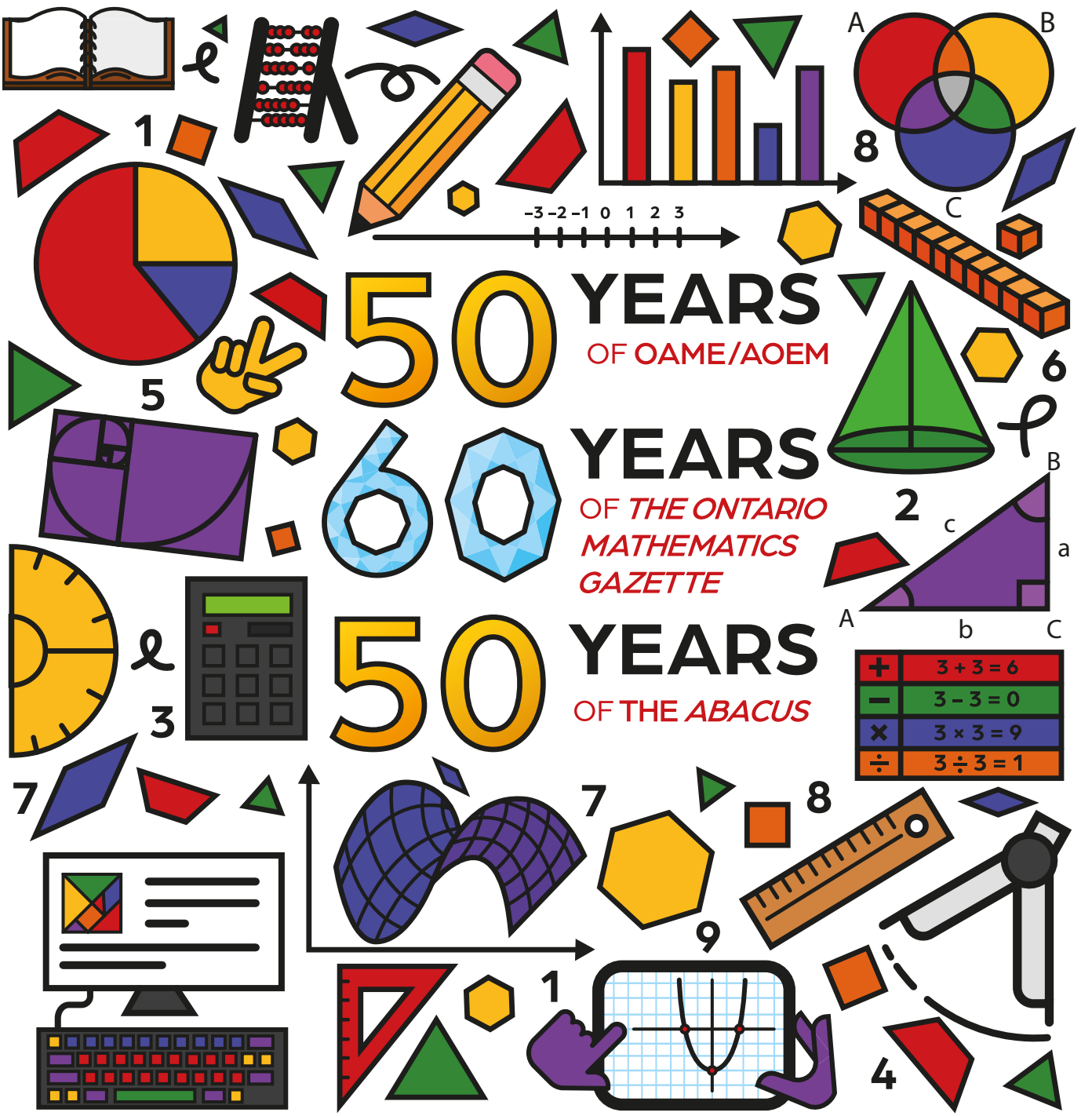
Ontario Mathematics Gazette

OAME – ONTARIO ASSOCIATION FOR MATHEMATICS EDUCATION

Vol. 60#3
March 2022

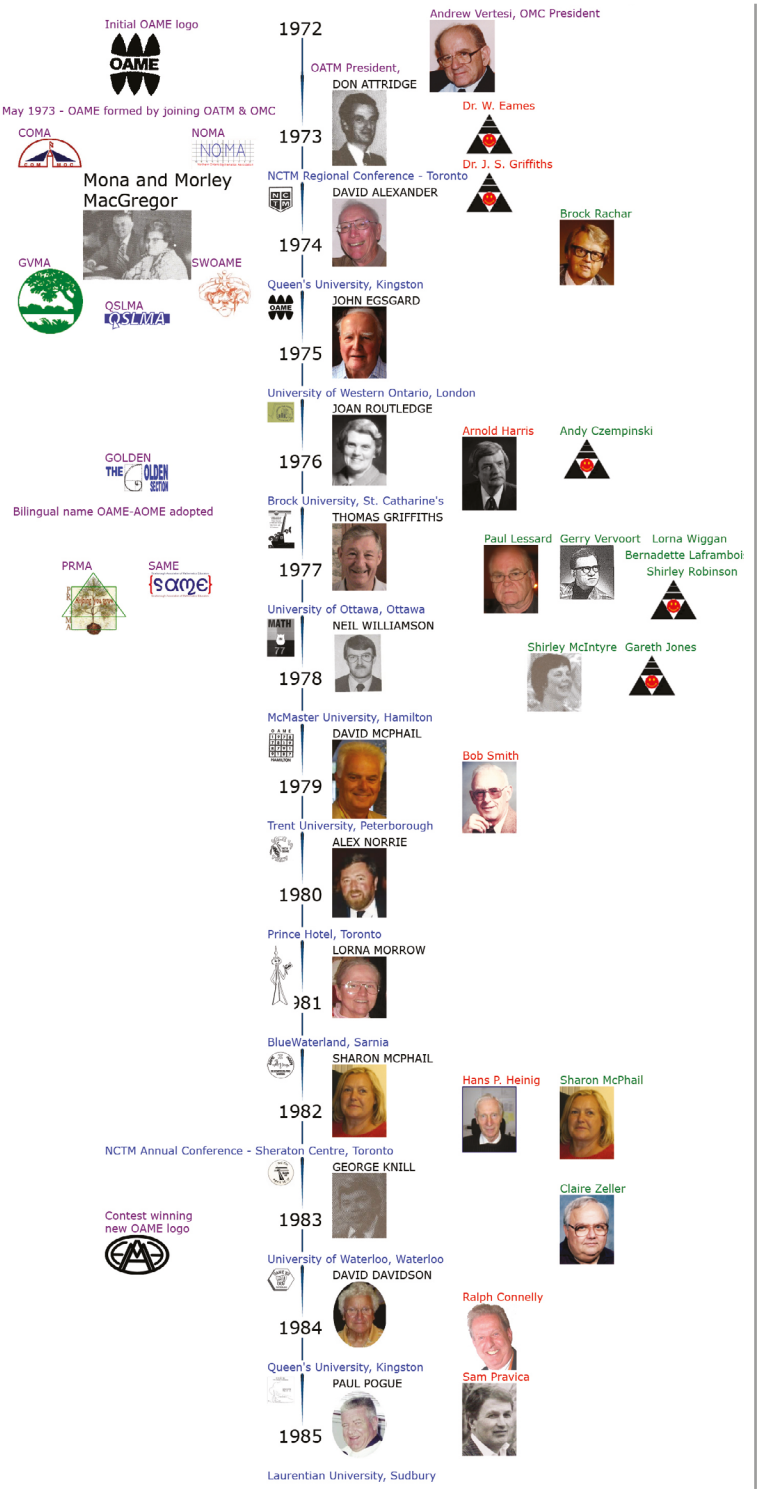
AOEM – ASSOCIATION ONTARIENNE POUR L'ENSEIGNEMENT DES MATHÉMATIQUES



OAME Archives – Timeline of OAME History

A pictoral display of the important people and events and milestones that have made the OAME what it is today.

Legend:
Year
Executive Directors
PRESIDENTS
Gazette Editors
Abacus Editors
OAME Milestones
Chapters established
Annual Conferences



Continued on the Back Cover…

Continued from the Inside Front Cover…

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Legend:
Executive Directors | Year | PRESIDENTS | *Gazette* Editors | *Abacus* Editors
OAME Milestones / Chapters established | Annual Conferences

1999
RALPH CONNELLY
www.oame.on.ca established
Sheraton Parkway Toronto North, Richmond Hill

2000
PETER SAARIMAKI
Jack Weiner

2001
University of Ottawa, Ottawa
MARY HOWE
Todd Romiens

2002
Dave and Sue Hessey
Delta Hotel Toronto East, Scarborough
SHIRLEY DALRYMPLE
Louis Lim

2003
TEAMS *(new name for Toronto chapter)*
Georgian College, Barrie
MARG WARREN

2004
University of Ontario Institute of Technology, Oshawa
STEWART CRAVEN
Marilyn Hurrell
MathMan (aka Gill Dunn)

2005
Greg Clarke - webmaster
OAME Vision statement
University of Waterloo, Waterloo
GORDON COOKE
Trevor Brown
Lorna J. Morrow

2006
First use of
TEAMS *official logo*
GUM project
York University, Toronto
KATHY KUBOTA-ZARIVNIJ

2007
Fanshawe College, London
DAN CHARBONNEAU

2008
First on line voting for OAME Board
Georgian College, Barrie
JACQUELINE HILL
MaryLou Kestell
Kathy Kubota-Zarivnij

2009
Members Only section redesign
Sheraton Parkway Toronto North, Richmond Hill
ANNA JUPP
Stewart Craven

2010
Carleton University, Ottawa
BEVERLY FARAHANI
Brock University, St. Catharines

2011
Fred and Lynda Ferneyhough
OAME app
Digital memberships
DAVID ZIMMER
Dr. Marian Small

2012
University of Windsor, Windsor
CONNIE QUADRINI
Jack LeSage
40th-Anniversary *Gazette*
Joined Twitter @OAMEcounts

2013
St. Lawrence College, Kingston
CATHY HALL
Immaculate Namukasa

2014
Seneca College, Toronto
SONIA ELLISON
eConference option

2015
Humber College, North Campus, Toronto
PAUL ALVES
Daniel H. Jarvis

2016
Humber College, Toronto
TIM SIBBALD

2017
Georgian College, Barrie
JUDY MENDAGLIO
Amy Lin

2018
St. Lawrence College, Kingston
JILL LAZARUS
Timothy Sibbald

2019
OAMEtalks podcast & webinar series
Humber College, North Campus, Toronto
DAVID PETRO

2020
University of Ottawa
PAUL ALVES
First ever fully virtual annual conference

2021
Virtually Anywhere!
JUDY MENDAGLIO
OAME new name for Ottawa chapter
AFEMO/OAME joint project

2022
Virtual
Tina Rapke
Marc Husband

Virtual

Submission of Articles

The *Ontario Mathematics Gazette* (OMG) is looking for news items, articles, and good ideas that are useful to mathematics teachers and mathematics education. We are seeking submissions, preferably from mathematics teachers K–12 and other mathematics education professionals, that describe innovative and creative approaches to mathematics teaching.

Please keep in mind the following criteria when making submissions to the *Gazette*:

- The ideas/activities must be of interest to the readership.
- The ideas/activities must be fresh and innovative.
- The mathematics content must be appropriate for the readership.
- The mathematics content must be accurate.
- The article must be well written and easily understood.
- The article and its ideas must be free of sexual, ethnic, racial, or other bias.
- The article must not have been previously published, nor should it be out for review by other publications.
- The article must be original.

Articles are to be word–processed, MS Word is preferred, and prepared according to the *Publication Manual of the American Psychological Association*, Seventh Edition. However, please use single-line spacing (not double). Articles should not exceed five numbered pages of text, and figures, images, and photographs should be placed in the text close to where they belong, with captions. The photographer's permission is required, and for photos of students under the age of 18, the written permission of a parent or guardian is required.

Please submit your article in one blind file (i.e., identity of author is not evident), and include author names, contact information including email and mailing addresses, photos—head and shoulders, biographies—less than 100 words, and all content removed for blinding in a second file. Please email these two files to Tim Sibbald at gazette@oame.on.ca.

Upon review, you will be notified whether your article has been accepted for publication (as is, or pending minor or major revisions) or rejected. The Editor reserves the right to edit manuscripts prior to publication. Once an article is published, it becomes the property of OAME/AOEM.

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The views expressed or implied in this publication, unless otherwise noted, should not be interpreted as official positions of OAME/AOEM.

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▲ About the *Ontario Mathematics Gazette*

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Full-page advertisements are to be on 8.5" by 11" paper with a minimum of 0.5" margins and single sided. Each advertisement should be print ready, and colour advertisements should have no bleeds.

Advertising Rates
Advertising rates are available by telephoning, emailing, or writing to the Advertising Manager.

▲ Editor's Report



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Tim Sibbald holds the Universities Director position on the OAME Board of Directors. He is a former President of OAME. He is an associate professor in the Schulich School of Education, Nipissing University, with a focus on mathematics education.



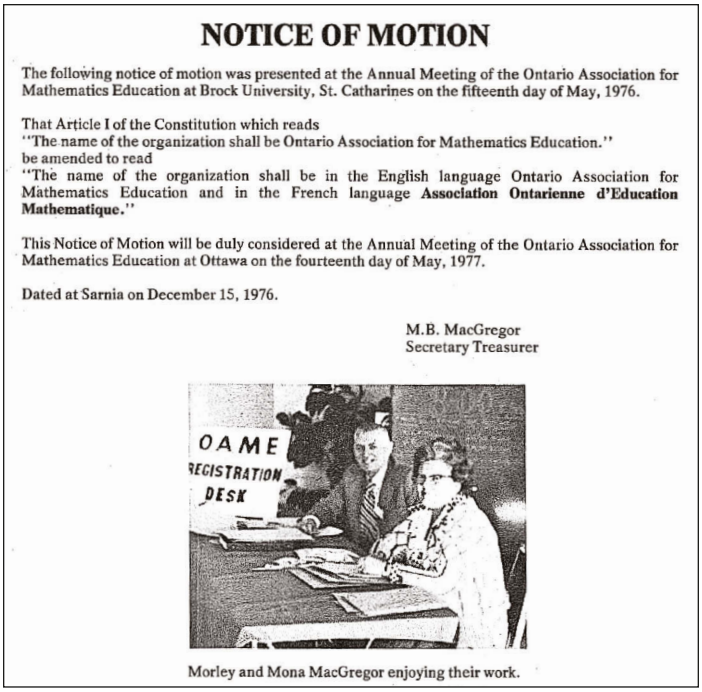
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Marc Husband has taught elementary mathematics in Ontario for more than 20 years. He earned his Ph.D. in Mathematics Education in 2019 and is currently an assistant professor at St. Francis Xavier University in Nova Scotia. His classroom-based research investigates using student ideas as a resource for learning mathematics in schools, teacher education, and professional learning settings.

Tina Rapke currently focuses on all grade levels of mathematics teaching and learning (including the education of future teachers). She is interested in how research informs classroom practice and vice versa. She has more than 20 years of teaching experience and is currently an associate professor at York University. Dr. Rapke holds a joint doctoral degree in mathematics and education.

We, the Editors of the *Gazette* and *Abacus* are delighted to bring together an anniversary issue of the *Gazette* and *Abacus* as a united publication! The *Ontario Mathematics Gazette* began publication in February 1962, and has reached its diamond anniversary with 60 years of continuous publishing. However, we also want to recognize the 50th anniversaries of the *Abacus* and the OAME/AOEM. The *Abacus* was first published in October 1973, and the OAME/AOEM began on May 13, 1973 (Alexander, 1973, p. 227). The intention of this anniversary issue is to acknowledge all three landmarks. We may be a little early, but felt a collective celebration—perhaps a kick-off of other celebrations—was well suited to the occasion.

If you are familiar with the archives and wonder about the 100th anniversary edition of the *Gazette* (1991, 29(3))), January 18, 1891 was the first meeting of the Mathematics



NOTICE OF MOTION

The following notice of motion was presented at the Annual Meeting of the Ontario Association for Mathematics Education at Brock University, St. Catharines on the fifteenth day of May, 1976.

That Article I of the Constitution which reads
"The name of the organization shall be Ontario Association for Mathematics Education."
be amended to read
"The name of the organization shall be in the English language Ontario Association for Mathematics Education and in the French language **Association Ontarienne d'Education Mathematique.**"

This Notice of Motion will be duly considered at the Annual Meeting of the Ontario Association for Mathematics Education at Ottawa on the fourteenth day of May, 1977.

Dated at Sarnia on December 15, 1976.

M.B. MacGregor
Secretary Treasurer

Morley and Mona MacGregor enjoying their work.

Figure 1: *From 1977,* Gazette*, 15(3), p. 72*

and Physics Association of Ontario. It was a precursor organization that changed through the years and ultimately led to the amalgamation of the *Ontario Mathematics Commission* (OMC) and the *Ontario Association of Teachers of Mathematics* (OATM) in 1973, to form the *Ontario Association for Mathematics Education* (OAME).

It is notable that amalgamation takes time, and thinking about amalgamation appears to have arisen earlier: "In 1971, the OATM became concerned about the 'we–they' attitudes that seemed to permeate the Mathematics Education community in Ontario" (LeSage, 1991, p. 8). The concern led to a leadership seminar, hosted jointly by the OATM and the OMC. The long and short of it is that OAME/AOEM, the *Abacus*, and the *Gazette* are collectively reaching a major anniversary, and an acknowledgement is appropriate.

There are two primary goals of this celebratory edition. To update the history of the OAME/AOEM and *Gazette* from the 40th-anniversary edition (i.e., *Gazette,* 50(4)—June 2012), and a complete history of the *Abacus*, which has not been done previously. Interested readers will find (in the archives on the website) the 40th-anniversary edition and the 100th-anniversary edition (i.e., *Gazette*, 29(3)—April 1991), which show the character, strength, and growth of the organization. We hope the celebratory update will add to this record.

A small detail about our name: the OAME formed in 1973, but as shown in Figure 1, in 1977, the name changed to OAME/AOEM. This was an inclusive addition in a decade where education in Ontario became bilingual.

Within this issue, you will find a variety of content that is challenging to summarize. We have inquired widely for contributions and have received an interesting mix of content. There are snippets through to articles, and a few columnists took on the challenge of addressing the anniversary. We will note there are omissions, but ask our readers to recognize that the effort took place during the extraordinary time of a global pandemic. It is more likely a sign of pandemic challenges than anything else.

There has been a sense of adventure to the endeavour, with the end result remaining unclear even two weeks before the final construction of the issue. The process highlighted how our collective vision and mission do not inhibit distinctly different ways of acting. We collectively model multiple solution methods in response to the vision and mission! It is that strength of variety that we hope comes through in this issue, as it truly is a reflection of our collective versatility.

An issue like this does not arise without guidance. The Editors are grateful to have had the advice and support of the 60th *Gazette* Anniversary Committee, composed of: Peter Saarimaki, Shirley Dalrymple, MaryLou Kestell, Ron Lancaster, Jeff Irvine, and Tim Sibbald.

Abacus Editors' Remarks

In preparation for the anniversary issue, we went back and reviewed all the previous editions of the *Abacus*, looking for examples and ideas that resonated with us and speak to current contexts of mathematics education. Several editions had ideas and activities, including printable worksheets, that teachers could easily use with their students and discuss with colleagues "on Monday."



Brock Rachar, the first Abacus *Editor*

Our inquiry through the years focused on number sense and specifically, mental mathematics (we have been focused on mental math since taking on our role of *Abacus* Editors). Here, we will take you on a trip down *Abacus* memory lane, pointing to some interesting examples and suggestions that we might hear teachers talking about and doing in actual elementary classrooms today.

First, we bring you a few excerpts from the Editor in 1975, Andy Czempinski. Andy, back in 1975, called for everyone involved in mathematics education to "make a concerted effort to let the public and our students know what mathematics is and what it is not" (*Abacus,* 3(2), p. 2). His call to action was followed with a quotation about "A Primary Aim for Mathematics Education" (*Abacus,* 3(2), p. 3):

A Primary Aim for Mathematics Education *

"... the chief and overriding aim for the teaching of mathematics in the schools (to be) the widest possible dissemination of an understanding of what mathematics is and what it is not. As far as we know, this has never been adopted as a conscious aim of any school system. When it is achieved, the average citizen will understand that mathematics is (a) a way of thinking which provides a powerful tool for analyzing subtle and unobvious aspects of our experience, and (b) a cultural resource which can add interest and enjoyment to life. Further, (c) it will be apparent that the symbolism of mathematics - algebraic and graphical - constitute an important language which is essential for communication of ideas and for formation of societal goals."

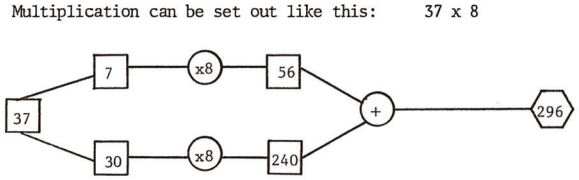
* Science Council of Canada Background Study No. 38: Mathematical Sciences in Canada, A.J. Coleman, G.D. Edwards, K.P. Belpzner.

We found these three goals fascinating because of how they speak to classroom learning experiences with the subject. Even back in 1975, mathematics was a subject that was concerned with thinking, which adds interest and pleasure to one's life.



Abacus *Editor, Trevor Brown*

Our next stop along this journey brought us to February 1987, when Trevor Brown was the Editor. This issue features some helpful suggestions for teachers to focus on splitting (or decomposing) numbers for multiplying. The flow chart printable worksheet provides examples and a few questions to practise. We were struck by this because of its relatability to current-day mental-math strategies for multiplication and how practice involves curating specific questions (no more than four) to think about in a single lesson.



From Abacus*, 25(3), p. 3*

Multiplication appeared again in the December 1988 issue, when Ron Ripley was the Editor. It showcased an activity that supports students in thinking about multiplication as repeated addition. The activity has students investigate groupings of three (dots) in relation to the symbolic notation (2x3).



Abacus *Editor, Ron Ripley*

The next issue that grabbed our attention was December 1989, when Anna-Maria Garnham and Colin Garnham were the Editors. We noticed an activity with a hundreds chart that many teachers likely do today—its purpose is to "help students perform quick computations" (*Abacus,* 28(2), p. 8).

In 2004, there was an acknowledgement that many students struggle with the traditional long-division algorithm. The page walks readers through an alternative approach that is rooted in benchmark (friendly) numbers and part-to-whole reasoning, the most memorable suggestion being to have students first estimate solutions to division questions by provoking them to think about multiplying the divisor by 10's, 100's, and 1000's.

Finally, we pay homage to our predecessors, MaryLou Kestell, Kathy Kubota-Zarivnij, and Pat Margerm. In their very first issue back in 2007, they cited research about mental mathematics and went on to provide lessons that address student-generated algorithms, with sense making being central to learning mental math.



