus for our session. We had done some pre-reading from the book, Models of Intervention in Mathematics: Reweaving the Tapestry (Fosnot, 2010) in advance, so we began there. As soon as our session was underway, I found it very important to set a positive tone and make sure that the educators in the room knew I valued the expertise they brought to the table. I also ensured that I immediately established myself as a co-learner and inquirer on this adventure into the land of teaching and learning mathematics. I needed to give my own growth mindset a kick start and talk myself into thinking I could make a difference. It was important for me to sit back and listen to the experience within those four walls.

The conversations during the first half of our session revealed that the intuitive knowledge of learners was an area that we might want to focus on. I reflected during lunch about all the things that were discussed and I looked at what I planned for the afternoon and realized that the direction we were about to go in did

not match where my audience was and what they needed. So I scrapped it. I made a single slide with potential pathways we could take instead, that were inspired by our morning conversations. I also photocopied another reading which I felt would enhance our morning discussion.

When we reconvened, I presented the group with the following question:

> *Where should we go next? I want you to feel that this time that has been set aside for you, is worthwhile and that you get something out of this. Is there anything up there on that slide that makes you curious?*

That's when we arrived on a new direction. I celebrated this decision by saying I am new to this too, and that I am excited for us to try it out. The general consensus in the room was excitement and acceptance to try something new and being okay with any outcome. The educators in the group were now steering the ship in their learning. I also enjoyed the experience. It turned out that the educators wanted to explore mathematical mindsets and new pedagogies.

The reading that I had photocopied over my lunch happened to come in handy because it was a chapter called, Math Daily 3 taken from the popular book, The Daily 5 (Boushey & Moser, 2014). We did some reading around the table from this chapter and discussed what this structure could potentially look like in our own classrooms. We talked about how we could adapt this structure so that it reflects our Board's vision of mathematics (the comprehensive math program) and help move our students forward. We planned that whole afternoon and the educators walked away with a new structure for a 60-minute math block where they had time built in for "guided math" or small group math instruction, whole group mini lessons such as a Fosnot math string, games and puzzles, meaningful problems and even some sketch-noting!

Before we even had a chance to meet again, the educators in my learning group were buzzing about how this new structure was succeeding for their students. I was stopped in the hallway with fabulous anecdotes and I was feeling so inspired! I visited the classrooms to see the happenings and provide my third party observations. Students, we had previous concerns about and who we thought had enormous gaps in early number concepts, were suddenly shining in the small group setting! These educators had the opportunity to strategically introduce math manipulatives to their students who may otherwise not have had the exposure. This structure lended itself to various assessment modes such as observations, conversations and products since students were able to explain their thinking in a new way and most importantly, students were feeling more confident and engaged, based on the feedback that they provided to their educators.

It has been two months since we started this new journey and our students love the changes that have been made and have asked if this can continue on until the end of the year. Educators who were not involved in the professional development have begun to ask questions and are intrigued by the progress these students have made. It was our school's missing piece and through our collaboration, connection and willingness to try something new and unknown, we tapped into something truly magical.

References

Boushey, G., & Moser, J. (2014). *The daily 5. Fostering literacy independence in the elementary grades*. Stenhouse Publishers: Portland, ME.

Fosnot, C. (Ed). (2010). *Models of intervention in mathematics: Reweaving the tapestry*. National Council of Teachers of Mathematics: Reston, VA.

Reflecting on the Narrative...

- Reflect on the significance of moments of "unlearning and relearning" that you have experienced in your professional practice.
- Reflect on the importance of setting a positive tone in professional learning settings.
- Explore inspirations that have occurred in your professional practice while teaching mathematics.
- Critically inquire into the role of manipulatives in your facilitation of mathematical understanding.
- Discuss the ethics associated with supporting colleagues along their professional learning journeys.

Narrative 2:
A Team Effort: The Math Contest

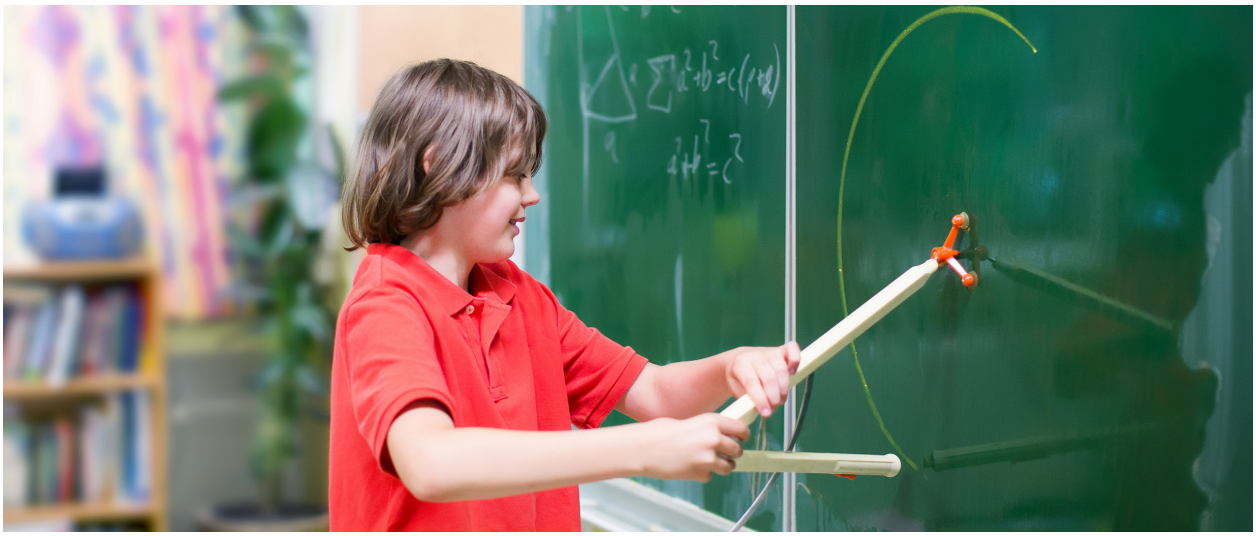
Have you ever tried to design one of those fabulous lessons that incorporates mathematical problem solving, tablet technology, collaborative groupings, student-centred math talk and web-based solution sharing with an authentic audience? Sounds like something you'd only read about in an Ontario College of Teachers publication, right? Well, that's what my colleague and I thought until we presented the idea to Grade 7 students from Six Nations of the Grand River.

My colleague and I got involved in a worldwide math contest shortly after its inception in 2009. A colleague of ours, a primary and junior math specialist and current math resource teacher, informed us of the online mathematics contest out of Brock University. We signed up and encountered the usual initial hiccups that seem to season many educators' first forays into online resource usage.

We had instances of insufficient internet bandwidth to conduct the contest. Several times the site crashed or was inaccessible on our end. We were also faced with the occasional conflict concerning the signing out and booking of the rolling computer lab. Thankfully, we share a sense of humour and our students, probably accustomed to substandard internet speeds that were not on par with the other schools at the time, didn't bat an eye as we struggled to complete the first few contests on account of all the technical and scheduling difficulties. Thankfully, we persevered and became more familiar with the contest's format and worked out the technical issues with some help from our IT support, who helped troubleshoot and make the most out of our school's internet resources.

The following year, we were much more aware of our potential barriers and began planning how to support students' growth and development in mathematical understanding. Throughout the year, we used the math contest as both a periodic assessment and a teaching tool to support student learning. The math contest is free for students in Grades 3 and 4, while Grades 5 to 12 may write the first contest of the year in October for free and then pay a small fee for future contests. With support from the school's vice principal who helped to fund our involvement, the Grade 7s wrote the first contest in October.

Taking the results from the first test, we looked over the data to determine the curriculum areas that students performed well in and which areas required increased focus and attention. We had seen a number of different strategies and problem solving skills from the thinking sheets. We gathered these sheets from the students upon completion of the October test and tried to come up with a way for students to share their thinking with each other so they could all improve their performance on the next contest date. In between contests, we showed the class some of the math contest's



recent YouTube video solutions to previous contest questions. This functioned as a learning experience as they viewed a novel approach to a problem they had struggled on. At first, we told the class that this was a video of me as a child, explaining a math problem with the use of a chalkboard. We had them fooled for a moment, until a couple of the Grade 7s realized that YouTube wasn't around when I was younger (or maybe even the internet, for that matter). That's when we told them it was a current pop singing sensation explaining his solutions in the video, which seemed to perk their interest in learning mathematics this way.

Now fully engaged, we asked them to view it again with attention to components of the video's technical aspects and how these supported the teaching of the mathematical problem solving approach. They noticed the use of visual explanations in the form of diagrams, tables and mathematical drawings. There was a clear, logical sequence to the explanation of the solution, along with mathematical proof at each step towards selecting the proper response. The class had a growing sense of what it takes to work through a multi-layered mathematical problem and we eagerly anticipated the results of the next contest.

However, we didn't see the change we had hoped for right away, as the students didn't seem to fully internalize the solution process, based on the October contest results. Based on our lived experience and scholarship, we knew that having students experience the process of teaching others would be beneficial to their learning. At the time, our school had a couple of tablets, so we devised a plan to mimic the math contest YouTube video solution by having the class record their own video solutions.

The students had to work in pairs, select a problem they wanted to explain and create a shooting script that clearly and logically described one or two ways to solve the problem.

In addition to this verbal explanation, there had to be some sort of visual aid to support their mathematical proof. Knowing they had an authentic audience for their video solutions, each pairing worked hard at ensuring their solutions were clearly articulated, as they collaborated on crafting their visual materials and mutually agreed on who would be the onscreen talent and behind the camera videographer. Once filmed, the students became their own critical friends, as they viewed each other's solutions and reflected and commented on the clarity of the solution process.

When we received the next contest results we celebrated as the entire class showed considerable improvement as a whole and each individual student exceeded their test score from the previous contest submission. It took the support of four educators and one IT worker to bring the students' creative talents and mathematical prowess to fruition while also showing the power of the process of teaching others to enhance one's own learning experience.

Reflecting on the Narrative...

- Identify key insights from this narrative that might inform your professional practice.
- Explore the significance of integrating "having students experience the process of teaching others" for mathematical learning in your professional context.
- Explore the processes of inquiry and reflection that may enhance mathematical learning.
- Reflect on how the ethical standards are integrated within your professional practice.
- Reflect on the value of utilizing technological tools within mathematical teaching and learning.

Narrative 3:
My Experience in Supporting Mathematics Instruction

During my first year of teaching, I had the good fortune and privilege of being coached by a colleague. When I think back on my experience with him, the first word that comes to mind is "specific". As of our very first meeting, our coach shared with me his "secrets" on how to encourage my students to succeed. The observations he made in my classroom helped me make my teaching clearer and more specific, with the ultimate goal of encouraging student success. I recognized in our coach a professional who is both very competent and humble.

Educator at École Secondaire Toronto Ouest

Whether as a teacher, a numeracy coordinator at École secondaire Etienne-Brûlé or a teacher-coach with the Conseil scolaire Viamonde, I have always practised a highly proactive form of academic leadership – with conviction and courage – to ensure that all students succeed.

To that end, a number of Professional Learning Community (PLC) meetings were set up in which the educators and I shared leadership with the principals of three schools, namely Toronto Ouest, Jeunes Sans Frontières and Étienne-Brûlé. During these meetings, we used data derived from student assignments, anecdotals, report cards and Education Quality and Accountability Office (EQAO) records to define a problem. We then drew up a team action plan to encourage greater harmonization of teaching practices and more effective learning for all mathematics students. My role was to serve as a coach for educators regarding implementing the action plan within the PLC context.

Below are a few of the actions we undertook:

Individual or Group Interviews with Educators

This was the most important stage. These interviews with the teachers allowed me to cultivate a climate of respect, empathy and confidence with them; this, in turn, gave me an opportunity to highlight their strengths, learn about their coaching needs and explain that we had a common objective, namely, to improve student performance in mathematics. In addition, this stage fostered a greater level of trust while also facilitating communication within the PLC and consolidating relations among all members of the learning community.

Developing Rubrics Allowing Educators to Monitor and Self-Evaluate their Instructional Practices as Related to Action Theory

Rubrics served as support tools that enabled educators to mutually observe one another in the classroom and to ask questions about their

instructional practices. After this exercise, I would meet with the educators – either as a group or individually – so that we could reflect together on planning appropriate actions. This activity represented a professional development opportunity for the educators as well as a chance for greater engagement with the students and their learning, and for collaboration and dialogue on resources and winning practices.

Integrating Technology in Teaching

Encouraging educators to pursue the integration of technology in their math courses (through interactive boards, computers and tablets) resulted in more effective differentiated instruction; at the same time, students felt more motivated to learn, and the collaborative work became more effective. For instance, the use of interactive boards enabled students to exchange ideas and engage in more classroom discussion about mathematics. While listening to their students, educators were able to evaluate their level of comprehension and therefore plan appropriate actions.

Thanks to the computers and tablets, students were able to access a variety of instructional activities, and to progress at their own pace and further develop their knowledge. Moreover, it was possible to collect evidence of student learning at any given time and document it in a portfolio.

Other Examples of Effective Practices with Students

As part of my duties, I had an opportunity to experiment with or implement certain strategies that proved conducive to student success.

- At the beginning of the school year, students were met with individually. That gave me a chance to develop a good relationship with each of them, and to identify their strengths and the challenges they were facing. These meetings also allowed me to determine their learning skills, work habits and the global citizenship skills they would have to develop in order to meet the course expectations. I was therefore able to help students set specific short- and long-term learning objectives.
- The learning outcome evaluation criteria were shared with students.
- No performance level was specified on the formative evaluations. Students had to use the feedback they received in order to improve the quality of their work. Those who failed to achieve the provincial standard received more classroom attention during the guided practice and were encouraged to participate in the tutoring sessions given by their peers or by the educator.
- It was possible at any point during the year for students to demonstrate that they were meeting an expectation. This strategy motivated them to learn and encouraged them to focus on their learning. They participated more actively in classroom discussions because they knew that mistakes would be accepted and that they would have an opportunity to correct their errors.
- Students had a chance to assess themselves with respect to their work habits and learning. They were then able to set new goals and develop their self-reliance.