MaryLou Kestell, Kathy Kubota-Zarivnij, and Pat Margerm as they appeared in their first issue of the Abacus*, 46(1)*

Our trip down *Abacus* memory lane provoked us to reflect on the fact that all the students described in these back issues would now be adults. We wondered about their experience as students, perhaps "struggling" with the long-division algorithm, and the influence the materials/information made available through the *Abacus* had on their understanding of what math is and what it's not.

Gazette Editor's Remarks

I have been the *Gazette* Editor since July 2017, with the first issue I handled being September 2017 (i.e., 56(1))—what a ride it has been!



The Editor is essentially the hub of a wheel in a complex printing process. However, I am always cognizant that in this analogy, the spokes of the wheel are people—the living breathing embodiment of current thinking about math education in the province. The complexity is the wide variety of issues and communications that go on, not to mention the level of detail that arises. The process is hidden away, ideally being invisible to readers, but can be quite elaborate and slowly evolving.

People

Among the people is the OAME/AOEM Communications Committee, the wonderful editorial team, the reliable reviewers, supporting colleagues, authors, and the readership.

The Communications Committee is a subcommittee of the Board of Directors, who give direction to the *Gazette* and *Abacus*. They are responsible for guidance, choosing Editors, approving column proposals, and decisions that go beyond the scope of the Editor (such as financing a special cover for this issue). It is good to have them for advice and as a sounding board.



Thank you, Anne!

The editorial team was the first place I turned to when I was finding out how best to fill the role. I asked members of the team what they needed, how our roles dovetail, and for their advice on how to be effective. This paid a huge dividend because of their years of experience and professionalism. Penny Clemens, Gitta Berg, and Anne Yeager have been involved in the *Gazette* longer than I have, and they are instrumental in maintaining high standards and the level of consistency that has been achieved. At times, I have had private conversations with each to clarify awkward points in the editorial process. Anne, for example, is my sounding board of advice, particularly around interpretation of the OAME/AOEM vision and mission. She has a plethora of knowledge and experience, but perhaps most importantly, periodically calls out when there is a need to step back and consider the overall needs of readers.



Thank you, Kayla!

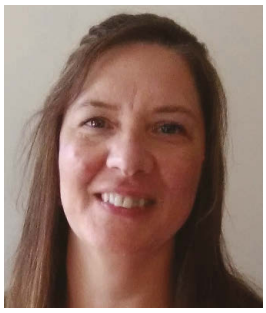
Recently, Kyla Kadlec has stepped up to address the editorial needs in French—something I simply am not capable of doing. Along the way, Jacqueline Foster was a considerable help as an Associate Editor. I would be remiss not to mention support in times of need by Ralph Connelly and John Rodger, who both have finely honed skills.

Gitta has always impressed with her ability to detect inconsistencies, and no matter how much I try, she always finds something to improve (and I mean this in a good way) every piece of the *Gazette* I send her. Her role is a bridge between some of the higher-order conceptual thinking and fundamental clarity of language and communication. She has been enormously helpful in interpreting details of style. She has also been excellent professional development, personally, as the details she handles are often behind the scenes in academic publishing, and so she has given a glimpse behind the proverbial curtain.



Thank you, Gitta!

Penny is the quiet, unassuming power of bringing it all together, designing covers, the layout, finding ways to implement new ideas. She has been doing what she does for many years and does it exceedingly well. A look through the archives shows that Penny has adapted technologies, but more than that, has been a long-term foundational aspect of facilitating the sharing of ideas through both the *Gazette* and *Abacus*.



Thank you, Penny!

I have had good fortune to work with a collection of top-notch columnists. They are timely, develop new ideas, and are a constant source of inspiration. For the first time ever, we had a virtual columnist social last year that was very pleasant. I can attest that the columnists are as lively in person and full of ideas as their columns suggest.

The reviewers—and we always welcome more, as *many hands makes lighter work*—provide constructive feedback for all articles that appear in the *Gazette*. They are the reason we can say the *Gazette* is double-blind peer reviewed—the gold standard of publishing. Speaking of more hands, thank you to Ralph Connelly and John Rodger for helping proofread this special edition.

As Editor, many more people who have been helpful in very different ways, whether a conversation over coffee with Editor Jack Weiner, assistance with French by Anne Roberge, Lynda and Fred for doing what they do…, there are simply too many to think of.

Complexity and Process

On one hand, the editorial process is simple. As material comes in, the editor reviews it and decides what the next step is. After each subsequent step, the Editor reviews as necessary and keeps the process rolling. However, everything runs on its own timing, and the decisions take things down a wide variety of paths. The process of making the anniversary issue began by considering how to organize the process. If you peruse the pages, you will rapidly realize that there are a lot of pieces, and each piece gets at least three sets of editorial eyes before it is queued for layout. I adopted a

process that allows for post-mortems of any problems that arise. When you see an erratum, it belies the details of recognizing how it happened to prevent it occurring again. The details do not matter; the point is simple: production of the *Gazette* is a complex (albeit manageable) undertaking.

When the process is successful, the editorial team becomes a footnote, professionally invisible, and readers focus on the thinking conveyed. That is why acknowledgement of the editorial team is so important on occasions like this. Collectively, all the editorial teams of the Gazette have achieved 60 years of conveying pedagogy, content, and ideas that have supported 60 years of readers growing professionally. It is impressive and speaks to a very high level of professionalism.

The Road Ahead

The *Gazette* and *Abacus* continue to flourish with the OAME/AOEM. If the archive is any indication, they will continue to evolve in a way that meaningfully adopts new technologies that can help communicate good practices. They will continue to change with the times and offer professional support to teachers with an array of foci.

However, that road ahead is not a given. It requires ongoing contributions sharing instructional practices from teachers who are willing to pursue the professional development that is authoring. It requires reviewers to give oversight. It requires a strong editorial team, who can continue to bring it to fruition—where we are in need of another Associate Editor. It needs a readership who engage with the ideas they find in the *Abacus* and *Gazette*.

On the Diamond Gazette*, Golden* Abacus*, and Golden OAME/AOEM anniversaries, it is clear that our community gives continuing support and engagement to these efforts. That is the clearest sign of our strength as a community, the road ahead, and how well earned these anniversaries are!*

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Ron Ripley photo from https://thewhig.remembering.ca/obituary/ronald-ripley-1076123605

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LeSage, J. (1991). A short and personal view of our roots. *Ontario Mathematics Gazette, 29*(3), 4–8.▲

▲ President's Message



JUDY MENDAGLIO
judy.mendaglio@oame.on.ca

Judy Mendaglio is the President of OAME/AOEM. She has worked in education in Ontario in many capacities: college instructor, secondary teacher and department head, university instructor, elementary and secondary consultant, and writer. Currently, Judy devotes most of her time to her many volunteer activities.

Happy 50th Birthday, OAME/AOEM! And Happy 60th Anniversary to the *Gazette*! And Happy 50th Anniversary to the *Abacus*! We must take advantage of this chance to celebrate the remarkable achievements of this illustrious organization. This 50th birthday provides the appropriate opportunity to glance over our shoulders and look at where we have been, and to peer through the portal into the future. What lies ahead for the organization, its chapters, and its members?

Because of the circumstances of the past three years, both personal and global, I know that "planning" and "goal setting" may be a fool's errand. The Board of Directors and the Executive Committee of OAME/AOEM have not met face-to-face in two years. Our Leadership Conference has been postponed twice. Our past three annual conferences, having each been planned as face-to-face conferences, have had to be held virtually, adding much more work onto the shoulders of the planning committee members, who were already facing the disappointment and reimagining of a conference they have been planning for three years. In fact, my entire two-year presidency will have allowed for only one face-to-face meeting with our Board of Directors, and I will not have had the chance to attend a live conference either as President-Elect or as President. However, even though planning may be a fool's errand, what we can do, and must do, as we contemplate our future, is hope and dream. So, my first hope is that we will meet face-to-face at our annual conference in May 2023, and that we will feel safe as we sit with each other, unmasked, sharing stories, and even that we feel free to hug long-time friends.

In recent years, we have learned so much and have had so many successes! We have learned how to conduct business meetings, using an online platform, and have successfully transitioned into the digital world to ensure that the business of OAME/AOEM and its committees continues

forward. We have learned how to engage students with rich mathematics, despite the necessity of them learning remotely, and have successfully supported teachers in developing new strategies for online and hybrid learning. We have learned how to put on very successful virtual conferences, and have assisted other organizations with planning their own fully online conferences. We have learned how to harness new technologies, and how to reimagine older technologies so that they can be used in new ways. And we have learned innovative ways to support each other when we cannot be together in the same room.

Virtual Executive and Board meetings are an unnatural way to meet people, to talk about the past and the future, and to set priorities. It is extraordinarily difficult to try to set goals and long-range plans, without sitting around a table and talking, mixing moments of social chit-chat with the hard business of leading an organization such as ours. There are always so many inspiring ideas shared, so many perspectives to consider, and so many possibilities to explore. However, time and resources are serious constraints for a volunteer organization such as ours. So, priorities must be carefully set. Our objectives are always guided by our Mission, Vision, and Strategic Priorities, and must always be considered within the larger context of many unique and changing educational environments across the province. What is so wonderful about being on the Board of Directors of OAME/AOEM is that we can talk and listen to each other and learn about what challenges are being faced by mathematics educators in various regions of the province. Each region has its own unique priorities, and each Chapter Representative brings those perspectives to the discussion around the OAME/AOEM table. We recognize at these times that there is no "one right answer" or "one right way" for our organization to support its members. Our members, like our students, are not a homogenous group.

OAME/AOEM, so well known for running successful Spring conferences, met the unique challenges posed by the COVID pandemic. In 2020, members of the Annual Conference Planning Committee and a group of wonderful OAME/AOEM volunteers pulled together as a team to "pivot" (a little-used word in March of 2020) and offer the conference virtually. Of course, we had a bank of experienced helpers because of our e-Conference options, but this was distinctly different. With the OAME/AOEM Virtual Conference of 2020, we saw registrations coming in faster than the virus was spreading, and we had attendees from around the globe visiting our sessions. It was astonishing! From this success, we learned that, while face-to-face conferences are always desirable for those who can attend, the virtual conference provides accessibility to professional learning for a greater number of educators than would have had the opportunity to attend an in-person event.

So, what I hope is that OAME/AOEM will continue to be creative in finding innovative ways to support all members, and indeed, all Ontario math teachers, to engage their students in relevant and rich mathematics. Several years ago, we began making our *Gazette* and *Abacus* archives available electronically to members, and our OAME Talks podcasts continue to offer conversations with leaders in mathematics education. We will continue to bring excellent professional learning opportunities in the future,

Historically, OAME/AOEM has always tried to provide reliable and timely responses to new data as it becomes available, as well as to changes in the Ontario math education environment. When it was recognized that girls were underrepresented in Senior mathematics classes, OAME/AOEM took on the goal of achieving gender equity in Senior math classes and of changing existing attitudes about girls and math. That girls didn't study math was thought to be okay by many people—parents and teachers alike. That girls and boys did not participate in equal numbers in the types of scholarship-generating competitive math contests that were available was also thought to be okay. In an effort to support girls in seeing themselves as capable mathematics students, OAME/AOEM designed and created their own math contest, the Ontario Mathematics Olympics (OMO), to provide the opportunity for boys and girls to participate, in equal numbers, as a team.

Since research had shown that girls were more likely to participate in co-operative challenges than competitive ones, the OMO was designed to have several co-operative problem-solving tasks, rather than the traditional pencil-and-paper "no cheating" types of contests that we still see today. Why not, since co-operative efforts are a realistic portrayal of how actual mathematicians, engineers, and scientists work through mathematical problems. The new contest was communicated to the regional chapters, and chapters were invited to send a team to the provincial OMO. While still more needs to be done to achieve gender equity in post-secondary mathematics programs, we are now seeing a more balanced distribution of genders in Senior math classes, and more girls are now indicating that they like mathematics than one would have seen 50 years ago. My wish is that soon everyone who identifies as female will view mathematics as a viable and rewarding field of study. My further wish is that we continue on the path of progress and work to identify and eliminate non-binary gender biases in our mathematics programs, at all levels.

During my time on the Board of Directors, we have worked to build stronger connections with those working in

both the English and in the French education systems of this province. We are providing more resources in French for students and teachers in our francophone communities. We are far from where we hope to be one day, but we are proud of the progress we have made, as represented by the number of sessions in French that are being given at our annual conferences, and the increase in the number of articles submitted to our publications from members of our francophone community. We are also privileged to have collaborated with l'Association francophone pour l'enseignement des mathématiques en Ontario (AFEMO) on two large projects over the past two years. For the first time in my teaching career, we now have the same math curriculum in English and in French schools (up to Grade 9), and it is my wish that this provides the opportunity to continue to provide resources in both languages.

Perhaps the biggest change we see as mathematics educators is the much-overdue rebranding of mathematics. For too long, mathematics was perceived as a foreign world, inhabited by odd geeky people, who speak an unintelligible foreign language, and who write in suspicious symbols. It was a place to be visited, if absolutely necessary, but not to be lived in. And that was thought to be okay by many people who would say, "I never use the math I learned in school." It was one of the most common phrases using the word "math" one would hear in the community (along with, "I was never any good at math"). However, it is finally being recognized that proficiency in mathematics is not only desirable, it is a necessity, and that allowing students the option of not being successful in mathematics is an issue of equitable access to future opportunities.

Ours is now a math-filled world, driven by data sets and mathematical modelling. No longer is it acceptable to support the myth that one could only be successful at math if one was born "super smart." Luckily, OAME/AOEM is well positioned to be responsive to this new branding of mathematics. As far back as I can remember, OAME/AOEM has promoted "mathematics for all." Long before Jo Boaler began championing the idea that every child should, and could, become a proficient mathematician, the amazing members of OAME/AOEM were writing resources, giving workshops, submitting articles, and sharing ideas that told of their belief that mathematics, delivered differently, could engage all students in a remarkable world that was only available to those who understood it, and that all students could, indeed, understand mathematics. These educators worked, sometimes tirelessly, usually on their own time for no financial gain, to promote the teaching of mathematics in ways that would allow all students, regardless of gender identification, racial identification, religious identification, special needs, culture, or language, to feel part of that wondrous world. However, we are not there yet.

While we have made so much progress opening up the world of mathematics to our female populations, in recent years, it has become clear to educators that, despite our efforts and best (but sometimes misguided) intentions, we have left many other students outside that world, waiting for an invitation to enter. Our new curriculum challenges us to identify our own biases, as well as biases that may stem from a Western way of thinking about mathematics. Mathematics education research, a relatively new field, continues to inform our work at OAME/AOEM, providing a lens through which we can focus our efforts. As math teachers, we value what data has to tell us, and what data has told us is that our old ways of thinking are no longer the right ways (and indeed may never have been so). We have learned that we need to listen to our students and the communities they come from, rather than to lecture at them. We have learned that we still have much to learn about preparing our youth for their futures, and that assuming that we already know what is best, however well intentioned, may be harming some of our students. We have learned that changing Sam to Susan or Aliyah in a word problem does not make students feel that they are being included. My hope is that we continue on the right track, heading in the right direction, using our vision of equity and inclusivity for all mathematics students to guide us, and our efforts will mean that we will soon see a rise in success rates in mathematics for all students. My wish is that soon, we will routinely hear adults say that they rely every day on the mathematics they learned at school. My wish is that our children will use mathematics to heal the planet, and that they will use mathematics, data, and technology to make the best decisions possible.

The OAME/AOEM map going forward is not in my hands. It is in the hands of our current and future members and our Board of Directors. Our ship will be steered by future Presidents, whose job it will be to navigate the waters of change so that everyone arrives safely at their destination. Our navigation system will continue to be provided by our Mission, Vision, and Strategic Priorities as well as by our current and future Position Papers. The past 50 years have been a time of unprecedented change and growth of knowledge, and OAME/AOEM has always been there, at the ready, to interpret the change and provide resources and supports for our mathematics education communities. Based on the past 50 years, I'd say that we are in very good hands, and that we have every reason to believe that our hopes and dreams can come true. ▲

▲ Executive Directors: Fred and Lynda Ferneyhough

Fred and Lynda Ferneyhough have been our Executive Directors since August 31, 2010.



One of the first initiatives we undertook as Executive Directors was to continue the work of Sue and Dave Hessey as we worked with the new Strategic Planning and Renewal Committee (SPaRC). As a result, the number of elected Directors at large was reduced from 21 to 6, and the number of Vice-Presidents from three to two. Since that time, the Board of Directors has added two more Directors, one to represent the colleges and one to represent universities. Also added was the non-voting position of Emeritus Director, who passes on words of wisdom to both the Executive Committee and the Board of Directors. More recently, the term of the President was changed from one year to two years, to allow Presidents more time to fulfill their vision for OAME/AOEM.

To increase membership, a one-year digital membership has been included for all teachers who attend our Spring conference. The membership has grown from just under 1000 to over 2500 while we have been the Executive Directors. Since chapter rebates depend upon the number of members, each chapter benefits when its members attend the conference. OAME/AOEM has held successful virtual conferences the last several years. We are all looking forward to resuming face-to-face conferences in the future.

It was decided by the Executive Committee to move the Leadership Conference from early February to November, so that there would be an event in each semester for secondary school teachers. Sadly, with COVID-19 restrictions, we have cancelled this conference the last two years.

The Executive Committee expressed a need for ad hoc committees to help accomplish some of the work for OAME/AOEM and address concerns. The ad hoc committees are: a Technology Committee that was directed to secure a platform for online meetings (this committee decided to proceed with Zoom, which has been a necessity over the past two years); a Conference Committee that worked through recommendations for the annual conference; a Document Management Committee; and an Advocacy Committee that is charged with forming statements that reflect our Mission, Vision, and Strategic Priorities. So far, position papers regarding the following have been posted on our website: *Access, Equity, and Inclusion*; *Critical Thinking; Destreaming/De-tracking*; and *STEM*.

OAME/AOEM has continued its partnership with the Ontario Ministry of Education in four special projects:

- The Math for the Nines team produced resources that could be used for the former Grade 9 Applied math program. Many of the activities and strategies from the work of this group are still valuable for the new destreamed Grade 9 math course.
- In the Spring of 2020, the government released new curriculum guidelines for Grades 1–8. OAME/AOEM partnered with l'Association francophone pour l'enseignement des mathématiques en Ontario (AFEMO), the organization for French-language math teachers, to produce webinars and resources for elementary school math teachers. A special emphasis was given to Coding, but also addressed *Fractions, Financial Literacy, and Mathematical Modelling*. Altogether we posted 36 webinars and 214 resource packages on www.ontariomath.support/.
- Following up on the success of the elementary resources, we again partnered with the Ontario Ministry of Education and AFEMO during the Fall of 2021, to support the destreamed Grade 9 curriculum—altogether posting 14 webinars and 52 resource packages on www.ontariomath.support/.
- The Mathies project translated three math learning tools from Flash to HTML5. The three most popular tools—*Money Tools*, *Colour Tiles*, and *Fraction Strips*—are now accessible on the Mathies website. We hope to translate more tools next year.

OAME/AOEM will continue to work with the Ontario Ministry of Education on curriculum revisions.

We, Fred and Lynda, are still going strong, but anticipate retiring from the Executive Directors position in a few years. If anyone (or couple) is interested in being the next Executive Director(s), please contact us at EDs@oame.on.ca. ▲

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

December 14, 2021

To the Ontario Association for Mathematics Education (OAME):

On behalf of the National Council of Teachers of Mathematics (NCTM), I am pleased and honored to extend NCTM's congratulations to the Ontario Association for Mathematics Education (OAME) on the 60th anniversary of the Ontario Mathematics Gazette publication and the 50th anniversary of the organization.

For more than 50 years, OAME has promoted, supported, and advocated for excellence in mathematics education throughout the Province of Ontario. And with the Ontario Mathematics Gazette reaching its 60th anniversary, we are grateful to join the celebration of its contribution to the mathematics education community.

NCTM feels a special kinship with the Ontario Mathematics Gazette which was a recipient of the 2016 National Council of Teachers of Mathematics (NCTM) Affiliate Member Publication Award. The award recognizes the outstanding of NCTM Affiliates in producing excellent journals and newsletters that keep their membership informed.

On NCTM's behalf, thank you for your continued commitment to advocating for equity, value, and resources in the mathematics education community. Please accept my heartfelt congratulations and NCTM's deep appreciation, and best wishes for more success in the future.

Sincerely,

Trena Wilkerson President

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WWW.NCTM.ORG

▲ A Few Words from Don Attridge

Don was the interim President of the pre-OAME organization, as the amalgamation of Ontario Association of Teachers of Mathematics (OATM) and the Ontario Mathematics Commission (OMC) was worked on. When OAME was formally inaugurated at the 1973 conference, Dave Alexander became OAME's first official President. Don was also a co-chair of the 40th-anniversary *Gazette* issue.

Don and Carol Attridge were the Executive Directors from 1989 until Bonnie and David Alexander took the helm in 1995. The following are from an email communication with Don:

> "…we took over from Morley and Mona McGregor from Sarnia. They were a wonderful team, which really handled the job most personally.
>
> Morley was the politician after being a principal of one of the elementary schools in Sarnia. Mona was a former secretary at some other elementary school. Mona did all the secretary "stuff," using a typewriter and carbon paper. There was no thought of using a computer. Her notes were excellent, and Morley and Mona literally ran the "show."
>
> There was a lot of mail and postage then—there were no emails. When they decided to retire, Carol and I thought we would try the position(s). Mona left a wonderful history of OATM/OAME for future organizations. Like Mona, Carol was the "mother-hen," as well as being secretary and summarizing the OAME meetings.
>
> We became great friends of many of the OAME/AOEM directorate. Don would communicate with the President each week (particularly Mickey Sandblom) to determine what the agenda would be for future meetings. Carol and I assisted with organizing the printing and mailing of the *Gazette* issues (three times per year), as well as administering the financial aspects of the organization. Naturally we attended all OAME conferences, passing out literature, directing the flow of the lectures, and chairing the annual meeting and elections. Unfortunately, we had to retire early [for personal reasons].
>
> For several years, the *Gazette* was full of ideas at the Senior level (high school/university). However, they were generally too difficult for the average elementary teacher. There was a definite request to create issues that would assist the elementary mathematics teachers in the elementary classrooms. Thus, the creation of the *Abacus*, which had a wealth of ideas from Primary classes onwards—the Editors and writers provided a wonderful supply of ideas.
>
> The combination of the *Gazette* and the *Abacus* greatly assisted mathematics teachers in the future. There was always criticism by high school teachers, who felt the students from elementary schools were poorly prepared in mathematics. Certainly, there were some excellent elementary mathematics teachers, but the general feeling was that the elementary teachers themselves had a poor background in mathematics. Everyone knows that mathematics was not the favourite subject of the majority of people—even Charles Schultz's Charlie Brown had trouble—"today we started fractions." Too often elementary teachers had to teach mathematics classes, and they had poor background to do so—perhaps they even hated the topic—not a good venue for the students—the teaching of the topic of mathematics was often shortchanged.
>
> OAME/AOEM made constant requests to the Ministry of Education that ALL elementary teachers have at least one course in mathematics before graduation—it probably is still a problem."