The math class this year was superb! I really liked my teacher, Mr. Ciarin. He was very engaging and approachable – both during and after class. I enjoyed learning with Netmaths and the Interactive Whiteboards (IWB). Mr. Ciarin set some challenges for me and encouraged me to reach my potential. He was a terrific math teacher!

Jaspor, a student at École Secondaire Toronto Ouest

"The math class is a success. The learning environment is calm and effective, and there are reference aids everywhere – an environment that is both academic and fun. Students succeed with ease. Every student is destined for success thanks to our first-rate math class."

Hetrya, a student at École Secondaire Toronto Ouest

Reflecting on the Narrative...

- Explore how professional learning communities can enhance professional ethical practice.
- Identify the benefits of collaboration and shared leadership within this narrative.
- Reflect on the use of technology to enhance the teaching and learning of mathematics.
- Explore the significance of taking the time to build relationships with students and the impact this has on their well-being and motivation to succeed.

Narrative 4:
Collaborative Coaching and Mathematics

We act as coaches in our role as teacher-consultants in supporting colleagues in their professional learning related to the teaching and learning of mathematics. I engaged in three different collaborative coaching experiences with colleagues that helped to enhance mathematical understanding. These three experiences focused on the following:

- Physical Learning Environment
- Interactive Whiteboards
- Diagnostic Assessment.

The Physical Learning Environment

Our first strategy involved providing classroom support to a Grade 2 educator. Over a period of several weeks, we used an approach that consisted of observing this educator's practices in the mornings and co-planning with him in the afternoons. The concepts we looked at throughout the coaching period were geometry and measurement. On our first day, we started off by suggesting a different classroom layout, improved display spaces, and a different arrangement of the math resources so that students could have easy and immediate access to the manipulatives for the area of math covered in the course. Moreover, as we were reviewing available resources, we began co-planning a complete unit using the backward-design model.

Here are the few points that the educator took into consideration for his future practices:

- Learning outcomes and criteria as expressed in the students' own words
- The use by students of a word wall and math-specific vocabulary
- Authentic recreational activities such as going hunting for solid forms, and large-group feedback on the solid forms that surround us in our daily lives; a schoolyard activity involving measurements and non-conventional units in which steps are counted to determine the distance covered by small student-launched vehicles; a time-study activity referring to the classroom clock each day when the school bell rings
- Planning for assessment and evaluation teaching through mini-lessons.

Interactive Whiteboard

The second part of our account involves professional learning with educators around the use of the Smart Notebook software, including the mathematical components accessible from the school board's computers and the use of Interactive Whiteboards (IWB) in every classroom. At the Conseil scolaire Viamonde we developed a four-session professional learning course, with meetings spaced two weeks apart, on using the IWB and featuring an in-class demonstration with the students during the final meeting.

Students using IWB working with geometric shapes.

These sessions were organized by Division (Primary and Junior). Once the educators felt comfortable with the software and the IWB, we introduced them to the tools they needed to use geometric shapes, as well as the measuring tools they required to trace, measure and transform angles, lines and geometric shapes. They also had access to an interactive bank of previously performed activities, a resource that allowed them to use or generate games for all areas of mathematics.

In the third session, the educators registered on the Smart Exchange site. This enabled them to do research and engage in activity exchanges around the world. Before the last session, participants had time to practice during the training program and to try out a few strategies in the classroom. For the last session (and over two periods), one educator per Division volunteered to welcome all participants as they observed a classroom math activity, including use of the software and the IWB.

Through their actions and collaboration, and thanks to the vital support provided by the adults present, the students demonstrated their understanding of the concepts they were studying, together with their skills in using the software and the interactive white board.

Diagnostic Assessment

In our third experience, we trained Grades 3 to 8 educators on the use of a math resources available throughout the board, namely *Leaps and Bounds towards Math Understanding* (Small, Lin, & Crofoot, 2011). Our goal here was to remind educators of the importance of diagnostic assessment and of the key mathematical ideas described in this excellent resource. This training consisted of two parts. In the first part, we introduced the resource and described how it is used, ensuring that all schools visited had access to the digital version.

In the second part, we co-planned a unit with the participants and with educators who were working at the same grade level. This unit dealt with a mathematical area of their choosing. It involved planning and exploring the big idea underlying the concept, as well as diagnosis, independent and guided paths, an examination of the difficulties potentially arising from studying the selected concept, the manipulatives required and the resources available in the digital version.

Later, educators who had tried out the resource were able to request specific coaching if they encountered any difficulties using it, or if they required classroom modelling. The feedback from the educators who had used this resource indicated that they saw diagnostic evaluation as a means of understanding their students' errors or mistakes in mathematics. The diagnostic results enabled them to react appropriately by revisiting the key idea – and this, in turn, allowed students to fill in any comprehension gaps they had vis-à-vis the concept being studied.

References

Small, M., & Lin, A., & Crofoot, J. (2011). *Leaps and bounds toward math understanding.* Toronto, Ontario: Nelson Education.

Reflecting on the Narrative...

- Critically explore the impact of the learning environment on the mathematical learning of students.
- Discuss the significance of gamification for teaching and learning mathematics.
- Inquire into how mathematical understanding might be enhanced through experiential land-based learning opportunities.
- Critically investigate the role of teaching through big ideas and diagnostic assessment for the enhancement of professional practice.

Narrative 5:
Story of My Transformation

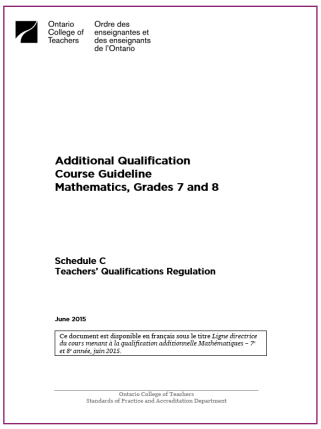
My First 10 Years

As an intermediate elementary mathematics educator, I spent the first 10 years of my career confident that I was teaching math using instructional methods that were proven effective in general for many educators and students over generations. For me, mathematics was about following rules precisely as it was reduced to processes and procedures more dependent on commitment and discipline rather than understanding, thinking, connecting, representing, and/or creating.
I recall many times teaching math and guiding students to focus more on how to follow steps rather than on why the steps work, why they were necessary and why the understanding of math was valuable to them in their lives.
I didn't know how to teach any different, nor was I open to really accepting anything else since that was how I understood and succeeded in math throughout elementary, high school and university.

Math as an Experience

As a math Additional Qualification (AQ) instructor, the part of the story on math learning success throughout formal education isn't paralleled very often and instead contrasted by the trauma that so many elementary educators have experienced through their years of a difficult relationship with learning math.