Editor: I would like to sincerely thank Don for taking time, so many years later, to contribute once again to the spirit of OAME/AOEM. Thank you, Don! ▲

From Gazette*, 1983, 25(2), p. 52*

"PARTICIP · ACTION"

THE

ONTARIO MATHEMATICS GAZETTE WANTS YOU!

Every mathematics teacher has special teaching techniques, useful worksheets, or other neat items for the mathematics classroom. These should be shared!

Here is your chance at stardom. Turn those super ideas into articles for possible use in the Gazette or other journals.

INTRODUCING

THE O. M. G. AUTHORING ROOM

The O.A.M.E. Publications Committee has reserved space at the S.A.M.E. Conference from 10:00 A.M. to 4:00 P.M. on Friday, May 8. The room (to be announced) will be stocked with Macintosh and Commodore 64 microcomputers and staffed with Gazette editors to help you **efficiently** and **painlessly** put those ideas into a publishable package.

DON'T BE SHY. COME AND SHARE!!

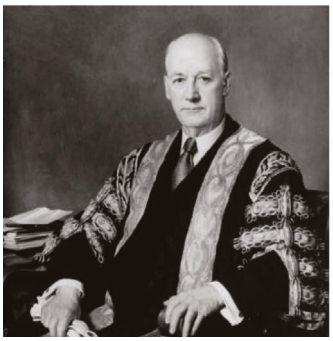
▲ Blast from the Past! Samuel Beatty



JEFF IRVINE
dr.jeffrey.irvine@bell.net

Jeff Irvine, PhD, has been a secondary mathematics teacher, department head, and vice-principal. He has taught at three faculties of education and at a community college. For several years, he was an Education Officer in the Curriculum and Assessment Policy Branch of the Ontario Ministry of Education, where his portfolio was Grades 7 to 12 mathematics for the Province of Ontario. Jeff is co-author or contributing author for 11 high school mathematics textbooks. With over 45 years in education, Jeff is particularly interested in the interplay of student motivation and mathematics achievement.

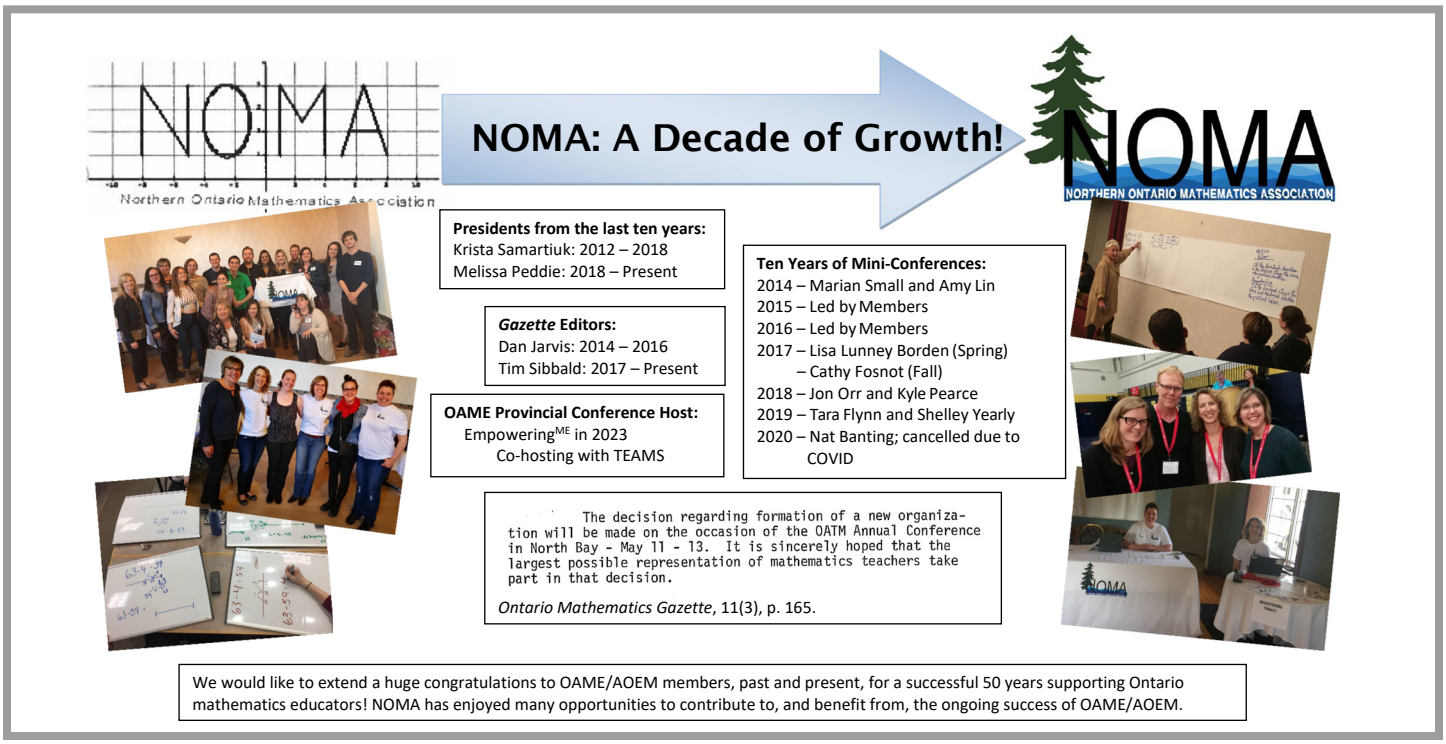
In 1963, the *Gazette*, in its second year of publishing, was in financial trouble. The future was bleak, and without additional financing, the *Gazette* would have to cease publication. Enter the Samuel Beatty Fund. Thanks to the Samuel Beatty Fund's financial support for production costs, the *Gazette* was able to continue publishing professional learning supports for Ontario math teachers. This financial support continued for 12 years, through 1974. Without this financial support, the *Gazette* would have been unable to continue production, and you would not be reading this article today. So who was Samuel Beatty, and what is the Samuel Beatty Fund?



Samuel Beatty (1881–1970) was born in Hamilton and attended the University of Toronto, where in 1915, he became the first person to receive a doctorate (Ph.D.) in Mathematics from a Canadian university. His doctoral adviser was John Charles Fields (Fields Medal, Fields Institute). Beatty eventually became Chancellor of the University of Toronto, a post he held from 1953 to 1959.

Beatty was instrumental in bringing renowned geometer H.S.M. Coxeter to the University of Toronto, and during World War II, Beatty facilitated access to the university resources for Nobel Prize winner Walter Kohn, who had been denied access due to his German ancestry. Beatty helped found the Canadian Mathematical Congress (later the Canadian Mathematical Society) and was its first president. He was known as an excellent teacher and problem solver.

In 1926, Beatty published a problem that led to the Beatty sequence (actually, two "attractive" sequences). Let R be an irrational number greater than 1, and S be the number satisfying $\frac{1}{R}+\frac{1}{S}=1$, which leads to $S=\frac{R}{R-1}$. If $[x]$ is defined as the floor function (the greatest integer less than or equal



TEXAS INSTRUMENTS



On behalf of Tom Steinke, Kevin Spry, Darryl Marchand, Len Catleugh, and all of the TI Education Canada team, we would like to congratulate the OAME Gazette on 60 incredible years of supporting math educators and math education across Ontario. We are grateful for having been part of this incredible journey and look forward to continuing to support OAME, math educators, and math education across Ontario for many more years to come.

to x), then the Beatty sequences are $[nR]$ and $[nS]$, where n is a positive integer. For example, if $R = \pi$, then $S = \frac{\pi}{\pi - 1}$, and the two "attractive" sequences are B_R: 3, 6, 9, 12, 15, 18, 21, 25, 28, 31, 34, 37, 40, 43, 47, 50,… and B_S: 1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 24, 26,…. Beatty's theorem (also known as Rayleigh's theorem) states that for any positive irrational number R, the sequences B_R and B_S partition the set of positive integers, where each positive integer belongs to exactly one of the two sequences.

When Beatty retired as a Dean in 1952, his friends and former students established the Samuel Beatty Fund. The purpose of the fund is to promote and encourage the study of Mathematics at the University of Toronto and throughout the Province of Ontario. Still in existence, the fund currently provides financial support for undergraduate students in Mathematics, Physics, Computer Science, as well as Statistics and Actuarial Science. The fund also sponsors high school mathematics contests, the Tournament of Towns, and Math Battles; high school Computer Science Showcase; Computer Insights for high school students and high school teachers; a Statistics outreach program for high school students; and the Mathematics SOAR (Strategic Outcomes for Academic pRogress) program.

There are other connections of Samuel Beatty to the *Gazette*. In 1974, Robinson published an extended obituary of Beatty, in *Gazette* 13(1). For several years in the early 1980's, the Samuel Beatty Essay contest was featured in the *Gazette*. The essay contest was open to all students in Canada, and requested a 2000-word essay on a mathematical topic. Cash prizes were awarded. Some of the award-winning essays included Pythagorean Triples, Leonhard Euler, Codes and Ciphers, and Mathematics Applied to Biological Population Growth (author names are unknown.).

Samuel Beatty was a renowned Canadian mathematician and scholar. His interest in promoting the study of mathematics and related subjects led to his support of the *Gazette* and supporting generations of students in our field.

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▲

▲ *Abacus* Review 2007–2021





KATHY KUBOTA-ZARIVNIJ
MARYLOU KESTELL
PAT MARGERM

What was our vision/our invitation?

Greetings! Through the *Abacus*, we'd like to invite you to engage fully in mathematical thinking and doing as a means of furthering your experiences and insight into mathematics for teaching (Ball, 2000, 2005). Mason (2005) explains that full mathematical engagement includes actively doing such things as jotting down your own ideas, doing tasks, and constructing your own examples, trying to make connections, getting involved in detail, standing back to get the big picture, explaining to someone else what you are doing, being prepared to struggle, and acknowledging feelings. Also, by doing mathematics yourself, rather than reading and hearing about mathematics, you will have the immediate experience upon which to consider your own mathematics content pedagogical knowledge needed for teaching mathematics to students.

Get some colleagues together from your Division, and explore aspects of teaching and learning whole and decimal number addition. So, let's do math!

Over our 14 years, we covered many topics as highlighted in Table 1.

How did we delivery on that goal?

Our goal was to make the *Abacus* a place where teachers could go to study mathematics for teaching. A *research summary* outlined the latest information about the conceptual and procedural practices around teaching the topic in math classes from Grades 4–8. We included representations of the use of *manipulatives* that students could use to show their mathematical thinking, and references to *picture books* (literature) that would support the ideas emerging in the study of the math concept in question. Initially, we created *samples of student work* with commentary for teachers to study as they modelled such actions in the classroom. The focus was on highlighting student thinking and encouraging classroom discourse for making sense of the mathematics and learning to communicate that thinking.

Table 1: Abacus *topics through the years*

	Topic	Content in Four Editions
2007	Number Sense and Numeration	Addition, subtraction, multiplication, and division, each from concepts, alternative algorithms, and mental math strategies
2008	Arithmetic to Algebra	Equality and relational thinking. Algebra as generalized arithmetic, algebra as functional relationships, and multiple representations
2009	Fractions	Representations, comparing and ordering, equivalence fractions, decimals, percent, ratio, rate, and proportion
2010	Measurement	Investigating linear measure, area measure, capacity and volume, time and distance/time rate
2011	Geometry	Composing and analyzing two-dimensional shapes, three-dimensional objects, and transformations
2012	Data Management and Probability	Collecting and organizing, reading data, making inferences, representing and interpreting probability
2013	Proportional Reasoning	Number Sense and Numeration, rate, Geometry and Measurement, Patterning and Algebra
2014	Spatial Reasoning	Different contexts: Geometry, Number Sense and Numeration, and Measurement
2015	Relational Thinking	Addition, subtraction, multiplication, and division
2016	Fractions	As part of a whole, as quotient and unit fraction, operator, ratios
2017	Division	Of whole numbers, with decimal quotients and rates, decimal numbers and equivalent ratios
2018	Comparisons	Geometry and Spatial Sense, Number Sense and Numeration, Measurement, Patterning and Algebra, Data Management and Probability
2019	Building Whole Number Sense	Addition, subtraction, multiplication, and division
2020	Building Fraction Sense	Representing and comparing as division of a whole, set, and measure

CHAPTER TIMELINE

1992: Chapter founded as TEY²MS

1994: First Mini-Conference

OAME 1997: The Name of the Game

1998: Chapter renamed TE²Y²MS

OMO 1999

2002: Chapter renamed TEAMS

OMO 2002

OAME 2005: NEXUS: Building Mathematical Connections

OMO 2011

OAME 2013: Think BIG

OMO 2017

OAME 2021: Equity Counts

2021: Monthly Speaker Series

OAME 2023: EmPOWERing^{ME} (with NOMA)

Toronto Educators Association for MathematicS

T E A M S





OAME PAST PRESIDENTS

Peter Saarimaki (1999–2000)
Stewart Craven (2003–2004)
Kathy Kubota-Zarivnij (2005–2006)
Anna Jupp (2008–2009)





***GAZETTE* EDITOR**

Stewart Craven (2008–2010)

***ABACUS* EDITORS**

Trevor Brown (2004–2007)
MaryLou Kestell (2007–2021)
Kathy Kubota-Zarivnij (2007–2021)





AWARD WINNERS

Secondary School Math Staff Award
Marc Garneau C.I. (1986)
Eastern Commerce C.I. (2002)

Elementary Staff Award
William Burgess P.S. (2011)
Epiphany of Our Lord C.A. (2013)

Union Gas Award
Anna Jupp (2005)
Felicity Laudisa (2005)

Exceptional and Creative Elementary Teaching Award
Najwa Chalabi (2015)
Rebecca Colaiacovo (2021)

OAME Leadership Award
Kathy Kubota-Zarivnij (2009)
Pat Margerm (2012)

Life Members of OAME
Peter Saarimaki (2001)
Kathy Kubota-Zarivnij (2010)
Wayne Erdman (2014)

The *Abacus* structure was as follows:

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- Links to Literature
- LET'S DO MATH: sample student work with annotation
- LET'S DO MATH: sample student work with annotation
- Next Steps for Your Professional Learning
  - Application to Your Classroom
  - Suggested Readings

By 2012, we began including a two-page spread we called *The Bansho Plan*. In the *Abacus*, we showed a three-part lesson—*Getting Started*, *Working On It*, and *Consolidation*—demonstrating how a classroom lesson might proceed. However, what is a Bansho?

> The bansho process uses a visual display of all students' solutions that is organized from least to most mathematically rich. This is a process of assessment for learning and allows students and teachers view the full range of mathematical thinking their classmates used to solve the problem. Students have the opportunity to see and hear many approaches to solving the problem, and they are able to consider strategies that connect with the next step in their conceptual understanding of the mathematics (Ontario Ministry of Education [OME], n.d., p. 24).

and

> Mathematical ways of talking are modelled and practised—resulting in the creation of a safe math-talk community. All students have a chance to learn more about the math used in developing solutions and to clarify their understanding of the concepts and procedures… Through the careful management of discourse, the mathematics is made explicit.
>
> Japanese educators call this teaching strategy bansho. We will call this process of organizing, displaying, annotating and discussing solutions bansho as well. Bansho engages the teacher in examining student work, organizing it, and displaying it to make explicit the goals of the lesson task (OME, n.d., p. 22).

Math consultants told us they used the *Abacus*, and especially the Bansho plan, in their professional learning

sessions with teachers.

In 2019, we changed the format again, to focus on mental and visual mathematical thinking with quick images, games, and puzzles. The Table of Contents changed to include the following:

TABLE OF CONTENTS

- Designing Practice Tasks (Content focus: Conceptual Understanding, Procedural Fluency, Strategic Competence, and Productive Disposition)
- Quick Images, Math Puzzles, and Math Games
- Quick Images
- Math Puzzles
- Brain Teasers
- Math Games

What's next?

We hope that the future of the *Abacus* and the study of Mathematics for Teaching continues as our great Ontario Association for Mathematics Education continues to thrive.

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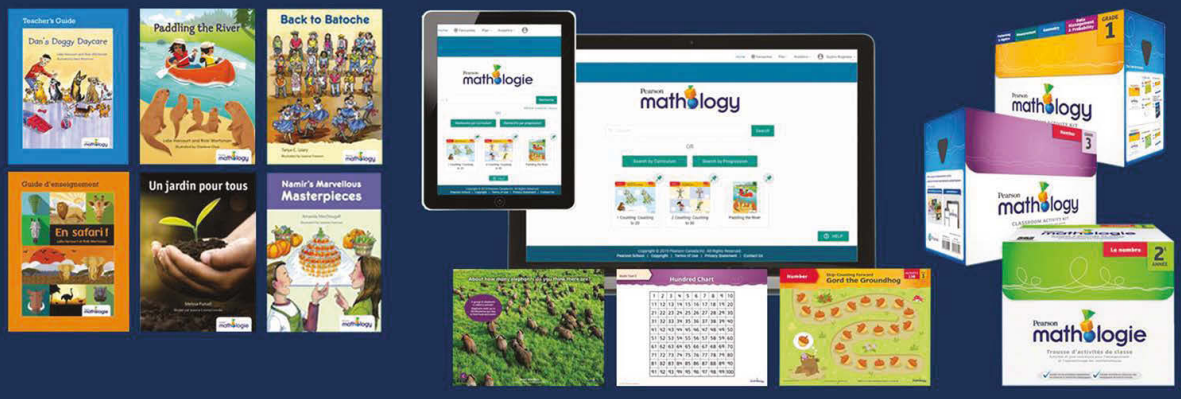
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Congratulations OAME *Gazette* on 60 Amazing Years!
Congratulations OAME on your 50th Anniversary!



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An Analogy on Learning Mathematics



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Tom Griffiths is a long-standing member of OAME/AOEM and its predecessor, OATM. He is a Past President and recipient of the Life Membership Award. Tom was first published in the Gazette *in March 1972, and has regularly submitted items ever since. It is fitting that on the 50th anniversary of his first* Gazette *contribution that we find Tom continuing to bring ideas to the mathematics education community.*

This article is intended as an idea for teachers to discuss the process of learning with their students.

Helping students learn mathematics is an incredibly rewarding endeavour. In doing this, we often refer to learning the tools of the subject. Recently I have expanded this analogy further to help my students and myself understand the process of learning. In fact, this analogy is relevant to learning anything.

My analogy is to consider the process of learning to become a carpenter. To be a carpenter, you need materials, tools, skills, and plans. The analogy is that the materials, such as wood, nails, and glues for a carpenter, are the numbers, graphs, and shapes for a mathematician. The tools for the carpenter are chisels, hammers, and saws, and are likened to mathematical operations, algorithms, and theorems. Skills take time, experience, and patience to develop in both endeavours, and it is necessary to practise, understand the tools, and develop skills by trial and error. The plans for the carpenter are the problems for the mathematician.

The carpenter must learn and understand the properties and idiosyncrasies of the materials they use; it is very different to work with pine or oak, just as children find it very different to work with whole numbers or rationals. The young mathematician needs to understand how numbers work. This is hopefully developed from a very young age in number skills, with parents, guardians, and family members counting everything with the child. Names of shapes are learned very early, so that by the time the student comes to school, they will have an idea of the basic materials of mathematics. As teachers, it is then our responsibility to help the learner develop the skills needed to use those materials. I emphasize helping the learner, since it is the learning, rather than the teaching, that is of prime importance (just as it is what the carpenter makes, as opposed to how he was taught to make it, that matters). If the learner does not learn, then the exercise is pointless.

The carpenter practises with hammers, chisels, and other tools, thus learning to develop a feel and understanding of the best way to use them. (Wood grain behaves differently for a chisel going across it versus with it.) Similarly, the young mathematician must practise, first using fairly fixed algorithms and later investigating different approaches to using the tools. The learner must not only learn the basics, such as multiplication and addition facts and other algorithms, but must also investigate, discover patterns, and understand them for themselves.

In the classroom, an aid to the development of skills is the textbook. The exercises in the book help the learner practise the skills and algorithms. Most textbooks have problem sections that provide opportunities to explore and develop those skills, as well as understanding them and their use more deeply. Additional problem sets are an extension of the plans, to give the learner a challenge.

With practice and experience, the mastery of the use of the skills and tools leads to a deeper insight into the possible applications of the tools, much like the carpenter progresses from hand to power tools (or vice versa these days). In essence, having more options provides for being able to address a wider range of needs.

Modular Arithmetic

Modular arithmetic is a process of working with remainders with respect to a particular value. For example, 10 has a remainder of 3 when divided by 7 (i.e., "modulo 7"), and 18 has a remainder of 4. When multiplied, 10 x 18 = 180, and that has a remainder of 5 when divided by 7. However, modular arithmetic says 10 x 18 gives the same result as the product of the remainders 3 x 4 = 12, and the remainder of 12 divided by 7 is 5.

An example of this analogy is as follows:

The plan or problem is:

If today is Tuesday, what day of the week will it be in a Googol (10 to the power of 100) days time?

The material is the finite number system modulo 7, i.e., (0,1,2,3,4,5,6).

The tool is the multiplication table for modulo 7.

The skill is using this table to evaluate 10 to the power of 100.

Now 10 modulo 7, or more commonly written as 10 mod 7, is 3. It is the remainder when 10 is divided by 7.

In modulo 7 arithmetic, $100 = 10 \times 10 = (3 \bmod 7) \times (3 \bmod 7) = 9 \bmod 7 = 2 \bmod 7$.

$1\,000\,000 = 100 \times 100 \times 100 = (2 \bmod 7) \times (2 \bmod 7) \times$

(2 mod 7) = 8 mod 7 = 1 mod 7.

$10^{100} = (10^{96}) \times (10^4) = (10^{6^{16}}) \times (10^4)$.

In mod 7, this gives $(10^6 \bmod 7)^{16} \times (10^4) = 1^{16} \times (100 \bmod 7)^2 = (1 \bmod 7) \times (2 \bmod 7) \times (2 \bmod 7) = 4 \bmod 7$.

So, if today is Tuesday, the answer is Saturday.

One of the reasons I have chosen modulo numbers as an example is that finite number systems are very familiar to students in working with days of the week, hours in a day, and other examples. They are rarely taught in school, and are not on the regular curriculum. They are, however, the fundamental concept used in encryption. The standard security for credit cards and e-commerce uses them. As such, students should know of the existence of such a fundamental concept in today's world of computers. They are also a very valuable tool in solving Diophantine equations, which do appear in the school curriculum.