For many educators, experience with learning math carries into our lack of confidence with teaching math causing extra stress when working at diversifying our programs to include a focus on achievement categories and math processes necessary for a learning comprehensive math program. So many educators recount at some point being confronted with the challenges of trying to succeed in math when it had become overwhelming and they didn't have the skills and strategies to make sense of the learning.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Additional Qualification
Course Guideline
Mathematics, Grades 7 and 8

Schedule C
Teachers' Qualifications Regulation

June 2015

Ce document est disponible en français sous le titre Ligne directrice du cours menant à la qualification additionnelle Mathématiques – 7e et 8e année, juin 2015.

Ontario College of Teachers
Standards of Practice and Accreditation Department

Cover of a Math AQ Course Guideline.

Knowing today how powerful a personalized inquiry program can be in building creative critical thinkers and problem solvers. It is no surprise that once math became a challenge that so many learners weren't able to work their way through the struggles with the concepts. Our math learning environments today are quite different than what many of us have experienced and this started with educators

transforming their practice and working hard to overcome their own lack of confidence in the subject material. Recently, there has been an increased focus on differentiation as we personalize the learning for each student. Educators are deconstructing the Math curriculum, making connections, and building a deeper understanding of the role of assessment through the *Growing Success* (Ontario Ministry of Education, 2010) document. Technology has provided greater access to collaboration where educators are working via many freely available tools and technology is also providing greater access to learning resources that are becoming common place in the classroom.

My Story of Transformation

The story of my transformation begins when I moved out of my comfort zone to teach age groups that I am certified to teach, but had not worked with for many years. In the division at the time were excellent teacher leaders that are well respected for their leadership in our school and regionally in our school board. They were very supportive in opening their classrooms, sharing their instructional practices and modelling effective reflective practices necessary to continually shape the program to be the most effective for each learner. Within a few short weeks, I discovered that I needed to shift my focus from knowing the subject of math to understanding the dynamics of instruction and assessment in a math program. The efforts of working collaboratively with my colleagues was very significant as it helped me to connect with the formal learning I was part of through the AQ and within my board. I had the team to motivate me to infuse new elements into my math program and then discuss and question the learning with the team. I felt empowered to test instructional strategies, report back with my observations and debrief the learning ongoing throughout my program transformation.

Many educators report similar collaborative successes in the AQ courses from one session to the next and many educators emphasize how impactful the collaboration has been in building a bond with colleagues at different stages in their journey with teaching math. These partnerships with professionals at different levels of expertise are working and shaping a model of effective reflective professionalism as they experience success through supporting each other's learning. This is true with the connections made in online AQ courses. Educators make connections and build a strong sense of trust through their work in the courses that carries over beyond the duration of the courses.

Facilitator

Working through collaboration and transitioning ourselves into the role of facilitator or guide-on-the side and not '*keeper of the knowledge*' has aligned our mindset with that which we work to build in our students. Educators are framing their efforts (much like we try to do with our students) to be in tune with a growth mindset learning community where we are receptive to our students and how they are learning. I can recall many situations where educators have benefited from their collaboration in moderated marking sessions that have helped to dig deeper into the curriculum and identifying indicators of learning that we can anchor personalized feedback on to drive instruction. Other educators have benefited from working collaboratively to reconstruct the paths students take in the program by deconstructing the curriculum and making Big Idea connections that incorporate cross-curricular connections. Much of this stems from educators being inspired by effective practices they explore in the professional development they received during the AQ they are working through as they discuss effective practices in the planning, teaching and assessment cycle of an ongoing modern learning model.

Professional Learning

The level of professional knowledge and practice continues to grow and expand in the areas of instruction and assessment as educators reference a multitude of resources that inspire them to build differentiated and personalized math programs that supports diversity and engages all students. Educators have shared a different mindset to assessment inspired by Fosnot's (2007) *Landscapes of Learning* and Boaler's (2016) work on Mathematical Mindsets. Being open to how students learn best and connecting to a variety of elements from each student's schema has helped educators maintain a constructivist approach to teaching and learning that frames their assessment lens. Educators are finding

greater success in teaching mathematics as they use asset indicators rather than working from a deficit mindset in tuning the progression of the program. Through their work on understanding a new model of assessment focussed on the learning progress rather than just the result, educators are tuning their programs to flow with the planning, instruction and assessment cycle that needs feedback from ongoing assessment to drive learning and instruction. This is very evident in educators exploring and finding great value in a new framework of math instruction.

Math Classrooms Today

Our classrooms today are full of math talk both verbally and through a variety of representations (*models, diagrams and movements*). Educators have worked to transition as part of a program framework that empowers students to dig into their own understanding as they work on open-ended problems. Mathematical processes and the Achievement Chart are intentional components reflected in the learning. Just recently, I have been collaborating with a math team in our school working to transform our classrooms to more of a Guided Math Model inspired by the *Daily 3* math detailed in the '*Daily 5: Fostering Literacy Independence in the Elementary Grades* (Boushey & Moser, 2014).

Student learning continues to improve as we find ways to hear and understand how our students are understanding and applying their learning to solve problems and communicate solutions. The guided math groups are making a difference, as reported by many educators. I am discovering this to be very true as with my own class, I can set more specific learning goals for the small group and be part of their thinking and application of strategies that I assess throughout the learning process to build more specific immediate feedback. Educators in my AQ courses are inspired by the experiences we share and the successes our students are having that is inspiring them to work through the challenges of their transition knowing it will be a positive impact on student learning. The problem solving frameworks woven into the guided program vary and include ample opportunity for discussions having students' self- and peer-assess as they share and question the learning through a Math Congress (Fosnot & Dolk, 2002), Bansho and/or Gallery Walk (Fosnot & Dolk, 2002). Mathematics instruction is becoming more known for making mistakes and learning through collaboration for our students and educators alike rather than just memorization of facts and procedures.

My Learning Journey

The journey I am on with math is one of learning about math and learning to teach effectively. To do this, educators I have worked with and supported in their learning journey have come to understand that past experiences with mathematics will be overcome as we learn about our students and what works best to support their progress. Educators have come to understand also that our professional growth is a journey and one that will be successful as we work from a growth mathematical mindset ourselves. We will be more receptive of different ways our students understand math valuing their creativity and supporting their learning effectively. Educators will continue to harness past and new experiences as we appreciate the changes in our elementary system that enable our students to see mathematics in their daily lives.

References

Boaler, J. (2016). *Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages and innovative teaching*. San Francisco, CA: Jossey-Bass.

Boushey, G., & Moser, J. (2014). *The daily 5. Fostering literacy independence in the elementary grades. Portland, ME*: Stenhouse Publishers.

Fosnot, C. (Ed). (2007). Landscapes of learning, found in *Overview: Investigating multiplication and division grades 3-5*. First Hand, Heinemann: Portsmouth, NH

Fosnot, C., & Dolk, M. (2002). *Young mathematicians at work constructing fractions, decimals, and percents*. Portsmouth, NH: Heinemann.