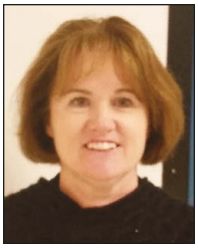
Too often, modular arithmetic is considered an extra-curricular topic because it arises in math contests. It is certainly a rich topic for extra-curricular encouragement of students. With the analogy, contest problems are among the "plans" used to help the learner develop skills and get a deeper understanding. These are easily found in contest papers. They give an accessible *raison d'être* to use the tools and skills, where credit card encryption has some additional complexities. The advantage of using contests is that they are well written and varied. They vary in difficulty from very simple problems to extremely challenging. They also vary in topic to assist the learner in developing a variety of skills and tools at the same time, rather than concentrating on only a limited number, as exemplified in a textbook.

Taking up the contest problems is an excellent opportunity for the teacher to expand on both the understanding and use of algorithms, as well as digressing into the interconnection of different algorithms. The diversity of the use of different algorithms in different problems is like the use of different tools in different projects, patterns, and concepts.

I recommend to my students that they keep a file, no pun intended, or "toolbox" of algorithms and formulae for themselves, and add to them as they progress. I still have and use the file I made for myself as a high school student and refer to it quite frequently for such items as trigonometric formulae.

The process of learning is lifelong and exciting, and depends on developing skills and understanding them at the same time. I believe that it helps both the learner and teacher to have a model of how to learn, and what part of the process is being developed in any particular activity. The products of a carpenter are useful, and often elegant and beautiful. So are those of a mathematician. ▲

▲ OAME/NCTM Report: Celebrating OAME/AOEM and NCTM Co-operation! 60 Years for the *Gazette*! And the 50-Year Anniversary of OAME/AOEM!



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Jacqueline Hill is a retired high school teacher of mathematics. She is a Past President of OAME and OMCA, as well as the recipient of the award for Exceptional Teaching in Secondary Mathematics. She also recently received the OAME Life Membership Award for outstanding contributions to OAME.

Fifty years is a golden anniversary for OAME/AOEM. That is 600 months, 2600 weeks, and approximately 1 577 880 000 seconds (using 365.25 days in a year). That is a remarkable feat!

In the 40th-anniversary edition of the *Gazette*, it was noted that the NCTM and Mathematical and Physical Association of Ontario (MPAO) started their affiliation for the ongoing pursuit of mathematics education as far back as the 1950's. It should be noted that the formerly known MPAO changed its name to Ontario Association of Teachers of Mathematics and Physics (OATMP), and that in 1961, OATMP hosted the first NCTM summer meeting outside the United States. In 1982, the NCTM Annual Conference (Toronto) was the first (and so far only) time the annual conference had been held outside of the United States. In 1990, the NCTM regional meeting was in Hamilton. In early 2017, the NCTM had a Board of Directors meeting in Toronto, which then President Tim Sibbald and NCTM Representative Todd Romiens attended.

Since this is the 60th anniversary of the *Gazette*, it is a special note that when Dan Jarvis was at the helm of the *Gazette*, it was awarded the 2016 NCTM Award for Publications (see Dan's reflection for photos).

Ontario has been well represented in NCTM throughout the years.

1965–1968 – John C. Egsgard was an Elected Officer for NCTM.

1976–1978 – John C. Egsgard was the NCTM President.

1982–1985 – Bob Robinson was an Elected Officer for NCTM.

1994–1997 – Lorna Fay Wiggan was an Elected Officer for NCTM.

2000–2003 – Frances Schatz was the OAME/AOEM Representative to NCTM (though she could have started earlier, but was also the *Abacus* Editor at the time, so it is a bit hazy as to their overlap).

2004–2008 – John Kersley was the OAME/AOEM Representative to NCTM.

2007–2010 – Christine Suurtamm was an Elected Officer for NCTM.

2008–2010 – Laurie Moher was the OAME/AOEM Representative for NCTM.

2011–2017 – Todd Romiens was the OAME/AOEM Representative for NCTM.

2016 – Dan Jarvis was at the helm of the *Gazette* when it was awarded the NCTM Outstanding Publication Award.

2017–present – Jacqueline Hill is the OAME/AOEM Representative for NCTM.

2021–present – Paul Alves is the Canadian Region Representative on the Membership and Affiliate Relations Committee for NCTM.

It is a rare and very special occasion to celebrate a 50-year anniversary, or 60-year anniversary in the case of the *Gazette*. Yet, OAME/AOEM and NCTM have been fast friends and allies in the face of mathematics education. It shows very strong leadership on the part of both organizations that the relationship continues to survive and thrive. ▲



▲ Elementary Mathematics Curriculum, Teaching, and Learning: The Past Ten Years



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Dr. Christine Suurtamm is currently Professor Emeritus in Mathematics Education at the University of Ottawa. She began her career as a classroom teacher, which encouraged her research into the complexity of mathematics teaching and formative assessment. She has been a Lead Researcher on several research projects, to understand and support mathematics teaching. Most recently, she has been a Research Adviser to the Ontario Ministry of Education curriculum writing team for the elementary and Grade 9 curricula.

This article reviews the elementary mathematics curriculum, teaching, and learning over the past ten years, picking up where the article on elementary mathematics teaching (Stuart, 2012) in the 40th-anniversary edition left off. In this article, we consider several components that contribute to mathematics teaching and learning, such as the curriculum, professional development initiatives and resources to support mathematics teaching, and the students we teach. Threaded throughout this article are research references, as much of the mathematics teaching and learning within Ontario, including curriculum, professional learning, and resources, is evidence based.

Evolution of the Curriculum

The 2005 mathematics curriculum leaned on many of the ideas that had been supported by research and had emerged from the work of the National Council of Teachers of Mathematics (NCTM), an organization that first put out standards for mathematics instruction and evaluation in 1989, updated those in 1999, and continues to provide evidence-based resources and professional development in the United States and beyond (e.g., NCTM, 2014). Evidence of the influence of NCTM can be seen in the 2005 mathematics curriculum incorporation of mathematical processes (problem solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communication) in the Ontario curriculum as well as in other ways (Ontario Ministry of Education [OME], 2005). The focus on mathematical processes or mathematical actions can also

be seen in the variety of verbs that are in the 2005 mathematics curriculum, such as in this Grade 1 curriculum expectation, which emphasizes students creating and describing:

> Students will create symmetrical designs and pictures, using concrete materials (e.g., pattern blocks, connecting cubes, paper for folding), and describe the relative locations of the parts (OME, 2005, p. 38).

The 2005 curriculum appeared to serve Ontario well, as Ontario ranked above average on international mathematics assessments, and Ontario was often cited as not only having high achievement (in the top 15 countries), but also high equity (OECD, 2015; O'Grady et al., 2019; Sahlberg, 2016; Silver et al., 2018).

However, a new curriculum was long overdue to take into account such things as new research, technology, and perspectives. When a new Progressive Conservative government came to power in 2018, there was a renewed stance on mathematics education. As a first response, there was the publication of a supplement to the 2005 curriculum, called *Focusing on the Fundamentals of Math: A Teacher's Guide* (OME, 2018), which highlighted particular ideas, mainly related to number, in the 2005 curriculum, which were deemed "foundational to all aspects of mathematics" (OME, 2018, p. 2). This was followed by the development of a new elementary mathematics curriculum, which was released in 2020. Like the 2005 curriculum, the curriculum development process included commissioning a background research report (Suurtamm & McKie, 2019), to provide a jurisdictional scan and a review of current research relevant to teaching and learning elementary mathematics. There was also consultation with a variety of stakeholders and a cadre of subject-matter experts to provide advice and relevant research, and review curriculum drafts from the curriculum writing teams.

The background research report provided a summary of research over the previous ten years on how children learn particular mathematics concepts, effective pedagogical strategies, assessment, professional development, and curriculum design. The report highlighted research into learning progressions, to indicate particular ways that students build their understanding of concepts (e.g., Blanton et al., 2017; Clements & Sarama, 2014; Lawson, 2015), with a reminder that these concepts are not necessarily built following a linear trajectory, but are built in different ways, contexts, and through different experiences that students have (e.g., Empson, 2011; Koch et al., 2021; Simon, 1995). The report also highlighted current research in areas such as the development of fractions and proportional reasoning (e.g., Bruce & Flynn, 2019; Bruce et al., 2022 [in press]; Empson & Levi, 2011), algebraic thinking (e.g., Blanton et al., 2017), and spatial reasoning (Moss et al., 2016). It also reported on topics such as computational thinking (coding), mathematical modelling, and financial literacy. These topics were emergent in the mathematics curricula of other jurisdictions, particularly those that are high performing, as well evident in research literature (e.g., Gadanidis et al., 2017; Hirsch & Roth-McDuffie, 2016; Lucey & Maxwell, 2011; Suurtamm & Roulet, 2007). Research on the structure of mathematics curricula revealed that most recent curricula were built around mathematics strands, and were presented in digital form to allow for easy access and for resources to be connected to the curriculum (Suurtamm & McKie, 2019; Thompson et al., 2018).

The Ontario elementary mathematics curriculum was released in June 2020, with implementation of the curriculum to take place starting in the Fall of 2020. There were many familiar features to the new Ontario math curriculum. For instance, it is organized by strands, includes the mathematical processes, contains overall and specific expectations, and has many of the same topics. The curriculum appeared in a digital format, which allowed teachers to be able to view the curriculum by grade or as a continuum of ideas by strand across grades. The digital format also has many linked teacher supports—such as a glossary, key concepts per grade, sample tasks, and sample long-range plans as well as learning continua. This provides "one-stop shopping" to teachers, rather than teachers having to visit a variety of websites to find information and ideas to support implementation. The use of the digital format not only helps to organize all the supports in one place, but it also provides the opportunity for new resources to be added over time. Thus, the curriculum and its supports are dynamic, rather than static.

Although the curriculum is organized into strands, as it was in the 2005 curriculum, the strands are somewhat different: A. Social–Emotional Learning Skills (SEL) in Mathematics and the Mathematical Processes, B. Number, C. Algebra, D. Data, E. Spatial Sense, and F. Financial Literacy. The Measurement and Geometry strands in the 2005 curriculum were combined into one strand, Spatial Sense. Financial Literacy is a new strand that responds to calls for students to be financially literate citizens (OME, 2010). In terms of mathematics content within the strands, some new topics emerged, such as coding, mathematical modelling, and financial literacy, topics which will help students to develop a deeper understanding of mathematics as they connect mathematical ideas and apply mathematics in real-life contexts. When the curriculum was first revealed, coding rose to the surface as a new focus for which teachers felt they needed training, support, and resources. Another new topic, mathematical modelling, engages students in rich, messy problems that cross strands, and helps students develop the modelling process of

analyzing situations, collecting and organizing information, and creating a workable solution to address the messy problem. Many resources were developed to help teachers understand this process and find modelling problems for students to work with. One source of resources for both coding and mathematical modelling was through the Ontario Association for Mathematics Education (OAME/AOEM), one of the Ministry-funded partners chosen to develop both professional learning and classroom-ready resources. As well as new topics, there were new approaches to familiar content, such as fractions in the Primary grades, an earlier introduction to integers in the Junior and Intermediate grades, and the inclusion of non-linear relations in algebraic thinking.

Strand A, with a focus on SEL, emphasizes the importance of a student's relationship with mathematics and with the stance that they take when they engage in mathematical activity. The SEL skills outlined in the curriculum include:

- identify and manage emotions
- recognize sources of stress and cope with challenges
- maintain positive motivation and perseverance
- build relationships and communicate effectively
- develop self-awareness and sense of identity
- think critically and creatively (OME, 2020)

and are paired with the mathematical processes that are identical to the mathematical processes in the 2005 curriculum. The goal of students' enhancing their SEL skills and engaging in mathematical processes is to deepen their mathematics understanding, but also to "help every student develop a positive identity as a capable 'math learner'" (OME, 2020, p. 80). The discussion of social–emotional learning emphasizes the role that teachers play in supporting students to develop positive social–emotional learning skills. Although research in the affective domain in mathematics is not new (e.g., Hannula et al., 2019), its specific inclusion in the Ontario curriculum as a separate strand is significant.

Professional Development and Resources

In 2003, an Expert Panel, commissioned by the OME, released a report, *The Early Math Strategy: Report of the Expert Panel on Early Mathematics in Ontario* (OME, 2003), which was followed in 2004 by *Teaching and Learning Mathematics: The Report of the Expert Panel on Mathematics in Grades 4 to 6 in Ontario* (OME, 2004). These two reports guided professional development initiatives and resources. In terms of professional development, each school in Ontario designated a lead teacher in mathematics, who received extensive training on effective mathematics teaching and learning, which was to be shared with teachers within their school. Alongside this "train the trainer" professional development model, resources to guide teachers were produced. These *Guides to Effective Instruction* not only provided classroom-ready resources that continue to be used, but also provided information for teachers on how students develop mathematics concepts, and guidance on things to look for when paying attention to students' thinking. Classroom-ready resources were also developed for Grades 7–12 through the *Leading Math Success* (OME, 2004) initiative.

Professional development has evolved from a "train the trainer" model to recognize the important role of teacher collaboration through professional learning communities, co-teaching and co-planning, lesson study, book study, and other models of collaborative professional work, which focus on enhancing student understanding (Borko & Potari, 2020). Several Ontario research projects have focused on the power of teacher collaboration, and results demonstrate success in working with collaborative models for sharing knowledge and experience in teaching and learning (e.g., Bruce et al., 2011, 2012; Bruce & Flynn, 2013; McKie et al., 2017; Suurtamm, 2020). For instance, the Collaborative Inquiry for Learning in Mathematics (CIL-M) was a three-year study that involved over 200 Ontario teachers and 1000 students, and engaged teachers in "peer coaching, mathematics content learning, classroom-embedded mathematics professional learning, facilitation of school and district-level professional learning networks, and increased leadership capacity in math education" (Bruce & Flynn, 2013, p. 691). Results of this work indicated increased teacher efficacy, student achievement, and positive student beliefs (Bruce & Flynn, 2013).

Another initiative, the MOE's Renewed Math Strategy (RMS) in 2016, used a collaborative model, with three mathematics lead teachers in each school, mathematics coaches working with teachers, and dedicated resources such as "Mathies." The RMS provided new forms of support to all schools, increased support to some schools, and intensive support to a select group of schools with the greatest needs in mathematics. Resources included webinars, monographs, and online teaching resources to support a differentiated and targeted approach to student learning. This initiative also encouraged a shared commitment to transform cultures of collaboration across all levels of the education system through a new Policy/Program Memorandum (OME, 2016).

Subject associations also provide support for enhancing mathematics teaching and learning. The Ontario Association for Mathematics Education (OAME/AOEM) has provided teaching resources through their online portal, as well as professional learning opportunities through their annual conferences, leadership conferences, speaker series, and interactive teaching resources. The high-quality conferences provide Ontario

teachers access to the latest ideas in mathematics teaching and learning coming from educators within Ontario and beyond. For instance, Jo Boaler has presented at several professional development events and brought her emphasis on growth mindset (Boaler, 2015), which draws on the work of Dweck (2007), to Ontario teachers. This work raised the awareness of the connection between how students see themselves as mathematically capable and their achievement. The term "growth mindset" became fairly commonplace in teachers' discussions and in the classroom setting as teachers emphasize the role of making mistakes and taking risks as ways to enhance problem-solving skills and thus students' understanding of mathematics. These ideas also align well with the development of SEL skills, as seen in the 2020 math curriculum.

The National Council of Teachers of Mathematics (NCTM) has also influenced mathematics education in Ontario. Several resources have been commonplace in professional development activities in school boards. The publication *Principles to Actions* (NCTM, 2014) outlines effective research-based teaching practices in mathematics, and has been used by several school boards as a book study at multiple levels including teachers and principals. The teaching practices outlined in this publication align with the 2020 OME resource document *High-Impact Instructional Practices in Mathematics*, which accompanies the elementary mathematics curriculum, and provides a brief overview of pedagogical practices that are effective in implementing the curriculum. Another resource that has been the focus of book studies throughout Ontario schools is *Five Practices for Orchestrating Mathematical Discussions* (Smith & Stein, 2018), which provides classroom examples and outlines a framework for orchestrating meaningful student engagement and discussion with rich tasks.

However, in the past few years, mathematics education resources and professional development have moved well beyond print resources, workshops, and webinars as teachers are turning to social media (e.g., Twitter) for professional development and access to teaching resources. Twitter has been shown to not only provide resources and informal professional development, but to also help to build professional communities (Larsen, 2019).

Enhancing and Supporting Our Students' Mathematics Experiences

Considering our learners is critical as we think about how mathematics teaching and learning have evolved and been influenced over the past ten years. Addressing the diversity within classrooms means recognizing that students and teachers bring with them a range of different experiences, perspectives, and beliefs toward mathematics.

Differentiating student instruction to address student needs has been an ongoing focus of elementary school teaching. Documents such as *Learning for All: A Guide to Effective Assessment and Instruction for All Students, Kindergarten to Grade 12* (OME, 2013) was a critical component to draw attention to the importance of supporting all students in mathematics. A variety of resources helped to support student learning, such as a focus on open-ended and parallel tasks (e.g., Small, 2020), as well as diagnostic resources and resources to highlight mathematics growth continua (e.g., Lawson, 2015; Small, 2010).

In recent years, emphasis has been placed on the use of equitable teaching practices and culturally responsive pedagogy to ensure that all students see themselves in the mathematics that is taught, and the approaches to mathematics (Aguirre et al., 2013; Celedón-Pattichis et al., 2018). Equitable practices emphasize that all students should have access to high-quality mathematics instruction and engage in rich mathematical activity (Celedón-Pattichis et al., 2018). This perspective warns against "streaming" based on perceived student ability, as this can often rob students of the opportunity to engage in activities that develop their conceptual understanding and prevent them from seeing themselves as mathematically capable (Boaler & Staples, 2008). We have seen this focus explicitly on "destreaming" in the 2021 Grade 9 mathematics course. However, equitable teaching practices, such as low-floor–high-ceiling tasks, using a variety of assessment strategies, as well as paying attention and valuing each student's ways of thinking and solving mathematics problems, are also encouraged in elementary classrooms and in the 2020 elementary mathematics curriculum.

The 2020 mathematics curriculum also encourages culturally relevant and responsive pedagogy (CRRP) that builds on students' experiences and respects students' cultures. CRRP emphasizes that all students should see themselves in mathematics, and that mathematics is a cultural practice with mathematical ideas coming from a range of different cultures, not just the predominant culture in the classroom (Celedón-Pattichis et al., 2018). A great deal of work has been emerging to support understanding Indigenous perspectives and ways of seeing mathematics (e.g., Beatty & Blair, 2015; Beatty & Clyne, 2020; Lunney Borden & Munroe, 2016; Lunney Borden et al., 2018). For instance, one project includes Indigenous artists and educators from local communities, and connects Indigenous art forms with mathematical concepts (Beatty & Clyne, 2020).

Teacher Responsiveness

Teachers have been quite responsive to changes in

curriculum, resources, and situations. During the past ten years, probably the biggest challenge and call for change has been due to the health pandemic over the past two years, where teachers have constantly moved between online learning and in-class learning, with health protocols constraining normal learning situations. I have worked with many teachers during this time, and what has struck me the most is how teachers worked to maintain their strong pedagogical practices within these various settings. I saw teachers creating ways for students to work collaboratively on problem-solving tasks in online or socially distanced settings, and strive to find ways to make students' mathematical thinking visible. This responsiveness and care for student learning is a strong indication of the high level of professionalism of Ontario teachers to ensure high-quality mathematics teaching and learning.

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Remembering Sharon McPhail (1942–2021)

BY RALPH CONNELLY



I first met Sharon at the St. John's, Newfoundland National Council of Teachers of Mathematics (NCTM) meeting in 1977. At the time, I was teaching at Memorial University, but was about to move to Ontario to begin teaching at Brock University. She asked me to contact her when I got to Ontario, and when I did, she told me I should run for the OAME/AOEM Council. She downplayed my objections (nobody knew me, etc.) and convinced me to run. Somehow, I was elected, and the rest, as they say, is history. Therefore, Sharon gets the credit (or blame?) for launching me into over four decades of work with OAME.

Sharon served in many roles with OAME/AOEM—Councillor, Director, *Abacus* Editor, and President, to name just a few. She also was Treasurer, and later President of the Consultants/Coordinators Association of Primary Educators (CCAPE), and, in that position, was a driving force in implementing Junior Kindergarten across the province.

The project on which Sharon and I worked most closely together is also a project of which I am most proud—we were Project Coordinators and co-Editors for the *Linking Assessment and Instruction in Mathematics: Primary Years* document. It was a truly groundbreaking document at the time. That project is where I came to appreciate how truly incredible Sharon was. Ideas just seemed to constantly flow from her, and she had boundless energy. Every thought/suggestion that she had, as we put that document together, just kept making it better—I am still in awe of all that she did, even drawing some of the illustrations!

Although in retirement, she and husband Dave veered a bit from education into an exceptionally successful Internet boating business, Sharon still kept in touch with her OAME/AOEM friends, and was in attendance at our virtual Past Presidents' Reception last May.

Sharon always committed fully to whatever she did. She will certainly be missed. ▲

Events at the Fields



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At their core, there is a fundamental connection between the OAME/AOEM and the Fields Institute for Research in Mathematical Sciences. There is a reason that the *Gazette* has included a regular column addressing events at the Fields for many years—both are Ontario-based organizations that are gathering points for people interested in mathematics and mathematics education. The Fields MathEd Forum, a monthly public meeting, during which current topics and research in math education are discussed, is a place where research and practice come together. At the Forum, teachers and education researchers alike share their experiences with the community for mutual benefit. For this anniversary edition of the *Gazette*, I have gathered some reflections from attendees of the MathEd Forum to give some insight into why people attend the Forum each month. Forum attendees come from many different backgrounds, and we each have our own reasons why we participate. Below are some responses I received when I asked the question, "What draws you to the Fields MathEd Forum?"

Iain Brodie, elementary teacher

I was first invited to the Fields MathEd Forum by Gord Doctorow. When I went there for the first time, I immediately felt included in the community of math educators who were there. Not only did we get to hear groundbreaking ideas and research, we got to create a community of people, all of whom want to make sure that our students get the best math education possible. The MathEd Forum regularly provides me with the best professional development—only surpassed by my graduate classes in Math Ed.

John Kezys, college mathematics instructor

The people at the Forum draw me. The Fields MathEd Forum provides the opportunity to meet math teachers from all levels of education. I teach foundation-level mathematics to first- semester college students. These students face significant challenges in their transition from secondary to college. Sessions at the Forum provide me with a perspective of students' journey through their education. The Forum prepares me to be a better math teacher.

Brian Forrest, mathematics professor

As a research mathematician, I have always believed that the greatest impact most of us could have is not through the papers we write, but through the students we teach. Attending the Fields Forum has allowed me to meet people from wide-ranging backgrounds, who share a passion for teaching mathematics.

Paul Alves, secondary teacher

Prior to the pandemic, the Fields MathEd Forum was my getaway for the month from the busyness of the classroom and other work. It was time for me to nourish my professional curiosity with like-minded individuals. On more than one occasion, I have left Fields with something that I could share with colleagues, and in many instances, an activity or task that I could use in my classroom. Fields continued to connect with the MathEd community during the pandemic through virtual offerings that continued the tradition of engaging in professional learning for all levels of education. Here's hoping that we continue to come together and share as a community in the years to come.

Gord Doctorow, retired university math lecturer and former secondary school math teacher

What draws me to the Fields MathEd Forum? When I first started going in the late 1990's, I was teaching math at an alternative secondary school in Scarborough. I was very interested in discussions about curriculum, especially in the aspirations to be part of a process of advising the Ministry of Education. The Fields had a lot of very good thinkers there at all levels of math education, including textbook publishers and some interested members of the public. As time went on, I got more and more involved in the discussions and even did a presentation or two. I was intrigued by new collaborative research presentations and even got involved in program planning. One event I helped organize was a panel and discussion on mathematics in science fiction. I was able to assemble a small group of science-fiction writers, and the presentation took place in the Lillian Smith Library in the area of the Merrill Collection. The library is located across the street from the Fields Institute. The Merrill Collection is named after the deceased pioneer female science-fiction writer, Judith Merrill. I keep attending the Fields MathEd Forum, even though I have retired from teaching and math education, because the presentations are so varied and intriguing.

Dr. Miroslav Lovric, university mathematics professor

I have been coming to the Forum for quite some time, to

share and learn about what's going on in math education at all levels, and to socialize and network. The Forum has managed to bring diverse populations—primary and secondary teachers, college and university instructors, researchers in math education, graduate students, people from the Ministry of Education, and the general public—together, to establish important lines of communication and to hold informed discussions about every aspect of math education. The fact that there are so many people in the same place, with different ideas, views, and opinions, makes coming to the Forum meetings worthwhile to me.

Stewart Craven, secondary teacher

Although I was always intrigued with the plethora of topics addressed by the presenters at the Forum, and notwithstanding how many ideas influenced my thinking about mathematics education, it was a milieu where my friends and colleagues met on a regular basis during the school year. It is true that meetings that are easily shared online, regardless of where you reside, are a great advantage, but the random talk that naturally occurs when you meet in person cannot be duplicated at a distance. It is my hope that in due time, the Forum will return to a blended format that includes both online and in-person opportunities.

Parker Glynn-Adey, university mathematics professor

For me, the Fields MathEd Forum is about friendship and community around mathematics education. Everyone I have met there is passionate, curious, and playful. We all love mathematics and we all love education. Mathematics is our common language, our common culture, whether we teach in Kindergarten or university. I attend the Forum to listen and share with my friends.

Angelica Mendaglio, designer of K–12 assessments

For myself, I agree with everything written above. The one thought that I would add to the mix is that I am drawn to the Forum for what it represents. I see it as championing math education as a field of study, in which we try new things in our classrooms, conduct research, and learn from others in our community. I feel that it is of critical importance that we continue to question our understanding of teaching and learning mathematics, and always strive to improve the student experience. This is a part of why I attend the Forum—because I want to be involved in some small part with that process.

The Fields MathEd Forum will convene on the last Saturday in March and April. You can sign up to attend remotely through the Fields website, where you can also see their schedule of other upcoming math education events. ▲

▲ The Kindergarten Experiment – A Struggle for Recognition, Identity, and Acceptance



EDWARD SCHROETER
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Ed Schroeter, B.J., B.Ed., OCT, is a retired elementary teacher, having taught for 30 years, 18 of them in Kindergarten. He was the Grade 1 Lead Writer for the Ontario Mathematics Curriculum Resource Project *(2020–2021). He led three Teacher Learning and Leadership Projects (TLLP) lesson studies. From 2009 to 2019, he taught two ETFO Summer Academy courses, and presented more than a dozen workshops on inquiry learning around Ontario as part of the* Presenters on the Road program. *He is the author of Chapter 9 of* Teaching for Deep Understanding: An ETFO Curriculum Learning Resource Compilation.



When Maxine Chapman looks back on her 35-year career as a Primary teacher in Belleville and Hastings County, she remembers her former students and colleagues with great fondness. The 90-year-old began her teaching career in 1950 at the age of 18 in Foxborough, Ontario, and retired from Prince of Wales Public School in Belleville in 1986. She taught Kindergarten for more than half of that time. However, Mrs. Chapman is far less enthusiastic about "the constant political interference" in Kindergarten—government policy changes and inadequate support—that affected her ability to support her young students (M. Chapman, personal communication, October 24, 2021).

The shortage of resources for Kindergarten was such that when she transferred to Prince of Wales Public School in Belleville in 1964, she was "so excited" and "delighted" to have "a real Kindergarten room" that was purpose-built for the age group. During her lengthy career, the only provincial Kindergarten curriculum document that she received was a sooty copy of the Ontario Department of Education's (ODE) 1944 little handbook, *Program for Junior and Senior Kindergarten and Kindergarten–Primary Classes*. It had been salvaged from a school fire. In the 1960's, 70's, and 80's, she and her Kindergarten colleagues, as well as all other elementary teachers, were responsible for creating and planning their own programs (M. Chapman, personal

communication, October 24, 2021; Anderson & Jafar, 2003). Beyond the classroom, they met monthly as a group, shared program ideas as well as those published by the Federation of Women Teachers' Associations of Ontario (FWTAO), and had to provide all the equipment and materials necessary to run their programs. For example, all the childhood toys of Mrs. Chapman's four daughters eventually migrated to her Kindergarten classroom. Class size was also an issue. She typically had 25 students in her morning class and 25 students in the afternoon group with no assistant. "We had mothers," said Mrs. Chapman. "That was it." She explained that the only classroom assistance came from volunteers, usually personal friends whom she recruited or who offered to help. As time passed, some of these volunteers were hired part-time as teachers' aides (M. Chapman, personal communication, October 24, 2021). When preschool educator training moved from university extension courses to Ontario's Colleges of Applied Arts and Technology in 1969, and they established Early Childhood Educator (ECE) diploma programs (AECEO, n.d. A), help sometimes came in the form of young ECE students on field placements (M. Chapman, personal communication, November 25, 2021).

Kindergarten's Early Promise

The 140-year historical record of Kindergarten in Ontario supports Mrs. Chapman's account. It suggests that despite the best of educational leaders' intentions, Kindergarten has struggled to adhere to its core mission in the uncharted educational terrain between child care and schooling. Ontario has the longest history of public Kindergarten of any province or territory in Canada. Its first public Kindergarten opened at Louisa Street Public School in Toronto in 1883. *The Ontario Public School Act* was amended in 1885 to allow funding for school boards that wanted to open Kindergartens and for Kindergarten teacher training. Kindergarten was formally recognized in legislation in 1886. The credit for these changes is usually assigned to its leading proponent, James Hughes, Chief Inspector for public schools in Toronto, and Louisa Street Kindergarten Director, Ada Marean (Prochner, 2009, as cited in Wloka, 2020b).

Hughes and Marean met in 1876 during his visit to a New York Kindergarten, where she was teaching. She came to Toronto to work with Hughes on his Kindergarten project, initially opening a private model Kindergarten in Toronto in 1877 (Prochner, 2009, as cited in Wloka, 2020b). However, the program has been dogged by public debate about its purpose and the nature and role of play in learning. Program misinterpretation, class sizes, resources, along with demographic and social changes, have at different times all pulled Hughes's vision off course, until it arrived at its present form in 2016, *The Kindergarten Program*. This is much more than a curriculum; it sets out in detail that kindergarten should be taught jointly by an elementary teacher and a Registered Early Childhood Educator (Ontario Ministry of Education [OME], 2016). It is noticeably similar to the first Ontario Kindergartens.

The Ontario Kindergarten Model

The first Ontario Kindergarten model was based on creator Friedrich Froebel's early childhood pedagogy, curriculum, and approach for the youngest learners, from infants to school-aged children. The purpose of Kindergarten, a "child's garden to grow," was primarily to facilitate child development (e.g., character, curiosity, initiative, motivation, and problem solving) through play, rather than transmission of knowledge. Hughes was concerned that early academic instruction had a negative effect on children, so Kindergartens would not teach reading. For that reason, Hughes purposely avoided using the term "school" when referring to Kindergarten. The half-day program was designed for 12 to 24 children aged 3 to 7. The children would be taught by a specially trained "Kindergartner" (early childhood educator), one paid assistant, and unpaid students (Prochner, 2009, & Corbett, 1989, as cited in Wloka, 2020b). Hughes described Kindergarten as "the most stimulating educational process" in a young child's development, and insisted that all children were "entitled to its advantages" (Carter, 1966, p. 314, as cited in Wloka, 2020a; Hughes, 1897, p. x, as cited in Wloka, 2020a).

The goals of Ontario's earliest Kindergarten programs were remarkably similar to those of the current one. According to the ODE's 1908 program document, Kindergarten was expected to be a link between home and school, promote the development of identity, personal growth, and facilitate learning through play and action: "The kindergarten preserves the freedom and play spirit of early childhood and at the same time prepares the child to be an intelligent, orderly, and industrious pupil of the school" (ODE, 1908, as cited in Wloka, 2020a).

The Development of Froebel's Child Nurture and Activity Institute

German educator Friedrich Froebel opened his first school for young children in 1816 in Thuringia, Germany. He opened another school in Prussia in 1837 that he initially called the Child Nurture and Activity Institute. He later renamed it "the Kindergarten," German for "garden of children." Froebel developed his ideal form of early

childhood education from his observations of children and the ideas of Swiss educator Johann Heinrich Pestalozzi (Curtis, 2021). Froebel's ideas ran counter to the prevailing notion that early schooling was a form of babysitting, social philanthropy, or a preparation period for adulthood (Encyclopaedia Britannica Editors, 2016). He believed that play was central to learning and that children construct an understanding of the world through direct experience with it, foreshadowing the thinking of later educators such as John Dewey, Maria Montessori, and Jean Piaget (Wloka, 2020b).

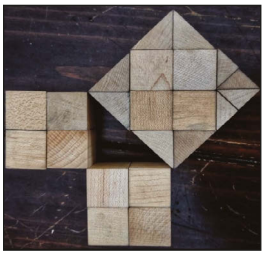


Figure 1: *Pythagorean theorem, using Froebel gifts* (Photograph by Suzanne Schroeter)



Figure 2: *Froebel gifts* (Photograph by Suzanne Schroeter)

His ideas about how learning happened were a radical departure from the commonly held beliefs of the time. Froebel believed that children learn by engaging in age-appropriate, developmental, self-directed, and structured play activities under the direction of a specially trained teacher. Too much free play, Froebel suggested, would leave child development too much to chance. Each child was to have their own small plot of land on which to plant seeds, tend plants, and observe them grow (British Association for Early Childhood Education, n.d.). Drawing on his mathematical and scientific knowledge, Froebel also designed and produced a set of open-ended teaching materials called "gifts" (e.g., wooden geometric blocks) and activities called "occupations" (e.g., sticks, clay, sand, slates, chalk, wax, shells, stones, scissors, and paper folding), with detailed instructions on how to use them to support children's self-initiated and guided play, help children understand certain concepts, and develop manual dexterity (Corbett, 1989, as cited in Wloka, 2020a). These early building toys and structured play with them supported early understanding of spatial visualization and orientation, rudimentary physics, engineering, geometry, attributes and properties, fractions, and whole–part relationships. The gifts (Figure 1) could be used to teach mathematical language and concepts like angle, triangle, diagonal, and rectangular prism (Froebel, 2021b). They could even be used to teach the Pythagorean theorem ($a^2 + b^2 = c^2$, Figure 2) to older children (Froebel, 2021a).

Early Implementation Challenges in Ontario

Implementing the Froebelian model in Ontario proved difficult. One obstacle was the high number of children in Kindergarten rooms, which limited the use of Froebel's principle that individual children need a great deal of freedom as well as individual attention from teachers. The Kindergarten classes were often composed of as many as 50 children at peak capacity. Kindergartens were usually open during the mornings only. Some cities with higher enrolment were able to afford opening afternoon classes to avoid overcrowding. This overcrowding was related to the passage of the *Ontario Truancy Act* of 1891. It made school attendance mandatory for a full school year from the age of 8 to 14 for the first time. With older siblings now unavailable to take care of their younger brothers and sisters while parents worked, Kindergartens and Grades 1 and 2 classrooms were suddenly packed to the rafters, as the saying goes (Prochner, 2009, as cited in Wloka, 2020b).

More Kindergarten Growing Pains

In 1913, only 30 years after its introduction, the leading advocate for Kindergarten in Ontario, James Hughes, declared that play, as a method of learning, "had met with defeat." Kindergarten inspections found that not all educators had the same understanding of Froebel's principles. Some taught directed lessons, contrary to Froebel's guided play and self-selected play approach that stipulated the teachers were to be a *guide on the side*. Some Kindergartens, led by educators who lacked specialized training, looked more like Primary classes, employing a familiar, teacher-directed model commonly in use at the time. Many teachers found it difficult to accept play as the first method of education during children's foundational years in the educational system. Many thought that the foundation should consist of work (Corbett, 1989, as cited in Wloka, 2020b). New teacher training for new combined Kindergarten–Primary classes was introduced in 1914, in the form of the Kindergarten–Primary certificate. The intent was to stop the dilution of the Kindergarten model and introduce the Froebelian Kindergarten philosophy and activities into Grade 1, as well as allow schools with low enrolment of young children to offer programming for them. However, the opposite occurred. Many Kindergarten teachers adopted directed group activities introduced in the Kindergarten–Primary program as a survival tactic for large class sizes. The provincial government allowed school boards to decide whether to offer Kindergarten–Primary classes or Kindergarten until the 1950s, and many chose to do so. Kindergarten in Ontario had veered from Froebel's structured math and science play trajectory (Corbett, 1989, as cited in Wloka, 2020b).

Academic Preparation Comes to Kindergarten

Conflicting ideas about the role of Kindergarten, and declining support for it, persisted from the early 1920's until the late 1940's. Over time, the Kindergarten–Primary certificate teacher training, introduced in 1914, steadily increased the orientation of Kindergarten classrooms toward subject instruction. In the 1920's, the Primary Teacher Association called for Kindergarten children to be tested for readiness before they entered Grade 1. The association also suggested putting more academic content into Kindergarten, replacing Kindergarten supervisors with Primary supervisors, and linking Kindergarten with the school instead of home. Initially, "the Kindergartners," Froebel's term for Kindergarten teachers, opposed these ideas. However, when Kindergarten began experiencing declining support and enrolment across Canada, some Kindergarten educators decided they should adopt the Primary school expectations to ensure Kindergarten had a permanent place in the school system. The evolution was accelerated further in 1939 by the introduction of the Primary (Kindergarten to Grade 2) specialist (Prochner & Howe, 2000). The declining enrolment in Kindergarten, and waning popularity, coincided with new theories in psychology and in education that criticized Froebelian methods of guided play. Open-ended and free play and new, larger toys such as dolls, trains, puzzles, and playhouses came into vogue, replacing Froebel's smaller toys and materials (Wollons, 2000, as cited in Wloka, 2020b). By the 1930's, many Kindergartens had become "reading classes" for children who were "not ready" to start Grade 1 (Corbett, 1989, as cited in Wloka, 2020a). Kindergarten experienced a further decline during the Second World War, when a growing number of women began working in wartime industries. They needed full-day child care, where Kindergarten was half days. The federal and provincial governments responded by opening wartime nurseries (Prochner & Howe, 2000).

Froebel's Program Reborn?

The ODE intervened on behalf of Kindergarten programs again in 1944. It tried to reshape the program closer to the original Froebelian vision and introduced Junior Kindergarten. The Department issued the *Program for Junior and Senior Kindergarten and Kindergarten–Primary Classes*, declaring that "the child had emerged as a control figure in the drama of education" following the work of "Rousseau, Pestalozzi, and Froebel" (ODE, 1944). The main goals of Junior and Senior Kindergarten were socialization and development of language. The half-day program would start with free play, followed by group games, singing or listening to stories, outdoor time, a served snack, and a rest time on pads placed on the floor.

The program in Junior Kindergarten was intended to provide the experience and preparation for future instruction, and insisted that specific subjects were integrated seamlessly into the daily routine, and not separated in practice as separate lessons. Missing from the 1944 Kindergarten program, or not explicitly stated, was Froebel's individualized guided math and science play (ODE, 1944, as cited in Wloka, 2020a). However, the ODE did end the practice of combined Kindergarten–Primary classes in the 1950's (Corbett, 1989, as cited in Wloka, 2020a).

Educational Reform in the 1960's: Living and Learning

In the late 1950's and 1960's, there was a renewed commitment to Froebel's Kindergarten, but the policy lacked any mechanisms to ensure its full implementation. During this period, there was a significant increase in the number of children attending Kindergarten and of schools offering the program as an increasing number of baby boomers entered school. Consolidation of tiny rural schools also allowed more schools to provide Kindergarten (Corbett, 1989, as cited in Wloka, 2020b; Prochner & Howe, 2000). The ODE revised the 1944 Kindergarten program in 1966 under the title *Kindergarten*. The 1966 revision was expanded to cover Kindergarten to Grade 6. The text and goals of the 1966 document aligned with John Hughes's original Froebelian vision for Kindergarten in Ontario in that it did not stipulate any planned or teacher-directed instruction in Kindergarten, except for speaking, auditory discrimination, and teacher read-alouds. The 1966 document included numerous citations from Froebel that emphasized that the individual needs of each child should be met by the program, and that the program should not be "highly formalized and devoted to 'reading readiness'" (ODE, 1966, as cited in Wloka, 2020b). Quoting Froebel, the document further stated that a considerable part of the Kindergarten day should be devoted to "activity time," which was defined as "a highly individualized experience which allows for much self-initiated, self-selected, self-directed and self-evaluated activity." It narrowed the role of the teacher to one of stimulating, guiding, observing, and encouraging the development of language and the whole child (ODE, 1966, as cited in Wloka, 2020b).

Living and Learning: The Report of the Provincial Committee on Aims and Objectives in the Schools of Ontario reaffirmed the Froebelian view that Kindergarten's fundamental role should be an informal introduction to learning, and that the education system should "resist

pressure to apply the rigors of schooling too early to young children" (OME, 1968). Still missing from Kindergarten policy during this period were explicit directions to implement Froebel's individualized guided play. The ODE outlined only broad goals for Kindergarten (e.g., socialization and the development of language), leaving responsibility for program development to local school boards (ODE, 1966, as cited in Wloka, 2020b). As a result, some Kindergartens had a clearly child-centred focus, while others were teacher-centred, with the goal "to get as many of the class through a Grade 1 readiness workbook before June and perhaps have them reading from a pre-primer as well." Some were a combination of both, and some were thought to be "a babysitting service" (Wahlstrom et al., 1980, as cited in Wloka, 2020).

Social Engineering in the 1970's

A growing interest in moving Kindergarten away from play-based learning, expanding "academic and physical educational opportunities for young children," and launching Full-Day Kindergarten (FDK) across Ontario emerged during the 1970's. It was a period of declining Kindergarten enrolment that coincided with the end of the post-war "baby boom" (Biemiller, 1978, as cited in Wloka, 2020a). At the same time, the number of working and single mothers continued to increase along with their childcare needs. This prompted some elements of society to propose that the academic content of Kindergarten should be increased to compensate for "the deficiencies of many home environments (e.g., apartments) for stimulating physical, social, and in some cases, intellectual growth" (Biemiller, 1978, as cited in Wloka, 2020a). Since Kindergarten programming was still a matter of local jurisdiction, some large school boards had already implemented FDK to provide more academic time for reading, mathematics, writing, and/or bilingual education (Biemiller, 1978, as cited in Wloka, 2020a). The OME financed a study in 1978 to see whether FDK, combined with more academic activities, produced improved language and academic skills. The evidence was inconclusive, but the report indicated that children in FDK seemed to be more tired and stressed at the end of the school day than their half-day peers. The report recommended further research "before implementing FDK programs for academic reasons on a large scale" (Biemiller, 1978, as cited in Wloka, 2020a).

Kindergarten Integrated into the Primary Division

In the mid-1980's, the province reaffirmed its commitment to Froebelian philosophy when it released its 1985 *Report of the Early Primary Education Project*. The OME document recommended that the Kindergarten curriculum provide opportunities for exploration and growth, value the role of play in a child's learning, and maintain continuity between home and school. It also recommended that all school boards in Ontario provide half-day Junior Kindergarten, and that Junior Kindergarten to Grade 3 be organized into a common division, the purpose of which was to provide continuity in programming and closer links with families and the community. The report was in response to increasing numbers of single parents and parents' growing isolation from traditional support systems. It urged the study of expanding Kindergarten to a full-day program (FDK) because it could help children who lacked "enriched experiences" at home (OME, 1985). It justified the expansion with educational research and economic rationalism. The report cited evidence from the Michigan HighScope Educational Research Foundation and the Institute for Developmental Studies at New York University that suggested "carefully designed and administered cognitive stimulation early in life can make substantial differences not only to children's intelligence, but also to the strengthening of their self-confidence and social competence" (OME, 1985). The report quoted research that showed that good-quality early childhood education leads to lower delinquency rates, much higher productivity, self-sufficiency, employability, and positive participation in economic life. Researchers calculated that for every $1000 society invested in high-quality early Primary programs, the return to society would be $7000 in economic benefit for the community (OME, 1985).

Preparing Young Children for the Global Workforce

The 1990's were a turbulent time for Kindergarten. Froebel's developmentally oriented program evolved into to a decidedly more academic one. The 1994 Ontario Royal Commission report, *For the Love of Learning*, set the stage for a view of education driven by accountability and evaluation (Bruno-Jofré & Hills, 2011). The government of the day reduced grants for Junior Kindergarten by 50 percent and enabled school boards to cancel Junior Kindergarten programs (Karia, 2014). In 1998, it introduced a new Kindergarten curriculum. It was marked by standardization, the importance of preparing children for Grade 1, future employment, and economic competitiveness. *The Kindergarten Program* (1998) contained nine pages of specific learning outcomes in language, mathematics, science and technology, personal and social development, and arts, that children were to

achieve before they began Grade 1 (OME, 1998). The revised 2006 program took this even further, expanding the learning expectations to 30 pages (OME, 2006). Although both the 1998 and 2006 programs acknowledged that "children develop at different rates and in different ways," for the first time in the history of Ontario Kindergarten, all the learning expectations were prefaced with the phrase, "By the end of Kindergarten, children will: …" (OME, 1998; OME, 2006). This was a clear departure from Froebel's child-centred, developmental approach.