Ontario Ministry of Education. (2010). Growing success: Assessment, evaluation, and reporting in Ontario Schools. Retrieved from http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf

Ontario Ministry of Education. (2011). *Capacity building series. Bansho (Board Writing)*. Retrived from http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/CBS_bansho.pdf

Reflecting on the Narrative...

- Critically explore the role of student mindsets in the learning of mathematics.
- Reflect on your own mathematical mindset as an educator and identify how it frames and influences your teaching.
- Discuss how a constructivist approach frames your teaching and assessment practices in mathematics.
- Critically explore the significance of the following pedagogical strategies to support mathematical learning:

    - Guided math groups
    - Math congress
    - Bansho
    - Gallery Walk.

- Identify professional learning practices and processes that support educators mathematical teaching and learning.
- Discuss how an ethical stance is reflected in your collaborative practices with colleagues.

Narrative 6:
Collaborative Inquiry into Mathematics

I believe that our chances of successfully changing educator practice is heightened when we bring educators together for professional dialogue and honour the knowledge they already come with in order to enhance student engagement and learning. Both these aspects of the collaborative inquiry framework work together to ensure its success as a professional development process. In my role as an Instructional Coach, I've had several opportunities to facilitate collaborative inquiries at the primary, junior and intermediate levels. In a collaborative inquiry, educators work together to identify the greatest area of need, analyze relevant data, test out instructional approaches, make adjustments, and reflect on the process as a whole. This is an iterative approach, meant to increase student learning as educators reflect and build on each successive inquiry.

One of the Grade 2 collaborative inquires I participated in led to some insightful observations and key learning. For the first meeting, educators brought evidence of learning through observations, anecdotal notes, conversations and student work. We first had a discussion using the 'See/Think/Wonder' protocol, which led us to identifying the greatest area of need for our students - students' ability to explain their thinking through reasoning and proving. These skills not only span the five mathematical strands, but also the entire curricula.

Using our school's Theory of Action and the language of the mathematical processes, we crafted our overarching learning goal:

> *We are learning to explain our thinking (reasoning and proving) using mathematical words and symbols while solving problems.*

We then generated a learning goal based on curriculum expectations related to addition, which was the next concept teachers wanted to work on with their students:

> *We are learning to solve problems involving the addition of numbers and explain our thinking [reasoning and proving] using mathematical words and symbols using a variety of strategies.*

We then created success criteria aligned with the learning goal (that is, I can choose a strategy to solve the problem; I can explain my strategy using a variety of representations). As a group, we used several resources and our own experiences to craft a question to gauge students' understanding of addition. We also created a list of task requirements (for example, concluding statement and clearly labeled diagram), which were then used to lead a lesson on what a good answer looks like; students had a better understanding of the difference between success criteria and task requirements once we demonstrated using sample problems.

After administering the first question to students, we came together to moderate the work and generate next steps, keeping in mind our learning goal and success criteria; our focus was reasoning and proving and the vehicle was addition. We divided the work into high, medium and low, then examined the 'high' examples to ensure alignment with the success criteria we created. We shared these examples with students in order to establish a common understanding of expectations in regards to 'explain your thinking'. Three more lessons were created to improve students' ability to reason and prove; even though we were focusing on addition, we wanted to emphasis students' capacity to explain their thinking. Our lessons included but was not limited to:

- establishing common language related to reasoning and proving
- making vocabulary lists and anchor charts
- generating sentence frames
- creating open-ended and open-routed tasks, and
- using talk moves.

Educator working with students building models

Our first lesson was focused on describing relationships between quantities by using addition through open-routed and parallel tasks; we moderated student work based on the success criteria, took anecdotal notes, which were used to have conversations with individual students, generated strategies and tools to support student learning and created our next lesson based on the data we just gathered. During our conversations, we came to realize that students did not have to document their thinking in writing at all times, therefore, for one question, we had students act out the solution to the problem and for another problem, we had students explain their thinking orally. Strategies that were taught included:

- making 10s
- counting on
- doubling, and
- number talks.

Tools to support these strategies included:

- number lines
- open number lines
- manipulatives
- ten frames, and
- rekenreks.

This cycle was repeated three more times, culminating in a summative task to determine student growth over time.

Students and educator working together.

During our moderation of the summative assessment, we saw growth in several students from the first word problem to the most recent word problem in terms of their understanding of addition concepts; some students also started to see the relationship between addition and subtraction and between addition and multiplication. This was due in large part to the strategies and tools we used to move their learning forward as well as student's self-reflecting and self-assessing their learning in order to make their thinking more visible. It was interesting to note that no matter how careful we were in crafting the questions, students always interpreted the questions based on their experiences and prior knowledge.

While this should come as no surprise, this realization was heightened during this collaborative inquiry. For example, one problem we gave them asked how many trips it would take to get students to the Planetarium for their field trip using three cars. Many students wondered why we were not taking the bus and others were stuck on the notion that there must be an adult with them at all times (for example, at the Planetarium, in the cars and back at the school with the students still waiting to get a ride), thus changing the configuration of people in the car.

This question proved how important context is for students - the problem we pose to them has to have meaning, it has to make sense and the ability to make connections.

Other key learnings that came from student work and our discussions were:

- language of the learning criteria is important
- anticipating student responses beforehand
- determining what a level 4 looks like.

As a culminating activity, we presented our journey to the rest of the staff, which included eaducators answering the questions themselves (for example, anticipation), examining student work to make notes about student progress over time (for example, observations), and generating next steps for instructional purposes to keep the learning moving forward (for example, assessment).

I learned that it is important to support educators along the implementation bridge. As we learn to change our practices, there will be changes in outcomes. The key is to start where the educators are and to keep in mind this is a process; it's a journey and changes can't happen overnight but if we start with small steps, eventually we will see large gains in our students.

Reflecting on the Narrative...

- Reflect on a time when professional inquiry has taken you to a deeper level of understanding about something you initially thought was obvious.
- Explore the significance of the following statements for your own professional practice,
    - "These skills not only span the five mathematical strands, but also the entire curricula."
    - ..."if we start with small steps, eventually we will see large gains in our students."
- Identify insights gained from this narrative regarding collaborative inquiries.
- Reflect on a time when you have inquired into something that challenged your assumptions and biases.

Narrative 7:
A Collaborative Inquiry on Numeracy

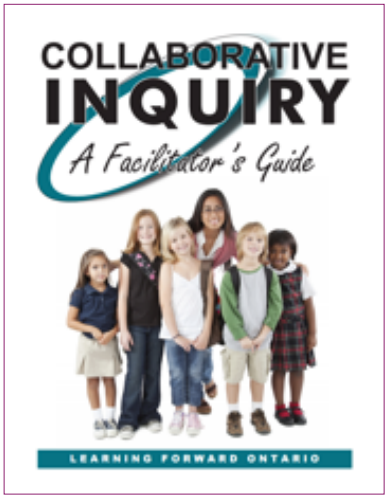
The Conseil scolaire Viamonde conducted a collaborative inquiry on numeracy at three elementary schools in the Toronto area. The team was made up of 12 Junior Division teachers, two resource teachers, three principals and two elementary-level educator-consultants.