Renewed Focus on Mathematics Returns to Kindergarten

The publication of *The Kindergarten Program* in 1998, *The Early Years Study* in 1999 by the Hon. Margaret McCain and Dr. Fraser Mustard, the *Early Math Strategy: The Report of the Expert Panel on Early Math in Ontario* in 2003, and the revised *Kindergarten Program* in 2006, set the stage for further changes to the Kindergarten program. It shone a spotlight on the importance of providing three-, four-, and five-year-old children with a strong foundation in mathematics, but doing so using a developmentally appropriate program. Although not specifically referring to Kindergarten, McCain and Mustard wrote that "we now know that a substantial base of mathematical understanding is set in the first few years" (McCain & Mustard, 1999, p. 9). The report stated that a positive attitude toward mathematics, an understanding of key concepts, and mathematical skills must be developed in the early grades. It identified the "extremely influential and important role" of Primary educators (McCain & Mustard, 1999).

The Resurgence of Froebelian Philosophy

The development of proposals to replace the half-day Kindergarten with the full-day program was driven by evidence of the importance of early childhood education. For example, studies indicated that 27 percent of Ontario children were significantly behind their peers when they started Grade 1. UNICEF data on Early Learning and Care benchmarks listed Canada at the bottom of country rankings due to the lack of universal child care and a national early education program (Pascal, 2009). A form of Froebel's child-centred Kindergarten pedagogy returned to Ontario in 2010, when the province began implementing a full-day, two-year Kindergarten for four- and five-year-old children. Like Froebel's Kindergarten, the 2010 and 2016 programs were to be taught by a team of two educators: a teacher licensed by the Ontario College of Teachers and an Early Childhood Educator registered with the College of Early Childhood Educators.

At the heart of both *The Full-Day Early Learning Kindergarten Program* (Draft 2010–11) and the revised version, *The Kindergarten Program* (2016) are Froebel's insights on child-initiated activity and adult guidance. Both programs set out goals for what four- and five-year-old students across the province should typically learn during the two-year Kindergarten program, but allows for considerable variance. It outlines a program remarkably like Froebel's original design (OME, 2010–11, 2016). The main difference between the Ontario program and Froebel's is class size. Since 2017, Ontario Kindergarten classes have a hard cap of 29, but in each school year, 10 percent or less of the Junior Kindergarten and Kindergarten classes in a school board may have a class size that exceeds the provincial class size limit, as long as it does not exceed 32, in a few specified circumstances (*Education Act*, 1990). The Social Program Evaluation Group (SPEG) at Queen's University criticized the student–teacher ratio in Kindergarten, suggesting the lower ratios of 8:1 or 13:1 and maximum group sizes of 24 or 26 in Ontario's *Day Nurseries Act* be used (Vanderlee et al., 2012).

Despite the implementation of a near Froebelian, full-day Kindergarten in Ontario in 2010, the debate about the purpose, best model, effectiveness, and role of Kindergarten, and its role in child development and early learning, is not over. In the last decade, SPEG at Queen's University, mentioned in the preceding paragraph (2012), the OME (2013), the Elementary Teachers' Federation of Ontario (2011), and researchers at Queen's University (2019) and the Ontario Institute for Studies in Education at the University of Toronto (2019), to name a few, have published reports on the topic. It will be interesting to see how Kindergarten evolves during the rest of the twenty-first century, what pressures come to bear on it, and whether Ontario will ever bring Froebel's vision to complete and lasting fruition.

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Mathematics Association for Cottage Country

MAC^2 https://mac2.oame.on.ca/ Est. 1995

Innovations

- We did online chapter meetings before it was cool (pioneered two-location monthly meetings from Bracebridge and Barrie, using Google Hangouts, starting in 2018).
- We organized the FIRST remote workshop at an OAME Annual Conference (workshop delivered in Barrie at OAME 2016 remotely from Ignace by Allan Richards).

OAME Life Membership Award (2016)
Lyn Vause, MAC^2 Pioneer, Past President, Conference Chair

MAC^2 Lifetime Achievement Award (2018)
Jack LeSage, MAC^2 Founder, Executive member, Secretary, OMO Chair, *Gazette* Editor, Conference Planner and Speaker

The Jack LeSage/MAC^2 Teacher Award
This award will be presented annually to a classroom teacher, who is a member of MAC^2, for contributions to mathematics education in their school and/or family of schools. The award will include a certificate and will cover the registration cost for a subsequent annual conference of OAME/AOEM.
Winners to date: Jeff Irwin, Ursula Irwin, Tracy Markman

OMO 2014 THE NUMBER GAMES

Hosted at Lakehead University
Co-chairs: Danielle Blair, Greg Clarke, Bill Morrison

LEAP INTO MATH OAME Annual Conference MAY 5-7, 2016

Hosted at Georgian College
Co-chairs: Bruce McKay, Greg Clarke

MAC^2 recognizes and appreciates the many contributions of Greg Clarke.



- Webmaster for MAC^2, OAME/AOEM, MCIS, and Ontario Math Support
- Council and Executive Member for over 20 years
- Developer of the MCIS (Mathematics Conference Information System), which has been and continues to be the gold standard for conference registrations
- OAME/AOEM annual conference co-chair 2016
- Huge supporter of everything MAC^2 and the people involved

List of Speakers from Mini-Conferences (past ten years)

Ruth Beatty • Lisa Beneteau • Danielle Blair • Lori Carlson • Jodi Caverzan Wells • Mark Chubb • Greg Clarke • Damian Cooper • Kathleen Corrigan • David Costello • Christopher Danielson • Sonia Ellison • Don Fraser • Richard Gallant • Gianna Helling • Kyla Kadlec • Monique Kadlec • Marie Keegan • Peter Liljedahl • Kit Luce • Kevin MacKay • Cathy Marks Krpan • Stephanie McEachern • Cheryl McGinnis • Cassandra Medve-Racine • Gina Micomonaco • Alanna Milligan • Jonathan Rajalingam • Diana Santos • Rebecca Shea • Jane Silva • Trish Steele • Heather Theijsmeijer • Diane Vetter • Ann Marie Weidl • Shelley Yearley

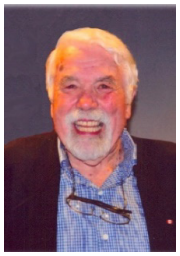
Passing of MAC^2 Notables



Dave Davidson – January 2016
MAC^2 Founder, OAME Past President



Brad Hilliard – January 2018
MAC^2 Founder, Treasurer



Jack Lesage – January 2019
MAC^2 Founder, OMO Chair, *Gazette* Editor

From *Gazette* 22(1), 3.



PRESIDENT'S MESSAGE

by

Dave Davidson

It was 1973 - Saturday, May 12, 9:30 a.m. "A Time for Decision" - the decision was made and O.A.M.E. was born in North Bay on that famous weekend with Dr. David Alexander serving as our first president in the 1973-74 year. Ten years have passed, many changes have taken place and we have seen much growth in our organization. I would like to take this opportunity to say thank you to the members of our association for allowing me to serve as your eleventh president. I shall do my best to live up to the trust you have placed in me.

Past, Present & Future Presidents



J. Egsgard, T. Griffiths, N. Williamson, A. Norrie
D. Alexander, J. Routledge, D. McPhail, L. Morrow, G. Knill

From September 1980. (*Ontario Mathematics Gazette,* 19(1), p. 72)



Future President?
Congratulations to Jill Lazarus!
(Photo courtesy of Jill Lazarus)





Past-President Event, April 2021:

Peter Saarimaki, Tim Sibbald, Shirley Dalrymple, Mickey Sandblom, Jeri Lunney, Paul Lessard, Ann Jones, MaryLou Kestell, Barry Onslow, Todd Romiens, Mary Howe, David Zimmer, Dino Dottori, Tom Griffiths, Anna Jupp, Ralph Connelly, Sonia Ellison, Jacqueline Hill, Paul Alves, Ron Lancaster, Dan Charboneau, Haris Raheel (KnowledgeHook), Sharon McPhail, Travis Ratnam (KnowledgeHook)

▲ The Evolution of the OAME/AOEM Website

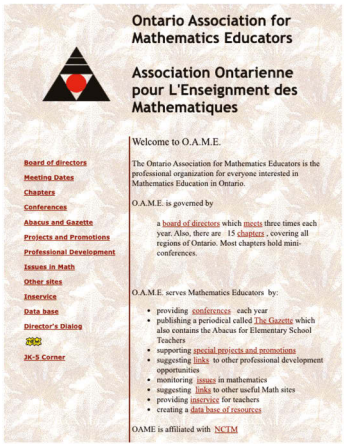


GREG CLARKE
OAME WEBSITE COORDINATOR
web@oame.on.ca

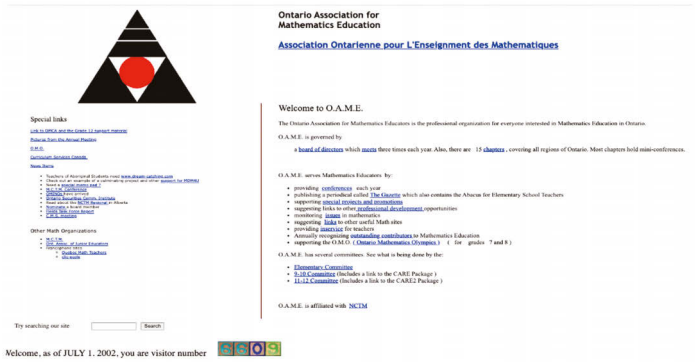
Greg Clarke has been the webmaster for OAME since 2004. He designed and implemented the MCIS Conference Registration system, which has been keeping track of the spaces available in OAME conferences since 2005. He was the co-chair of the OAME Annual Conference in 2016 and has been at the helm of the conference registration problems desk for two decades. He has been instrumental in several Ontario Mathematics Olympiads. He has been awarded a lifetime membership in both the OAME and the Ontario Mathematics Coordinators Association (OMCA). He retired from the Simcoe-Muskoka Catholic District Board in 2018 after working as a secondary teacher, department head, computer consultant, Curriculum Coordinator, eWorkshop developer, Provincial Mathematics Lead, and mathies software developer. Retirement has allowed him to take afternoon naps and expand his involvement with OAME projects, the music ministry at his church, and his genealogy interests. (Biography thanks to Ross Isenegger and Agnes Grafton.)

The initial OAME/AOEM website was created by QSLMA (Quinte St. Lawrence Mathematics Association) member, Doug Evans, in 1998.

Here is a snapshot of the home page from 1999: (thanks to the Wayback Machine, web.archive.org)



In 2002, we had 6609 visitors, and the site had a bit of a visual revamp:



In 2004, Doug passed the torch to Greg Clarke. Around this time, the new version of the home page, after a site redesign, was developed with the assistance of University of Toronto graduate student, Tasso Kastolas.



The 2004 design has been updated and tweaked since, with extra functionality added. The current home page that readers are familiar with is:



Some features have been added over the years to give extra functionality to the OAME/AOEM website:

- Complete *Gazette* and *Abacus* archive are available online.
- Digital history of OAME/AOEM is available in *Ye Olde Archives*.
- *OAME Members Only* now houses workshops, handouts, and videos. The latter allows streaming of selected conferences presentations and workshops.
- OAME/AOEM has a Twitter feed (@OAMEcounts).
- Scrolling news updates are provided.

BUT WAIT… there's more!

MCIS, the Math Conference Information System, has become the go-to place for all conferences and mini-conferences, webinars, for online registration for math events in Ontario.

It recently became the launchpad for the virtual OAME/AOEM Annual Conferences in 2020 and again in 2021, and most recently, the TEAMS Speaker Series.

The OAME/AOEM Annual Conference is one of the few subject conferences that allows attendees to pre-select their workshops—thus guaranteeing them a spot in the sessions they prefer and also allowing presenters to prepare properly for the number and level of participants. OAME/AOEM was also in the forefront of using iPads as integral tools in the registration area and hospitality booths at annual conferences.

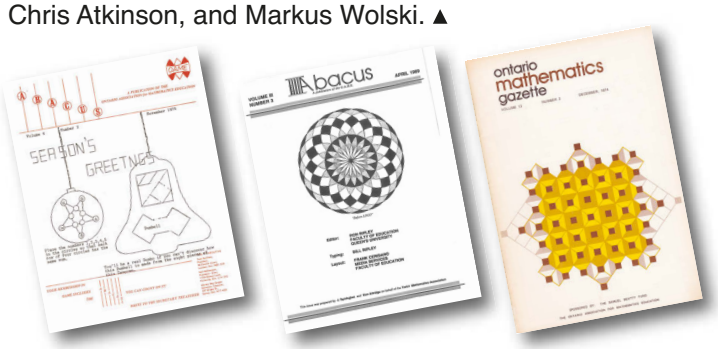
AND…

The OAME podcast, hosted by Past President David Petro, is now running into its fourth season! New for this season is a podcast episode every quarter as a companion to a new *Gazette* column on coding, hosted by Iain Brodie and Beyza Sezer.

Chapter websites and conference websites have shifted over time from static HTML pages, to WordPress, and most recently to Google Sites.

To view this list of achievements, as well as many others in OAME/AOEM history, see the timeline reproduced on the inside front and back covers. Alternatively, check out *Ye Olde Archives* on the OAME/AOEM website, and specifically, the Timeline of OAME/AOEM History: www.oame.on.ca/main/index.php? lang=en&code=archives&type=17

Thanks to Doug Evans, who started us off on this journey, and for those who have continued to support the webmaster in keeping up the websites—Claudio Attanasio, Kathy Pilon, Chris Atkinson, and Markus Wolski. ▲



▲ Six Ontario Government Pronouncements about Kindergarten from 1890 to 2016

EDWARD SCHROETER
edschroeter@outlook.com

"The kindergarten preserves the freedom and play spirit of early childhood and at the same time prepares the child to be an orderly, intelligent, and industrious pupil of the school" (Ontario Department of Education, 1908).

"Children of elementary school age are active and inquisitive, delighting in movement, in small tasks which they can perform with deftness and skill, and in the sense of visible and tangible accomplishment which such tasks offer. They are intensely interested in the character and purpose of the material objects around them. They are at once absorbed in creating their own miniature world of imagination and emotion, and keen observers who take pleasure in reproducing their observations by speech and dramatic action; and still engaged in mastering a difficult and unfamiliar language, without knowing they are doing so, because it is a means of communicating with others. Their activities are not aimless, but constitute the process by which children grow. They are in a very real sense their education; upon them the school must build its programme, offering the children fuller and more varied but more orderly opportunities for activity than they have hitherto enjoyed" (Ontario Department of Education, 1939; 1955, pp. 5–6).

A considerable part of a Kindergarten day should be devoted to "activity time" which is defined as "a highly individualized experience which allows for much self-initiated, self-selected, self-directed and self-evaluated activity" (Ontario Department of Education, 1966, p. 17).

"An equally important purpose of the project is to reaffirm the philosophy that formed the basis of the Ministry of Education curriculum documents issued in 1975, *The Formative Years and Education in the Primary and Junior Divisions*. Briefly stated, that philosophy emphasized the need to adapt programs to the abilities and talents of individual children, and underlined the importance of recognizing individuality in learning styles, of ensuring that each child develop self-confidence through the experience of success, and of promoting natural ways of learning — through play, for instance (Ontario Ministry of Education, 1985, p 8.).

"Without teaching to the lowest common denominator, the teacher must narrow the gap between the neediest children and those who have social, emotional, or intellectual advantages (Ontario Ministry of Education, 1995).

"The purpose of the [kindergarten] program is to establish a strong foundation for learning in the early years, and to do so in a safe and caring, play-based environment that promotes the physical, social, emotional, and cognitive development of all children" (Ontario Ministry of Education, 2016, p.8).

References: Please refer to Edward Schroeter's Kindergarten article in this issue. ▲

The official termination of the operations of the Ontario Mathematics Commission, which follows the completion of a joint project with the Ontario Association of Teachers of Mathematics; the establishment of the Ontario Association for Mathematics Education, cannot be allowed to pass into history without a sincere and well-deserved tribute to the Ontario Teachers' Federation.

The impetus and initial encouragement of a thorough going review of the provincial curriculum in elementary and secondary school mathematics came from the Mathematics Committee of O. T. F. under chairman Howard Mulligan, which developed, naturally in 1959 into an enlarged Mathematics Commission of O. T. F. with representatives from university, secondary school and elementary school bodies, and a year later into the Ontario Mathematics Commission as a fully representative independent body, supported jointly by the Ontario Teachers' Federation, the Ontario Department of Education, the Universities, and later, also by the Ontario Colleges of Applied Arts and Technology.

Prof. D. Alexander
Mr. G. R. Allan
Prof. H. A. J. Allen
Mr. F. C. Asbury
Dr. H. R. Atkinson
Mr. D. C. Attridge
Mr. L. Augustus
Miss A. Baird
Mrs. I. Bartels
Mr. D. B. Bastedo
Mr. R. W. Bass
Mr. W. Baxter
Dr. P. R. Beesack
Dr. B. Bernholtz
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September 29, 1973.

Throughout the life of the Commission, the constant encouragement of O. T. F. through its Board of Governors, the able professional contributions of O. T. F. 's appointees, the generous and consistent financial support of the Commission by O. T. F. and the provision of office accommodations were of vital importance to the effective functioning of the Commission. These contributions were complemented in no small measure by the invaluable personal support and guidance of Dr. Nora Hodgins, Secretary-Treasurer of O. T. F.

A sincere thank you ONTARIO TEACHERS' FEDERATION from those of us who had the privilege as members of the Ontario Mathematics Commission to improve ourselves through service to others in the field of mathematics education in Ontario.

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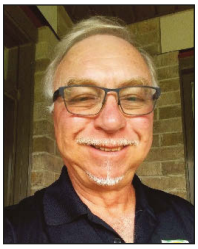
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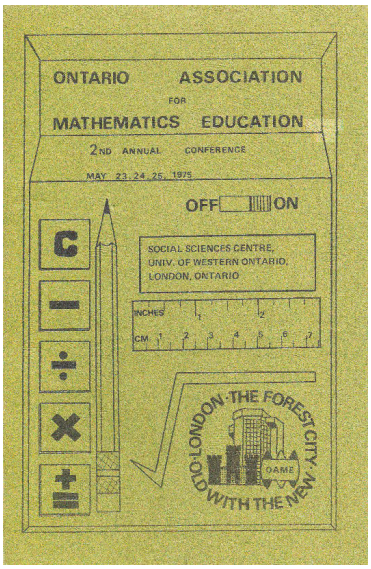
Ontario Mathematics Commission.

A History of the OAME/AOEM Annual Conference



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Beginning in 1974, the OAME/AOEM Annual Conference has been an important gathering of mathematics teachers and leaders from across Ontario, and has also welcomed delegates and presenters from other parts of Canada and around the world. The goals of the annual conference include sharing best practices, presenting research, exploring resources, and encouraging networking among the delegates, presenters, and exhibitors.

The conference is a major event of the school year, and has grown from 400 or 500 participants to over 1500 in recent years. It is clearly an important event to place on educators' calendars each year.

In 1972, NCTM held a regional conference in Toronto. The following year, an organizational meeting was held in North Bay, with the purpose of organizing the Ontario Association for Mathematics Education (OAME). Out of that meeting, an annual conference was proposed, and the first OAME Annual Conference was planned for Kingston the following year. And the rest is history.

In an effort to spread the accessibility of the conference, it is typically held in a different region of the province each year, and is organized by a local chapter of OAME/AOEM.

The COVID-19 pandemic led to exceptions with the conference being fully virtual in 2020, 2021, and 2022. Plans are to return to a full in-person conference in 2023. The conferences are organized by a team of volunteers from local OAME/AOEM chapters. It takes about two years to plan and organize a conference, and the hosting city is justly rewarded with a world-class conference at its doorstep.

The annual conference has been held at the locations listed below. Which ones have you attended?

YEAR	LOCATION	HOST CHAPTER
1974	Kingston	OAME
1975	London	OAME
1976	St. Catharines	OAME
1977	Ottawa	OAME
1978	Hamilton	OAME
1979	Peterborough	PRMA
1980	Toronto	SEYMA
1981	Sarnia	OAME
1982	Toronto	OAME
1983	Waterloo	GVMA
1984	Kingston	QSLMA
1985	Sudbury	NOMA
1986	London	OAME
1987	Scarborough	SAME
1988	Niagara Falls	GOLDEN
1989	Ottawa	COMA
1990	Hamilton	OAME
1991	Etobicoke	CHAMP
1992	Richmond Hill	Y^4MA
1993	Windsor	SWOAME
1994	Kingston	QSLMA
1995	Guelph	GVMA
1996	London	WOMA
1997	Toronto	TEY^2MS
1998	North Bay	NOMA
1999	Richmond Hill	Y^4MA
2000	Ottawa	COMA
2001	Scarborough	SAME
2002	Barrie	MAC^2
2003	Oshawa	PRMA
2004	Waterloo	GVMA
2005	Toronto	TEAMS
2006	London	WOMA
2007	Barrie	MAC^2
2008	Richmond Hill	Y^4MA
2009	Ottawa	COMA
2010	St. Catharines	GOLDEN
2011	Windsor	SWOAME
2012	Kingston	QSLMA
2013	Toronto	TEAMS
2014	Toronto	CHAMP
2015	Toronto	OAME
2016	Barrie	MAC^2
2017	Kingston	QSLMA
2018	Toronto	OAME
2019	Ottawa	COMA
2020	Oshawa (virtual)	PRMA & SAME
2021	Toronto (virtual)	TEAMS
2022	Windsor SWOAME (virtual)	
2023	Toronto (planned)	NOMA & TEAMS
2024	Kingston (planned)	O34MA & QSLMA

Keynote speakers have included highly respected academics and well-known and influential personalities. Long-time member, MaryLou Kestell, writes that she was transformed by Bill Higginson's talk at the 1974 conference, called "Mathematics—A Human Endeavour." Fred Ferneyhough remembers keynote addresses by such well-known personalities as David Suzuki, who spoke in London

about the need to present mathematics as a necessary study for all students, and Stephen Lewis, speaking in Ottawa about the need to make math more accessible to more students. Personally, I remember when Canadian astronaut, Bjarni Tryggvason, flew into Scarborough from the Space Shuttle, as well as controversial remarks in Toronto by Annie Kidder, of People for Education, which generated some significant debate on social media. Readers may recall when TV host and science writer, Bob McDonald, made a few appearances, and TV journalist turned Lieutenant Governor, David Onley, joined us in Toronto.

Many long-time delegates will recall pun-filled sessions by Don Fraser and Ron Lancaster's Math Trails. Don and Ron have presented at the annual conference going back to the 1970's. In the 80's and 90's, Edward Barbeau, George Knill, and MaryLou Kestell spoke at many conferences. Into the new millennium, Marian Small and Dan Meyer have made numerous appearances and continue to draw large crowds. More recent favourites have included Jo Boaler, Robert Q. Berry, Amy Lin, and Peter Liljedahl.

A highlight of the conference is when OAME/AOEM honours its annual award winners. These recognize people who demonstrate an outstanding contribution to mathematics education in Ontario. The awards recognize excellence in teaching, leadership, and significant contributions to OAME. In many years, the awards have been presented at a keynote address, but have also been an integral part of the conference banquet. The presentations are a meaningful way of involving conference goers in showing appreciation for the recipients' positive contributions.

Each conference plans a number of social activities for the delegates. For many years, we saw the Women and Mathematics Breakfast (which transitioned to the Equity Breakfast), university alumni events, and a conference banquet. A Past Presidents' Social has also been held in association with the conference for many years. Trips to local attractions, such as the National Gallery in Ottawa, rock climbing in Barrie, or a Toronto Blue Jays game, are always popular among delegates. Peter Saarimaki fondly remembers much of the social atmosphere, including the wine-and-cheese parties held in local pubs, and more recently within the Exhibitors' Hall. Most people look back warmly on the time spent networking with like-minded people from across the province, or meeting up with people they see annually at the OAME conference.

Over the many years of the annual conference, the exhibitors and sponsors have supported the OAME/AOEM conference in a multitude of ways. The exhibitors have gone from being primarily publishers to a wide array of companies involved in the education market. We now also see educational supply retailers showing their manipulatives and other learning materials, developers of educational software and online learning tools, and digital-equipment manufacturers and suppliers. In addition to their booths in the Exhibitors' Hall, they have sponsored keynote speakers, events such as receptions, luncheons, and wine-and-cheese parties, as well as provided souvenirs, school supplies, lanyards, and conference bags. As such, the exhibitors have always been a major component of the conference and contributed to delegates in a variety of ways.

One significant advance has been the impact of technology. Until 2004, registration was handled by mail, and delegates were required to submit their first and second choices for workshops in each timeslot. This was a very labour-intensive and time-consuming process. Then, 2005 ushered in the digital era, where the MCIS system (the brainchild of Greg Clarke) introduced online registration and personalization of delegates' daily schedules. OAME/AOEM remains one of the very few educational conferences, where delegates are able to select their sessions in advance. The digital age has transitioned sessions from being presented on chalkboard, whiteboard, or chart paper, to the use of computer-presentation technology. Many presenters still haul boxes of manipulatives into their breakout rooms, but stacks of













photocopied handouts are now a thing of the past. From 2014 to 2018, the keynote speakers and some featured sessions were live-streamed, which helped reach educators who could not make it to the conference site. Digital meeting technology emerged with the e-conference (and Rod Yeager's insights) that allowed the conference to be fully virtual in recent years.

So, why a mathematics education conference? From its inception, the OAME/AOEM conference has attracted educators from all grade levels. In the early years, more than half the sessions were intended for secondary school teachers, and many teachers in the Primary and Junior Divisions thought of the conference as being for "mathies." That slowly progressed, with more effort promoting the conference as a place for all educators to grow as mathematics teachers. The past 20 years have developed a much more equitable balance among the divisions.

Looking to the future, many people are drawn to the idea that teachers talk about their methods of teaching, and are happy to share their ideas with others. Others attend with the expectation of bringing back ideas and materials that they can use in the classroom the following day. Keynote and featured speakers are always a draw, as they provide bigger-picture insight into not only current trends and research in mathematics, but also to identify what is not working and how we might fix it. The history of the steady growth of the OAME/AOEM conference, in both numbers and enlightenment, demonstrates that it fulfills the role of an event dedicated to providing professional development in mathematics education for all who wish to attend. ▲



▲ What's the Problem? Problems from the Past



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Shawn is a former mathematics teacher, department head, and consultant. He strongly believes in the central role of problem solving in the mathematics classroom. He continues to be involved in mathematical activities: presenting workshops, writing articles, working on local projects, and helping create mathematics contests.

Welcome back, problem solvers. We're doing something a little different for this anniversary edition of the *Gazette*. In keeping with the flavour of this column, I will be looking at problems and problem solving in the *Gazette* over its history. We will return to the regular format next issue.

To help with this task, I decided to scan through every issue of the *Gazette* available in the archives on the OAME/AOEM website. At first, I spent a lot of time reading articles from the earlier issues. It was fascinating, seeing how different the curriculum and issues of the time were from those during my career. It was even more interesting to discover so many common threads that run through the years. I was surprised to see things like spiralling, manipulatives, and computers being discussed long before I thought they were being considered for classroom use. I strongly suggest you browse the archives from time to time, pick a year, and dive in. I am sure you will find something of interest!

The first issue of the *Gazette* appeared in February 1962. The focus in those first few years seemed to be more on senior high school and was more curriculum centred, as seen, for example, in an article about surds (Auckland, 1962). In the 1960's, the mathematics community was dealing with the "new math," and departmental exams (province-wide Grade 13 exams) were still given. The central role of problem solving in the mathematics classroom was evident from the beginning. Well-known problem-solving expert, George Pólya, when talking about the preparation of high school mathematics teachers, said that teacher candidates should have "some practice in solving problems… how should the teacher recognize or direct the creativity of his students if he himself had never an opportunity to do something approaching creative work?" (Pólya, 1962, p. 26)

For a large part of its history, the *Gazette* had a problems

section. In the 1960's, these problems were directed at teachers who sent in solutions. There were also solutions to problems from the departmental exams discussed from time to time. A couple of examples are as follows:

> Five men check their hats at a restaurant. While returning the hats after the meal, the check girl becomes confused and hands them out at random. What is the probability that no man receives his own hat? (submitted problem #4, *Ontario Mathematics Gazette* (*OMG*), 5(1), p. 33).

> The bisector of an angle of a scalene triangle meets the right bisector of the opposite side at point *P*. Show that *P* lies outside the triangle (problem 2 from the 1965 departmental exam, *OMG,* 4(2), p. 39).

The 1970's saw their own rounds of curriculum revisions, as well as the introduction of the metric system. Talking about curriculum reform, W.W. Sawyer made a couple of points that are still relevant today. Discussing ideas from the "old" curriculum that he agreed with, number one on the list was "that mathematics should be taught through understanding and not purely by rote. This is not new; it has been the practice of all good teachers and goes back at least to Socrates around B.C. 400" (Sawyer, 1974, p. 105). A view that he opposed "everything done before the 'New Math' was obsolete and valueless" (Sawyer, 1974, p. 105) was an opposition I agree with when applied to both curriculum and, more importantly, pedagogy.

The 1970's decade also saw the formation of the OAME from the existing Ontario Association of Teachers of Mathematics (OATM) and the Ontario Mathematics Commission (OMC). The problems section was alive and well in the 1970's. The section shifted its focus toward students, with problems given in two categories: up to Grade 9 and up to Grade 13. A couple of examples follow:

> The sum of two numbers is 8, and the product of these two numbers is 10. Find the sum of the squares of these numbers (problem 18.2.2, up to Grade 9, *OMG,* 18(2), p. 62).

> What is the value of
>
> $$\sqrt{6+\sqrt{6+\sqrt{6+\ldots}}}?$$
>
> (problem 14-3-2a, up to Grade 13, *OMG,* 14(3), p. 44).

Articles about problem solving in the classroom were also seen through the decade. Ouellette (1977) talked about the importance of giving students problems that require some creativity and ingenuity to solve. The article provided many sample problems, including:

> Find an easy method for computing the product (444 444 444 444 444) x (999 999 999 999 999) (Ouellette, 1977, p. 39, problem 8).

We should keep in mind that teachers, as well as students, should be practising their problem-solving skills. "Keeping fit means doing exercises, whether physical, spiritual, musical, in language, or in mathematics. This article suggested that keeping exercised in mathematics means attempting to solve problems…" (Maskell, 1979, p. 67). The large number of problems presented in these volumes of the *Gazette* gave teachers ample material to "keep fit."

The 1980's—a new decade, bigger hairstyles, and new issues. More curriculum changes occurred as Ontario saw Grade 13 disappear and the OAC courses introduced. Problem solving remained an important topic in the *Gazette*. The March 1980 issue (i.e., 18(3)) was dedicated to problem solving. So popular was the topic that the Editor noted, "No one doubts the key position of Problem Solving in the school curriculum. Your response has required that I set the March 1981 issue aside for Problem Solving II" (Smith, 1980). Numerous articles on problem solving also appeared outside these two special issues. The decade saw the formation of the OAME Problem-Solving Committee. As with the other decades, some of the issues of the day seemed contemporary, as illustrated by the statement, "Remember that pupils today don't have much patience—they seem to demand instant gratification—hence the popularity of video games" (Lucas, 1983).

The problems section continued to provide challenges for students and their teachers during the 1980's, as illustrated by the following two problems:

> Calculate the unknown without the aid of a calculator or computer: (*OMG*, 19(1), p. 37)
>
> $$\frac{1234567890}{1234567891^2-(1234567890 \times 1234567892)}$$
>
> *A*, *B*, *C*, and *D* are four different weights. When they are placed on a scale:
>
> - *A* and *B* balances *C* and *D*
> - *A* and *C* outweighs *B* and *D*
> - *C* is lighter than *D*
>
> Arrange the weights from heaviest to lightest (*OMG,* 24(3), p. 36).

The 1990's had their fair share of big moments: destreaming Mark I, tensions between the Ontario government and teachers, major changes to the curriculum at the end of the decade, and this author entered the profession (at St. Joseph-Scollard Hall Catholic Secondary School in September 1991). Within the OAME, the "new" (and current) logo was introduced on the cover of the April 1993 issue (i.e., 31(3)). Articles about problem solving

continued to be popular, with discussion of issues surrounding problem solving and pedagogy. Many articles included problems for the readers to try and to use within their classrooms. One such article shared several open problems that allowed for students' creativity and that did not have a single "right" answer. Two such examples (Svochik, 1992, p. 25, activities 2 and 3) are as follows:

> How many ways can you express 100, using the fundamental operations and the number 4?
>
> How many uses for the numeral 2715 can you find?

The decade also saw long-time problems column Editor (1986–1992), Ron Lancaster, a familiar name to Ontario math teachers (and beyond!), change the focus of the column a couple of times. Early in the 1990's, the problems section was replaced by the column "Mathematics & the World Around Us," where mathematics was brought out of items from the media, as seen in the example below (Lancaster, 1992, p. 35).

> Artist's concept is given for a 220-storey skyscraper in a proposed urban development plan by the Mitsui Construction Company in Tokyo. The 1321-metre-high building is designed to house one million people (from "Where the Sky Is the Limit" from *The Toronto Star*, Monday, July 20, 1992).
>
> This was followed by the following questions:
>
> a) How many people will live on each floor?
>
> b) How high is each floor?
>
> c) How do your answers for parts a) and b) compare with apartment buildings in your area?
>
> d) Will this building be taller than the CN Tower in Toronto?
>
> e) Do you think that most tenants will own a car? If so, do you think that enough underground parking spaces could be provided?
>
> This feature lasted until the June 1994 issue.

In the 1990's, the column "About Problem Solving," by John Grant McLoughlin, appeared in the *Gazette*. The column ran for several years and focused on problems and their use in the classroom, for example:

> A staircase has ten steps. You can take one or two steps at a time: you can take them in any order. In how many different ways can you go up the staircase? (McLoughlin, 1994)

I always enjoyed John's column and was fortunate enough to meet and work with him on many occasions throughout the years. I hope that the spirit of his column lives on in my own column.

As we moved into a new millennium, Ontario teachers were dealing with more curriculum changes from the late 1990's, as well as the loss of the OACs, as high school moved from five to four years. Mathematics teachers were also dealing with the implementation of new tools in their classrooms. Manipulatives and technology were becoming more prevalent in mathematics classrooms. As well, teachers were dealing with new methods of presenting mathematics to their students, and novel ways of assessing them.

These changes were reflected in the pages of the *Gazette*. Numerous regular features appeared to help teachers cope, and there were also articles addressing the issues. Therefore, although problem solving was woven into many of these features and columns, the number of items dedicated to problem solving was much smaller in this era. As a result, when the author of this column got his first article published in the *Gazette* (Godin, 2006), I was asked by the Editor, Marilyn Hurrell, whether I was interested in doing a regular feature on problem solving. I answered "yes," and "What's the Problem?" has since been a regular feature. Here is a sample problem from the early days of the column:

> Find a quadratic polynomial $f(x)$ such that, if n is a positive integer consisting of the digit 5 repeated k times, then $f(n)$ consists of the digit 5 repeated $2k$ times (for example, $f(555) = 555555$) (Godin, 2007, p. 22).

Not that there were no other examples of problem solving. Ron Lancaster returned with a column, "Photo Math—The fine art of viewing the world through a mathematical lens," which would run for eight years (*OMG,* 38(4) to 46(4)). Future *Gazette* Editor, Dan Jarvis, discussed the difficulties of doing problem solving on a regular basis: "Bluntly put, problem-based learning can be very uncomfortable at first, both for the teacher and for the students. If the former is used to 'delivering' lesson content from well-polished, teacher-centred lesson plans, and prefers a quiet, non-interactive classroom, this approach to learning can be quite unnerving. Further, if students have not had adequate experience in productive, co-operative group-work contexts, a gradual introduction of tasks will be required…" (Jarvis, 2008, p. 27).

Focusing from 2010 to the present, we start to see problems-based learning being one of the foci of mathematics teachers. Numerous articles, such as Todd (2011) and O'Dell and Frauenholtz (2020), appear oriented toward having a more problems-based classroom. Many interesting problems appear, such as the following:

> Two ladders of lengths, 20 ft. and 25 ft., are leaning against each wall of a narrow alley. Each ladder meets the opposite corner of the alley. The ladders

meet at a point 10 ft. above the ground. What is the width of the alley? (Sibbald & Pritchard, 2010)

Alice and Bob are practising their free-throws. In the morning, Alice makes $\frac{1}{4}$ of her shots and Bob makes $\frac{1}{5}$ of his. In the afternoon, Alice makes $\frac{3}{4}$ of her shots and Bob makes $\frac{3}{5}$ of his. At the end of the day, which person makes the larger portion of their total shots? (Godin, 2016)

In my bag, there are 12 straight sticks. Each stick is a different whole-number length. No matter which 3 sticks I take from my bag, I cannot make a triangle with them. What is the shortest possible length for the longest stick in my bag? (Irvine, 2018)

Melanie computes the mean μ, the median M, and the modes of the 365 values that are the dates in the months of 2019. Thus, her data consists of 12 1's, 12 2's,…, 12 28's, 11 29's, 11 30's, and 7 31's. Let d be the median of the modes. Arrange the numbers μ, M, and d from smallest to largest (Godin, 2019).

Ron Lancaster returned with the column "Mathematical Snapshots: The Art of Noticing, Wondering, and Questioning" (*OMG,* 57(1)), which continues to appear in the *Gazette* to this day. The topic of problems-based classrooms showed up in my fellow columnists' work, such as Costello (2020a, 2020b, 2021). Columnist Mirela Ciobanu gave us a hint of where to look for problems: "One of my greatest findings is that teachers do not have to rely merely on open investigative tasks to expose students to the investigation process. Closed problems, sometimes found in textbooks, might have the potential of being transformed into great opportunities for investigative activities" (Ciobanu, 2013). This is a position I whole-heartedly agree with and try to emulate in my columns. I even explored looking to math contests for problems (Godin, 2017), which led to a column, similar to my *Gazette* column, appearing in the Saskatchewan Mathematics Teachers' Society publication, *The Variable*.

As we head through another new decade, mathematics teachers are faced, again, with numerous challenges. A new curriculum is being implemented, with social and emotional mathematics being written into the documents. As well, teachers at all levels are having to deal with computational mathematics. High school teachers are once again faced with implementing destreaming; this on top of other things going on in the world that we do not have to bring up.

Remember, through it all, problem solving still lies at the heart of mathematics, and thus is central to mathematics instruction. Continue to look to the *Gazette* for pedagogical tips and problems to help with your professional growth. Personally, I am looking forward to seeing what will come from the next 60 years of the *Gazette*!

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▲ The *Abacus*, the Early Years

BY SHAWN GODIN

The first few volumes of the *Abacus* were quite different from the present volumes. At first, it was a collection of puzzles, problems, and activities at any grade level. Many of the activities, with a little modification, could easily be used today.

At first, the material was more Senior heavy, as indicated by the following problem from the *Abacus*, 4(2) page 3.

Evaluate

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\ldots+\frac{1}{\sqrt{1975}+\sqrt{1976}}$$

Volume two carried a regular feature called "The Lost Art." Columnist John Del Grande reminisces that "oldtimers" used to spend lots of time solving tough problems, especially old problem papers from the Grade 13 exams for students trying for scholarships. Through the next three issues, he shares some of these old exams, as well as solutions sent in by readers. For example, the 1923 exam paper was given in issue 1, and the author claims to have been able to solve all problems, except for:

> **#12** The four sides of a square circumscribing a circle cut any other tangent to the circle harmonically (*Abacus,* 2(1), p. 5).

I must admit that I had no idea how to do this one, mostly because I didn't know what it was asking (which reflects that general decline over the years in the amount of geometry in the curriculum)! Over the next few issues, several different solutions were supplied by the readers.

I agree with the philosophy of "The Lost Art." I think that it is a good practice for teachers to actively engage in solving problems. It keeps us sharp and helps us discover new things we can use in our classrooms. As well, it puts us in our students' shoes and helps us empathize with them as they go through the sometimes frustrating process of "problem solving."

Some of the activities are exercises, as opposed to *problems*, yet many have interesting or novel presentations. For example:

> When driving to school, I had to stop at a railway crossing. I observed that the train passed me in T seconds. Later on, I noticed that the same train crossed a bridge K metres long in t seconds; I also observed that the train travelled at a constant speed.
>
> Waiting for my first class to arrive, I calculated the speed of the train and its length. Can you do it? (*Abacus,* 3(1), p. 11)

However, there were plenty of examples of things that could turn into a good investigation. For example, in *Abacus,* 4(1), page 8, the title "Curious Products – Why?" was followed by ten multiplication questions. The first few are 574 x 143, 468 x 231, 561 x 273 …, which leads students to find a pattern and try to explain why it works, as well as many possible extensions.

It is interesting to note that the Editor of the *Gazette*, Tim Sibbald, had asked me to look at the first few volumes of the *Abacus* with a problem-solving lens. I ended up looking at the wrong years, by about a decade, yet still found many interesting tidbits. I would like to share a couple of things from this era. Each of the excerpts below leads the students to find a pattern. The activity then shows how the students can extend the work beyond the original problem, an important skill in math class and in life.

> The following conversation appeared in a *Family Circus* comic strip. As you can see, it is a conversation between a father and his son.
>
> Father: Think of a number between 1 and 100. Then, multiply the number you have chosen by 99. Add the digits of your answer.
>
> Billy: Okay, I did it.
>
> Father: The answer to this problem is on the back of my shirt. The father's shirt has an 18 on the back (*Abacus,* 28(1), p. 8).
>
> Sometimes when you add two numbers and multiply the same numbers, you get the same answer. For example, evaluate the following, and express your answer as a mixed number (*Abacus,* 25(2), p. 11).
>
> *(a)* $1\frac{1}{2}+3=$ $1\frac{1}{2}\times 3=$
>
> *(b)* $1\frac{1}{3}+4=$ $1\frac{1}{3}\times 4=$
>
> *(c)* $1\frac{1}{4}+5=$ $1\frac{1}{4}\times 5=$

Over the years, as a high school teacher, I used to skip over the *Abacus*, as it was aimed more at elementary teachers. Upon going through the exercise of looking over past issues of both the *Gazette* and the *Abacus*, I wished I would have paid more attention to the *Abacus*. For one thing, good pedagogy is good pedagogy, and we can incorporate ideas from other people's practice into our own, no matter the level. On top of that, I regularly take problems at a particular level and use them as inspiration to make problems at a higher or lower level, so looking at the *Abacus* for something that I could modify for one of my classes should have been more natural. Hopefully you can learn from this old dog and look to some of the sections of the journal that you may have been overlooking. You never know what treasures you will uncover. I would also encourage you to look back through the archives. There are a lot of great teaching ideas there, waiting to be used in your classroom. Happy hunting! ▲

▲ View through the Years: Anne Yeager, Associate Editor of the *Gazette*



Wow, what an accomplishment! Sixty years as a successful math journal: the *Ontario Mathematics Gazette*.

It has been a gift to have been an Associate Editor of the *Gazette* since 2010. I have worked and learned from Editors: Marian Small, Immaculate Namukasa, Dan Jarvis, Amy Lin, and presently, Tim Sibbald.

Each Editor has brought their own style and innovation to the *Gazette*. The Editors, in their own way, have made advancements, delivering different styles of editorials, bringing on a diverse variety of columnists, and have had different expectations. This has encouraged me to be flexible in my thinking, and has strengthened my own ability as an Editor.

One of the great advantages as an Associate Editor is that I *must* read the articles thoroughly, whereas in the past, I might have skimmed over or not read some that didn't catch my interest at first glance. Without exception, I have learned from each article! Additionally, as I read, I must consider how the article will be accepted by a wide range of audiences: teachers of all grade levels, professors, directors of education, even parents or students… while always keeping in mind, "Is this mathematically correct, valid, and relevant?" I would encourage those of you who wish a different style of professional learning to consider volunteering as an Associate Editor of the *Gazette* at some point in their educational career. (Editor: *We would welcome having a second Associate Editor.*)

View through 15 Years as a Director of OAME

Congratulations are in order for OAME/AOEM, for 50 years as a thriving, forward-looking mathematics organization! As a member of the Board of Directors and the Executive of OAME/AOEM during 2005–2020, I experienced the growth and change first-hand as a variety of challenges presented themselves. Each challenge was confronted with optimism and enthusiasm, and a good deal of hard work. Talk about problem solvers! New curricula, changing social expectations, professional development requirements, pivoting of the annual conferences due to a pandemic, technological changes, and political pressures are just a few of the challenges that OAME/AOEM has faced and worked through, to a successful current state.

During this time, I worked alongside 15 different Presidents, individuals who brought their own leadership approach to the organization, sharing their personal strengths and passion, motivating the Board of Directors, resulting in a stronger and more interesting organization. There are many dedicated persons within the OAME/AOEM Board of Directors, and I applaud them for their hard work, but there is one individual who has steadfastly been present at OAME/AOEM and who personally always "made my day" at each meeting—that is Greg Clarke.

Greg can be identified in a room by his wonderful laugh. His patience with each individual's question, particularly when it comes to technology, is astounding. Any request made of Greg is responded to with, "Yes, I can do that" (perhaps after a little thought). Even after a busy day, Greg enjoyed gathering a group to play a fun, rousing game of Baboo! Thank you, Greg, for your commitment and your personal generosity of time and spirit throughout the years, as well as your countless contributions that have made OAME the exceptional organization it is.

And knowing how Greg likes a game, here is a quiz with him in mind, designed in the spirit of fun. Most (if not all) the answers can be found within this special edition of the *Ontario Mathematics Gazette*.