The two consultants defined and explained the collaborative inquiry process at the first meeting held with the three schools. Since they were describing a new way of working for the entire team, the consultants took the time to study examples of inquiry questions and define the inquiry design for the year. They used a document entitled *Collaborative Inquiry: A Facilitators' Guide* (Learning Forward Ontario, 2011). All of the schools then analyzed the data related to their students' needs and instructional practices in numeracy (Education Quality and Accountability Office [EQAO] test results, report card notes and student surveys). The team then developed a chart that clearly indicated the students' strengths and challenges as well the instructional practices already implemented by each educator.

Following the completion of the student and educator needs analysis, it was decided to have the inquiry focus on the problem-solving process, higher-order thinking and communication. In addition, the educators wanted to explore open problems in a

What is the impact of teaching through problem-solving on our students' thinking skills and communication in the area of numeracy?

Using this inquiry question, the team developed a learning outcome and evaluation criteria to measure the evidence of how the students reasoned, how they checked their responses and how they used the math vocabulary. After the inquiry question had been developed, an action theory was drafted; the team referred to this theory at each Professional Learning Community (PLC) meeting, and this facilitated planning the next actions.



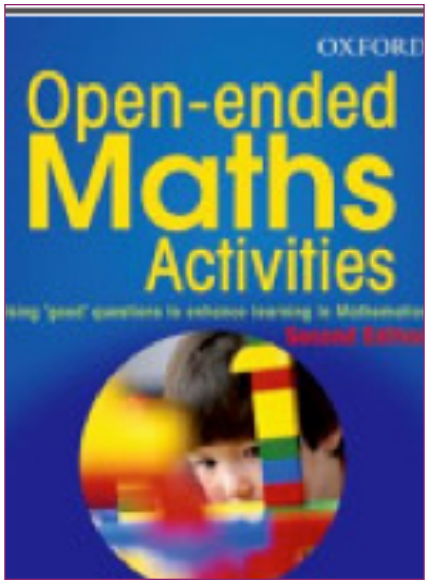
Four paths were planned, all following the same format: two PLC days with the three schools and one day of training in each school to address the educators' specific needs. Whenever the team met as a whole, the host school was responsible for modelling a classroom lesson. The other participants were observers who then reviewed everything with the entire group. During the first round in each school, the two educator-consultants planned a classroom learning experience consisting of modelling a lesson in three segments and an open-ended question. They used a problem taken from a resource entitled *Open-Ended Maths Activities: Using 'Good' Questions to Enhance Learning in Mathematics* (Sullivan & Lilburn, 2004). The educators greatly enjoyed using this resource, and all of them were given a copy

While analyzing the students' work, the team came to the realization that the main challenge facing the students had more to do with the understanding of basic concepts than with the problem-solving process itself. On the other hand, the team concluded that, while the inquiry question dealt with teaching THROUGH problem-solving, in practice the focus was actually on teaching FOR problem-solving. As a result, the team then modified the inquiry question as well as the learning outcome and evaluation criteria. It also decided to work more in the area of number sense and numeration because this was the greatest challenge for the students.

The new inquiry question read as follows:

What is the impact of teaching through problem-solving on our students' thinking skills and communication in the area of numeracy and their comprehension of basic number sense and numeration?

The new objective therefore became one of observing how students discovered the new concepts they were studying through exploration and experimentation using concrete or illustrated materials, personal and standard algorithms and problem-solving strategies. The next PLCs provided an opportunity to compare teaching FOR and THROUGH problem-solving. The *Guides to Effective Instruction in Mathematics* (Ontario Ministry of Education, 2006) were extremely helpful in carrying out this task. The team also discussed the importance of monitoring the development scale of a mathematical concept by studying some key mathematical documents and the progress charts of the *Guides to Effective Instruction in Mathematics* (Ontario Ministry of Education 2006).

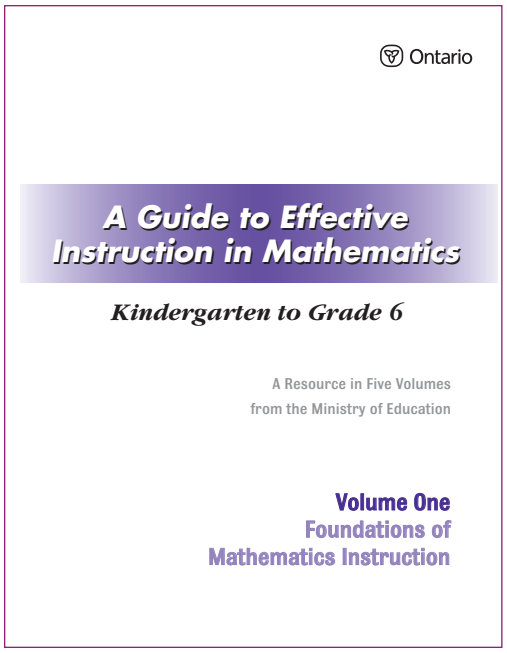


The educator-consultants offered a few training vignettes on some of the concepts that students find difficult (for instance, fractions and decimal numbers). They made substantial use of the *Guides to Effective Instruction in Mathematics* to create these vignettes, as well as the various training programs available from Dr. Marian Small. Reflective practice formed an integral part of the inquiry. The educators were often required to reflect on the practices being used and the impact of these practices on student learning. Resources on coaching and mentoring helped support the participant reflections.

At the final meeting, the team reviewed the entire inquiry process and analyzed the impact of the new practices on students and educators. The educators noted that, thanks to the open problems, their students were considerably more motivated when it came to problem-solving, especially students with learning exceptionalities. They attributed this

success to the fact that open problems allow greater scope for creativity and differentiated instruction. They also stated that open problems gave them a better understanding of their students' challenges; and this, in turn, facilitated how they planned the next stages of their teaching. Teaching THROUGH problem-solving enabled students to discover new concepts by using strategies and personal algorithms and by taking a more active part in their learning. Thanks to this strategy, educators gained an understanding of how important exploration is in the acquisition of a new concept and even in redefining the educator's role – a role that goes from being a master of knowledge to serving as a guide.

Finally, monitoring the development scale of a mathematical concept enabled educators to plan differently, that is, to accord more attention to the prerequisites of acquiring a concept and the outcomes of diagnostic tasks. In summary, educators said they felt better equipped to plan and teach the mathematical concepts of the curriculum. Students became more engaged in their learning because they were playing a more active role and the lessons were more closely aligned with their needs.



References

Learning Forward Ontario. (2011). *Collaborative inquiry: A facilitator's guide*. Retrieved from http://misalondon.ca/PDF/collabpdfs/Collaborative_Inquiry_Guide_2011.pdf

Ontario Ministry of Education. (2006). *A guide to effective instruction in mathematics, Kindergarten to grade 6: A resource in five volumes from the Ministry of Education*. Toronto, ON: Queen's Printer for Ontario.

Sullivan, P., & Lilburn, P. (2004). *Open-ended maths activities: Using 'good' questions to enhance learning in mathematics*. Melbourne, Australia: Oxford University Press.

Reflecting on the Narrative...

- Identify new insights gained from this narrative regarding collective mathematical inquiry as a shared professional learning process.
- Critically explore the inquiry questions that the educators focused on within their professional practice.
- Reflect on the "importance" of monitoring the development scale of a mathematical concept.
- Identify the mathematical professional knowledge that was evident within this narrative.
- Discuss how you use professional learning resources to inform your role as facilitator of the mathematical learning journey.

Narrative 8:
Supporting Indigenous Students: Collective Inquiry

Commencing in the fall of 2013, Indigenous math focused Collaborative Inquiry was intended to support the success of Indigenous students. I have been involved with this initiative over the past two school years as a principal, and this year as a board lead. My participation in this inquiry has afforded me the opportunity to reflect on my own personal knowledge and understanding of Indigenous cultures and histories. Despite years of working with Indigenous students, both as a educator and principal, I came to realize I had a very surface understanding of Indigenous cultures and histories, and this impacted the learners I was responsible for. Even though we were offering Anishinaabemowin (a First Nation language), and serving as a feeder school for a federal school from one of our local reserves, very little culture and history was visibly present in our school and district.

This made the work being done through the inquiry critically important both to schools in the area, and to me personally. This inquiry has transformed me both personally and professionally. As a co-inquirer, I have become deeply committed to fostering a culture of ethical inquiry related to supporting Indigenous learners. Through my work with the collaborative inquiry, I came to realize that some schools were not comfortable with the focus of our inquiry. As a result, I came to understand that as educators engaged with this inquiry, there could be different barriers and challenges that would need to be addressed. This collaborative inquiry was an opportunity to create a safe space for reciprocal learning and shared leadership to emerge. The creation of a space where freedom and opportunity to try different things in classrooms was encouraged. We had several educators who expressed gratitude for the "permission" to try different things and felt like they were allowed to stray a little from their planned paths. The inquiry provided opportunities to meet as a team to share new learnings, ask questions and discuss some of the ideas that could be replicated in other classrooms. We shared student work samples, anecdotes, photos and videos.

I had the opportunity to share the progress of this project with trustees and First Nation Education representatives through the First Nations Advisory Council. They were excited and pleased with the learning and sharing that was occurring during these inquiry meetings.

New Learning: Mathematical Thinking

This collaborative inquiry was energizing as it enabled me to work as part of a leadership team with our supervisory officers and program department leaders to explore culturally responsive processes for learning and teaching mathematics with an Indigenous focus. Through traditional cultural practices, students were able to engage in mathematical thinking. Observations, student work and

engagement in authentic experiences (for example, maple syrup harvesting) allowed us to discover that using a visual and spatial approach to mathematics learning was in fact beneficial for learners.

The work of Dr. Lisa Lunney Borden reinforced the learning related to mathematics that emerged through the inquiry. The team learned about the 'verbification' of mathematics (Lunney Borden, 2011) and how the language that we use can be confusing to some Indigenous learners. We discussed how a person may be English first language, but still may not think in that way, they may actually think in an Indigenous language. Dr. Lunney Borden's work (2014), also got us to look at the mathematical thinking that is evident in Indigenous cultures and the ways that we can bring that into our math lessons. Team members incorporated Indigenous games and crafts into the learning and had students identify what math was involved in these activities.

New Learning: Reciprocal Relationships

One of our board's greatest strengths as a result of the inquiry is our ever-growing relationship with Indigenous community partners. I noticed that many Elders and parents of our Indigenous students are reluctant to even enter a school due to the historical trauma associated with residential schools and also the past treatment of later generations of parents in regular schools. In the past, I had been hesitant to reach out to the Elders in my community, not wanting to offend them in any way.

I have now come to understand the significance of a relationship based on respect and trust that enables a reciprocal partnership between school and the community. These partnerships engage local communities in the teaching and learning process. As a result, Indigenous students are able to see their community, culture and values better reflected in the school.

I need to further explore strategies to enhance sustainable relationships with the community.

New Learning: Building Capacity in the School Board

We felt it was important to make Indigenous culture an integrated and authentic part of the school year as opposed to an occasional occurrence, or an add on. All of our participating schools also expressed a desire to infuse culturally responsive practices into the daily structure of the learning and not isolated incidents. However, there were some challenges. One challenge was inviting educators to critically examine their own assumptions and beliefs. This examination is part of supporting a culturally responsive pedagogy. Another challenge is the lack of time to attend meetings and the commitment required to continue work back at the school. Knowing that a large part of this initiative spreading within a school is dependent on the experiences of the staff linked to the group, it makes the sharing within a building more difficult.

It is vital that our educators see this as the start to their work around culturally responsive practices and pedagogy, and that they understand the need to continue their learning journey for the benefit of their Indigenous learners. It was also important that our federal colleagues and community partners saw our commitment and passion about learning the history and culture in order best serve the students when they enter the provincial system. It was actually very emotional at times.

Passion

I recognize now that my understanding of the whole system was limited in that my entry point for this system learning stemmed from my experiences as an elementary principal in a small rural school and as a secondary vice-principal. I quickly discovered that my passion for deepened and continued learning around Indigenous initiatives was not met by all administrators, and the lack of passion was easily mirrored by teaching staff. The opposite was also true. Those administrators that shared my passion for learning, passed this same passion along to their teaching staff. By nurturing relationships and being available to support when needed, I observed a growth in Indigenous knowledge, understanding and increased motivation to improve culturally

responsive practices and pedagogy for our Indigenous learners. I learned that time is essential to build trust for the system-level leader. Listening became a central part of my role when conversing with our Indigenous community partners.

Theory of Action

We had established the theory of action for the inquiry. We then brought the group together, shared the research and evidence for why this theory of action for this group of students now, and the provided the resources, reciprocal learning opportunities for educators to work through the inquiry cycle and learn through applying the inquiry process within the local context of their school and community. I believe that our work as educators is to build a professional culture of learning and growth. I believe that through building a professional culture, the best teaching and learning strategies, will emerge.

I am dedicated and passionate about improving educator knowledge, understanding and awareness of Indigenous histories, cultures and perspectives for all staff and students. This is of the utmost importance to improve practice and pedagogy to best serve the needs of our students, and allow for greater student achievement and well-being for our Indigenous leaners. Relationship building amongst educators and the focus on mathematics promoted and fostered an improved understanding of Indigenous learners, which required educators to refine professional practice across the school board system. This is reflective of the *Ethical Standards for the Teaching Profession* (Ontario College of Teachers, 2006a) and *Standards of Practice for the Teaching Profession* (Ontario College of Teachers, 2006b). It is a privilege to be part of this project and I look forward to continuing this work next year in a continuation of my leadership role. I hope to inspire and develop a shared vision for culturally responsive practices and pedagogy that will all hold important in the school board.

References

Bass, B. M., & Riggo, R. E. (2008). *Transformational leadership*. Mahwah, New Jersey: Lawrence Erlbaum Associates, INC.

Lunney Borden, L. (2011). The 'verbification' of mathematics: Using the grammatical structures of Mi'Kmaq to support student learning. *For the Learning of Mathematics, 31*(3).

Lunney Borden, L. (2014). More than a quick fix: A model for Aboriginal mathematics education. *Principal Connection*, *18*(1), 13-15.

Ontario College of Teachers. (2006a). *The ethical standards for the teaching profession*. Toronto, ON: Author.

Ontario College of Teachers. (2006b). *The standards of practice for the teaching profession*. Toronto, ON: Author.

Ontario Ministry of Education. (2013). *The Ontario leadership framework: A school and system leader's guide to putting Ontario's leadership framework into action*. Toronto, ON: Queen's Printer for Ontario.

Ontario Ministry of Education. (2014). *Achieving excellence: A renewed vision for education in Ontario*. Toronto, ON: Queen's Printer for Ontario.

Shires Golon, A. (2004). *Showing your work when it feels like there's nothing to show*. Retrieved July 13, 2016, from www.visualspatial.org/files/whowwork.pdf

The Literacy and Numeracy Secretariat. (2014). *Solidifying our leadership alliance*. Retrieved on July 13, 2016, from http://www.edu.gov.on.ca/eng/literacynumeracy/publications.html

Reflecting on the Narrative...

- Critically explore the ethical dimensions inherent within this narrative.
- Critically explore the underlying assumptions and beliefs related to leadership, collaborative inquiry and "passion" within this narrative.
- Identify the processes employed within the collaborative inquiry of the school community that engaged new relationships and scholarship.
- Critically explore the implications of this school community engagement with collaborative inquiry related to Indigenous language.
- Identify new insights related to your professional practice as a result of engaging with this written reflection.
- Critically explore the ethical professional responsibilities associated with the *Truth and Reconciliation's Calls to Action* as an embodiment of the ethical standard of *Integrity*.

Narrative 9:
Capacity Building through an Innovative Additional Qualification

In the spring of 2016, the Ontario *Renewed Mathematics Strategy* was released (Ontario Ministry of Education, 2016). This strategy outlined the vision and objectives for student well-being, engagement and learning in mathematics throughout the province. It also inspired deeper reflection and dialogue at the Bluewater District School Board about innovative opportunities for educators to increase their knowledge of mathematics content and related pedagogical strategies. Emerging from the discussion was to offer an Additional Qualification (AQ) on mathematics using a blended delivery model. Schools were encouraged to register as teams and the board provided funds to release the participants for face-to-face sessions.

Bluewater District School Board partnered with Brock University. We were provided with an AQ course guideline framework developed by the Ontario College of Teachers (2015). This framework allowed us to adapt the content to align with our school board priorities and mathematics goals. This course was designed for educators by educators. Brock University staff commented that it is one of the most comprehensive outlines they had seen. With the course ready to go, we put out the invitation to our educators. Forty-two educators representing teachers from Kindergarten to Grade 6 and administration embarked on the journey to enhance their teaching practice and improve student learning in mathematics. Some participants registered as part of a school team, others as individuals. The course was developed as a blended model involving face-to-face sessions and online discussions. Three face-to-face sessions were facilitated by a Provincial Mathematics Professional Learning Facilitator. These days allowed us to go deep into mathematical content in the Ontario curriculum that included looking at the principles of counting, quantity as a 'big idea,' operational sense and fractional and proportional thinking. A favourite learning that has stuck with many of the participants, and that I have heard spreading into the, conversations in schools is, "It is a fact that, 'the decimal does not move when multiplying or dividing by multiples of ten'". This came out of the session that looked at the "tricks" that students might be taught. These may be "shortcuts", but are not foundational to the development of deep conceptual understanding.

The online portion of the course allowed for in-depth reflection and discussions about key concepts and ideas that included, building an effective learning environment for all learners, effective instruction in mathematics, and promoting communication in mathematics. The discussions in the online portion have been rich and enhanced a deeper level of thinking. A good example is the initial discussion that focused on the *Ethical Standards for the Teaching Profession* (Ontario College of Teachers, 2006), and the connections of *Respect*, *Care*, *Integrity* and *Trust* to the constructivist approach for learning and teaching mathematics.

When developing the assignments, our goal was to ensure that the learning opportunities were relevant and meaningful. As outlined in Schedule D – Additional Qualification Course Guideline *Mathematics, Primary and Junior*, Part I, "The assessment and evaluation strategies reflect effective, collaborative and inquiry-based practices" (Ontario College of Teachers, 2015, p.18). One school team collaborated to plan a Math Night for their school. They effectively connected theory to practice by using some of the activities outlined in the resource, *Inspiring Your Child to Learn and Love Math* (Council of Ontario Directors of Education, 2015). They designed the evening using the three-part lesson framework. One of my comments to this team was, "What an amazing opportunity, I hope this becomes a reality for the students, parents and educators at your school." The course's final culminating experience was a Reflective Practice Inquiry that allowed for critical reflections of both, student and educator learning, over time. Feedback received from the candidates incited that they had a positive experience. Some of the candidates said, "I really enjoyed taking part in this course and would do it again in a heartbeat if we had another opportunity" and, "I have LOVED this course. I hope you are going to do part 2 in the fall."

This is where we are currently. If the feedback is an indication, the story will hopefully continue, with more opportunities for professional learning in mathematics in Bluewater District School Board, through the Additional Qualifications pathway.

References

Council of Ontario Directors of Education. (2015). *Inspiring your child to learn and love math. Resource guide*. Toronto, ON: Author.

Ontario College of Teachers. (2006). *Ethical standards for the teaching profession*. Toronto, ON: Author.

Ontario College of Teachers. (2015). *Mathematics primary and junior, part 1 additional qualification course guideline*. Toronto, ON: Author.

Ontario Ministry of Education. (2016). *A renewed math strategy for Ontario*. Retrieved from http://edu.gov.on.ca/eng/policyfunding/memos/april2016/min_math_strategy.html

Reflecting on the Narrative

- Explore the nature of collective inquiry in teaching practice.
- Inquire into how school boards and other organizations can collaboratively support professional, collective and co-constructed knowledge.
- Reflect on assessment and evaluation that may support "effective, collaborative and inquiry-based practices."
- Explore other models for collaborative learning opportunities that might be significant in informing cross-curricular professional practice.
- Identify key learning opportunities for mathematics AQs that support the acquisition of deep conceptual understandings.

Further Reflections

How might this resource be used to support other areas of teaching, learning and ongoing professional education?

References

Ontario College of Teachers. (2006a). *Ethical standards for the teaching profession*. Toronto, ON: Author.

Ontario College of Teachers. (2006b). *Standards of practice for the teaching profession*. Toronto, ON: Author.

Ontario College of Teachers. (2016). *Foundations of professional practice*. Toronto, ON: Author.

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Setting the Standard for Great Teaching

Cette publication est également disponible en français sous le titre
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