1. Who were the first Executive Directors of OAME?
   a) Morely and Mona McGregor
   b) David and Bonnie Alexander
   c) Fred and Lynda Ferneyhough
   d) Dave and Sue Hessey
2. What does OAME stand for?
   a) Obviously All Math is Exciting
   b) Ontario Association of Mathematics Educators
   c) Ontario Association for Mathematics Education
   d) Ontario Aims for Mathematics Excellence
3. When was the first *Ontario Mathematics Gazette* published?
   a) February 1962
   b) September 1962
   c) October 1961
   d) None of the above
4. Where was the first Annual OAME Conference held?
   a) North Bay
   b) Kitchener-Waterloo
   c) Kingston
   d) North York
4. Why does the *Ontario Mathematics Gazette* include a column about The Field's Institute?
   a) Both are Ontario-based organizations.
   b) Both organizations gather people interested in mathematics.
   c) Both meet and discuss current topics and research in mathematics education.
   d) All of the above

Answers: 1b, 2c, 3a, 4c, 5d

▲ View through the Years: Gitta Berg, *Gazette* Proofreader



I'd like to offer a well-deserved congratulations to the *Ontario Mathematics Gazette* on 60 years, the *Abacus* on 50 years, and the Ontario Association of Mathematics Education on 50 years of successfully serving its members. I've had the pleasure of proofreading for the *Gazette* for approximately the last 13 years, including some copy editing in later years, and most recently working on the *Abacus*. May both publications and OAME/AOEM continue their success in contributing to the professional growth of OAME/AOEM members and to the mathematics community. (The photo was taken in September 2021 on a trip to Germany, when I posed with Watzmann, my second cousin's handsome 10-month-old Bernese Mountain Dog.)

▲ View through the Years: Penny Clemens, *Gazette* Graphic Artist



I have had the privilege of creating the print-ready layout for the *Gazette* and *Abacus* as far back as 1994; beginning with dynamic and energetic Editor Jack Weiner. Today, many Editors later I continue working with a very similar Tim Sibbald! It's been a pleasure to work with him, as well as all the other Editors, contributors, Board and Executive members in between. The OAME *Gazette* and *Abacus* have had an impressive array of talented people dedicated to publishing a top-notch issue four times a year without fail.

The technology, method of design, production, and delivery to readers has evolved greatly over the years — as have the Editors and supporting teams — but the quality and relevance of content and the people behind it has remained consistently high.

Getting to know the people behind the scenes has truly been a pleasure. Each and every person, a dedicated and thorough professional, has made my job easy.

Congratulations, *Gazette,* on 60 years, *Abacus* on 50 years, and OAME/AOEM on 50 years. Wishing you continued growth and success in the future! ▲

▲ In the Middle: Advice, Archives, and the Next 60 Years



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Carly Ziniuk teaches Grade 9 Mathematics, Grade 12 Data Management, and Advanced Placement Statistics at the Bishop Strachan School in Toronto, Ontario, Canada. She is very active in adopting real-life data to engage her students in solving problems.

Kevin Kelly, the founding editor of *Wired* magazine, continues to offer at least one column a year in the tech-focused, future-looking magazine as senior maverick. Last April, on the occasion of his 68th birthday, Kelly offered 68 bits of unsolicited advice. Kelly's advice and the *Gazette* archives demonstrate what this publication has meant to math educators and students in Ontario, and how we can look forward to celebrating another 60 years of teaching and learning together.

> (Advice #13) Don't be the smartest person in the room. Hang out with, and learn from, people smarter than yourself. Even better, find smart people who will disagree with you.

Since 1962, the *Gazette* has been written, reviewed, and edited by people deeply invested in the teaching and learning of mathematics, and read by smart educators who want to do the same. Examining the *Gazette*'s archive of lessons, research, book reviews, and suggestions show 60 years of virtual "hanging out" and learning with smart people.

Multiple approaches to problems and how to present them to students have been a foundation of the *Gazette* since its inception. The December 1962 editorial focuses on the journal's "multiplicity of approaches." Editor-in-Chief Ralph G. Stanton writes:

> A knowledge of more than one approach often casts more light on a subject; the more angles a teacher can view a subject from, the better insight he will have. The great Gauss strongly urged the virtues of providing several alternative proofs of important results, and himself gave several proofs of his law of quadratic reciprocity.

Throughout the issues in the 1960's archive, you can find problems presented in one issue, then multiple different

solutions presented in subsequent issues. Many of these solutions involved approaches I had never seen before, even for situations I had thought myself the smartest in my room (or classroom, anyway!).

In the March 1966 issue, James Lucien Howland's *Many Facets of Mathematics* reasons that students' experiences with mathematics are changing, and the impact that technology is having on how we understand proof:

> ...there is the impact which modern computing devices have made upon mathematics. To understand this, we may consider two general methods for proving theorems—the constructive and the non-constructive. A constructive proof gives a step-by-step procedure, or an algorithm, for proving the result, or solving the problem in hand.

Howland continues to explain how using technology will not only change how proofs are conducted, but also how we teach. How prescient this 1966 article is for this current time! Sixty years later, we include coding throughout the elementary Mathematics curriculum, with a focus on algorithmic thinking, and our students have experienced technology throughout the entire learning experience in the past two years. From the *Gazette*, especially Mary Bourassa's excellent column, teachers now learn about how to work with flipped classrooms, and how to apply increasingly diverse constructivist games, apps, and online activities. The *Gazette* continues to find the smartest people in the room to provide new resources for technology learning.

D.H. Crawford's editorial opened the March 1969 issue with:

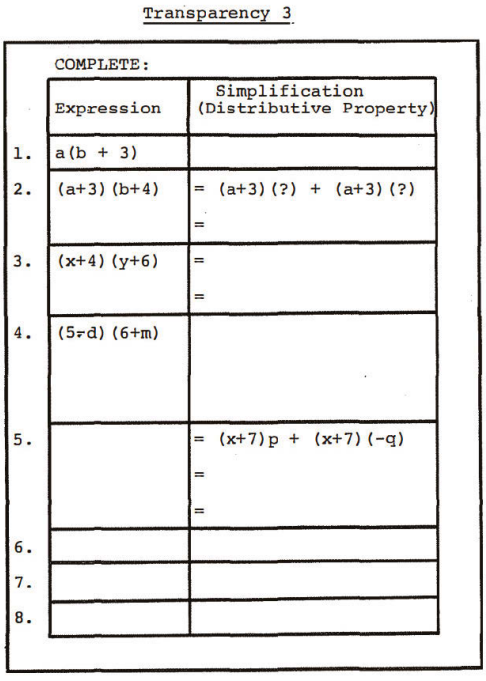
> 1968 was a year of sadness, and frustration. It seemed that man had learned little from history. War, civil disobedience, and unrest and assassination were in the forefront. Yet the year closed with a scientific and human achievement of the first order, the circling of the moon. What have these remarks to do with the teaching of mathematics? Perhaps they will serve to remind us that science and technology in themselves are sterile, and that it is how we view them and use them that counts most. If in our teaching of mathematics we cannot impart concern and goodwill for the students in our charge, what have we really accomplished?

Much of this paragraph could be repeated as a March 2021 *Gazette* editorial. The recent controversy over the MTH1W curriculum changes argues against the representation Crawford makes about the sterility of mathematics. Throughout the early years of the publication, the letters to the Editor showed actual arguments about mathematics, such as how to explain functions to students, a concept that had newly entered the Ontario curriculum. Pushing boundaries, asking questions of each other, and learning from each other is a piece of Kelly's advice that the *Gazette* has modelled throughout its history.

> (Advice #25) To make something good, just do it. To make something great, just redo it, redo it, redo it. The secret to making fine things is in remaking them.

The *Gazette*, since its inception, has been encouraging teachers to take risks and be creative in both their problem solving and the approaches they try with their students. Fellow *Gazette* columnist Ron Lancaster has regularly reminded that a Mathematical Snapshot (previously Photo Math) can inspire even further creativity. Each of Ron's images from around the province can be used in the classroom as is. Ron's biggest inspiration, however, is always to encourage teachers to find mathematical images in their own environments and create questions to solve with their students.

As early as 1969, the *Gazette* included sample charts for teachers to adapt for lessons, and transparencies to create in order to draw out student examples, including the example in Figure 1 from the June 1969 issue. Although we are unlikely to use this on a transparency 50+ years later, the same activity could easily be revised using Desmos teacher mode or Jamboard for our current algebraic lessons. Many teachers use the *Gazette* to inspire their creativity to get started and remake the activities they see there, as Kelly suggests.



Transparency 3

COMPLETE:

	Expression	Simplification (Distributive Property)
1.	a(b + 3)	
2.	(a+3)(b+4)	= (a+3)(?) + (a+3)(?) =
3.	(x+4)(y+6)	= =
4.	(5-d)(6+m)	
5.		= (x+7)p + (x+7)(-q) = =
6.		
7.		
8.		

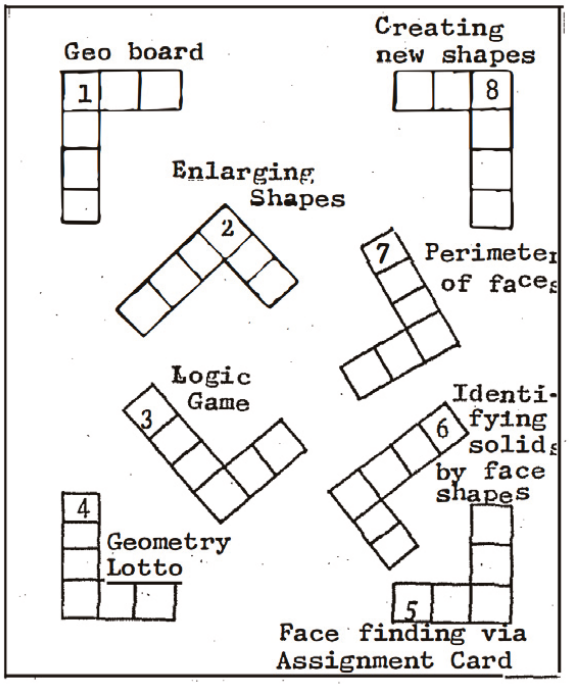
Figure 1: *Template for a transparency*

(Advice #39) You are what you do. Not what you say, not what you believe, not how you vote, but what you spend your time on.

Early on, the *Gazette* connected educational researchers and classroom teachers by providing them with materials that they could use with their students. In addition to helping teachers extend their understanding of mathematics, the journal regularly included ways teachers could actively revise their students' learning experiences. The September 1966 issue, for example, was the first special Elementary School Edition. Included with a sample lesson on examining solids, J.R. MacLean presents a series of activity centres along with a classroom arrangement.

The students proceed from one activity to another, working through assignment cards, chart activities, logic games, and measurement experiences. When they finish an activity, they are allowed to move to any other centre, provided there is an empty space. The teacher moves about the room, guiding, encouraging, and helping when requested. In this classroom atmosphere, the teacher's role is not to stop children talking, but rather to ensure that there is something worthwhile for them to talk about.

Each station in this arrangement was explained in detail, showing teachers directly how to change the way they actively spend their time in a classroom. By providing specific samples, such as (see Figure 2) this *Assignment Card Sample and Possible Result*, the *Gazette* provided teachers with time to spend, as Kelly says, doing what they thought would help their students.



Assignment Card Sample

1. Use graph paper to design a house - Use a triangle and a rectangle.
2. By making the sides longer draw another house. It will be the same shape but it will be larger in size.
3. How much bigger do you think the new shape is than the first shape?

Possible Result

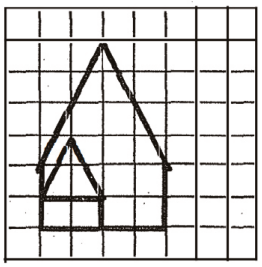


Figure 2: *Classroom activities*

The *Abacus* insert, which started with the September 1986 issue, helped elementary teachers by providing more appropriate content regularly. It now includes the to-do details similar to the 1966 approach: classroom set-ups, questions to offer, activities to try, and sample student responses to consider.

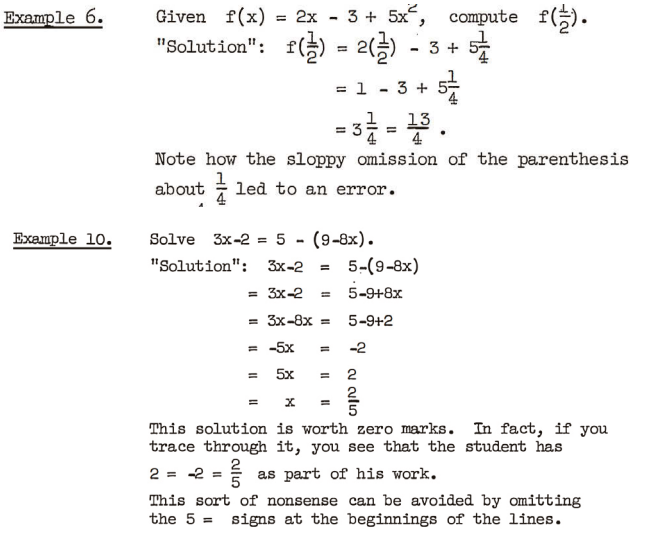
(Advice #65) Following your bliss is a recipe for paralysis if you don't know what you are passionate about. A better motto for most youth is "master something, anything." Through mastery of one thing, you can drift toward extensions of that mastery that bring you more joy, and eventually discover where your bliss is.

Siobhan Roberts' book, *King of Infinite Space*, and the TVO documentary, *The Man Who Saved Geometry* (made available by Roberts on Vimeo), describe Donald Coxeter's passion for geometry, and equal excitement in explaining his discoveries to curious teachers and students of geometry. Coxeter, one of the greatest geometers of all time, contributed an *Introduction to Geometry* in the October 1963 issue, a research paper in March 1967, and then in May 1967, gave his personal feedback on the then current *K–13 Geometry Report*. In all three pieces, Coxeter reveals both his bliss and mastery, and the *Gazette* Archives continues to share this with us almost 60 years later. The 1963 piece was written less than five years after M.C. Escher applied hyperbolic tiling, which Escher referred to as Coxetering. For many math teachers in this province, Coxeter, who was at the University of Toronto for over 60 years, is part of our direct mathematical lineage, and his joy continues to inspire the students who revel in the Escher drawings that frequently adorn their classrooms.

(Advice #12) Pros are just amateurs who know how to gracefully recover from their mistakes.

The October 1963 article, "Bad Form in Mathematics," talks about common mistakes in the Grade 13 examinations, "more common pitfalls into which unwary and sloppy students are constantly falling," and continues with "Bad form leads to error."

These pitfalls include misuse of brackets and overuse of the equal sign. The purpose of the article was to inform teachers how to improve their students' performance on standardized exams, but many of these errors are common occurrences still. The examples in Figure 3 are very similar to work I see regularly from my students.



Example 6. Given $f(x) = 2x - 3 + 5x^2$, compute $f(\frac{1}{2})$.

"Solution": $f(\frac{1}{2}) = 2(\frac{1}{2}) - 3 + 5\frac{1}{4}$

$= 1 - 3 + 5\frac{1}{4}$

$= 3\frac{1}{4} = \frac{13}{4}$.

Note how the sloppy omission of the parenthesis about $\frac{1}{4}$ led to an error.

Example 10. Solve $3x-2 = 5 - (9-8x)$.

"Solution": $3x-2 = 5-(9-8x)$

$= 3x-2 = 5-9+8x$

$= 3x-8x = 5-9+2$

$= -5x = -2$

$= 5x = 2$

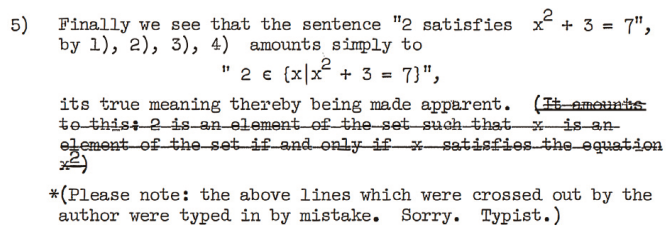
$= x = \frac{2}{5}$

This solution is worth zero marks. In fact, if you trace through it, you see that the student has $2 = -2 = \frac{2}{5}$ as part of his work.

This sort of nonsense can be avoided by omitting the 5 = signs at the beginnings of the lines.

Figure 3: *Examples and comments about student errors*

The newest curriculum documents include Social–Emotional Learning (SEL), which incorporates gracefully recovering from our mistakes. Early in the *Gazette*'s publication, the work was typed by hand and some symbols were handwritten. Errors were explained pragmatically, like this example from the December 1963 issue:



5) Finally we see that the sentence "2 satisfies $x^2 + 3 = 7$", by 1), 2), 3), 4) amounts simply to

" $2 \in \{x|x^2 + 3 = 7\}$",

its true meaning thereby being made apparent. ~~(It amounts to this: 2 is an element of the set such that x is an element of the set if and only if x satisfies the equation x^2)~~

*(Please note: the above lines which were crossed out by the author were typed in by mistake. Sorry. Typist.)

Did you know that the first *Gazette* used jokes to fill space? Issues in the 1980's included comics and hand-drawn images when an article left half a page open. Gracefully recovering from mistakes is also part of the *Gazette*'s legacy.

> (Advice #67) Over the long term, the future is decided by optimists. To be an optimist, you don't have to ignore all the many problems we create; you just have to imagine improving our capacity to solve problems.

Of all of Kelly's pieces of advice, this is the one that most rings true for me about the *Gazette*. Each submission to the journal is a profoundly optimistic act: reaching out to colleagues, some of whom you have never met and may never meet in person, and affecting students around the province.

George Pólya, the Stanford professor famous for his problem-solving tome, *How to Solve It*, presented suggestions for the revisions of the math curriculum in February 1962. In the very first issue of the *Gazette*, Pólya indicates the importance of creativity for teachers (sic): "How should the teacher recognize or direct the creativity of his students if he himself had never an opportunity to do something approaching creative work" (p. 26).

Pólya's problem-solving strategies have impacted mathematics educators around the world, and his comments that creativity is at the heart of problem solving are important for our students to hear and observe with us now. Our optimism as mathematicians and educators is not in ignoring problems, but in, as Kelly says, "improving our capacity to solve (them)."

In the February 1963 *Gazette* in "Message from the President of the Mathematics and Physics Section of the OEA" (Ontario Education Association), Father John Egsgard wrote:

> Today the fastest-growing and most radically changing of all sciences is mathematics. It is the only branch of learning in which all the major theories of 2000 years ago are still valid, yet never before has there been such a flood of fresh ideas. New developments have been extensive; new concepts have been revolutionary. Indeed, mathematics today is an entirely different discipline from what it was at the turn of the century.

How optimistic!

Improving our capacity to solve our problems continues to be the *Gazette*'s goal, 60 years later. The September issue included "Coding in the Classroom, Infographics, and Linking Mathematics Concepts to Economics," all areas showing new developments.

Many of my columns have included problems I have tried in my classroom, not always successfully on the first attempt. *Gazette* readers have reached out to me to explain how they adapted my idea or incorporated some portion into their own, and then I have in turn refined and revised. Hearing from teachers who have improved on my ideas by remaking them has been one of the most rewarding parts of my contributing to the *Gazette*. Kelly's advice encourages his readers to surround themselves with smart people, make and remake as part of the learning process, take risks, recover from mistakes, cultivate joy and enthusiasm in their work, and optimistically solve problems. A tour through 60 years of the *Gazette* shows that its curious readers have been doing just that throughout its history. ▲

▲ Secondary Curriculum Over the Last Decade



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Jill is a teacher in the Renfrew County District School Board. She is also a Past President and was a Director on the OAME/AOEM Board of Directors.

Ten years ago, in the 40th-anniversary edition of the OAME/AOEM *Gazette* (2012), Judy Crompton, Myrna Ingalls, and David Alexander outlined the evolution of instructional methodology in secondary mathematics. They highlighted four key turning points, which I will summarize below. I will then expand on this summary with a discussion of the secondary curriculum over the decade that followed—from 2012 until 2022.

Before 2012: A Summary of the Turning Points in Secondary Mathematics Instruction

Crompton et al. (2012) explained that prior to the 1970's, a primary instructional strategy was the Socratic presentation of mathematical skills. By the 1980's, new directions were taking shape. They described these directions in connection to four turning points.

The *first turning point* involved a new emphasis on mathematical processes (Crompton et al., 2012). This emphasis was reflected in the front matter of the 1985 Ontario mathematics curriculum. The *next turning point* was connected to new technology of the time—graphing software in the late 1980's, and graphing calculators in the mid-1990's. This technology, which slowly became more accessible by the late 1990's, made mathematical modelling more meaningful.

A *third turning point* arose with the 1999 (Grades 9 and 10) and 2000 (Grades 11 and 12) curricula incorporating mathematical processes in specific expectations. Unlike in 1985, mathematical processes such as communication, problem solving, and representing were identified in specific course expectations. The emphasis on mathematical processes remained when the revised curriculum was released in 2005 (Grades 9 and 10) and 2007 (Grades 11 and 12). This time, however, seven process expectations were outlined at the beginning of each course, and these expectations were "...to be integrated into student learning in all areas of this course" (Ontario Ministry of Education [OME], 2005, p. 29). In other words, the processes were no longer isolated to particular content expectations. Five mathematical processes—problem solving; reasoning and proving; reflecting; selecting tools and computational strategies; connecting, representing, and communicating—were to be integrated in all areas of each course (OME, 2005, 2007).

The *final turning point* that Judy, Myrna, and David identified began after the release of the 1999 curriculum. This turning point involved a decade of funding (e.g., for graphing calculators) and support (e.g., for curriculum projects) for curriculum implementation (Crompton et al., 2012). They referred to this as "a decade of implementation."

2012–2022: Another Decade of Implementation and Some Turning Points

For the most part, this has been another decade of implementation. The secondary mathematics curriculum remained the same until the release of a new Grade 9 curriculum for the 2021–2022 school year. Some more prominent ideas related to the curriculum have emerged over the last decade, however, and the most recent curriculum has prompted more turning points. I will discuss some of the new directions and key aspects of curriculum implementation here.

Mathematical Processes. Mathematical processes have been part of the secondary curriculum since the 1980's, and have become more explicit over the years. By 2005 and 2007, "process expectations" were included at the beginning of each course. In the destreamed curriculum for Grade 9 math (OME, 2021), the need to incorporate mathematical processes has been clarified further in a strand called "mathematical thinking and making connections." The first expectation in this strand is "mathematical processes," and the second is "making connections." In this course, students are expected to:

- apply the mathematical processes to develop a conceptual understanding of, and procedural fluency with, the mathematics they are learning;
- make connections between mathematics and various knowledge systems, their lived experiences, and various real-life applications of mathematics, including careers. (OME, 2021, p. 1)

In addition to making up one out of six strands in this curriculum, a turning point in this curriculum is the explicit expectation that mathematical processes will not only be incorporated in instruction; they must be assessed and evaluated. This expectation is new.

Technology. Compton et al. (2012) highlighted the implications of graphing technology for more meaningful

mathematical modelling. Over the last decade, technological advances have continued to contribute to more meaningful mathematical modelling. Free dynamic mathematics software and apps like Desmos and GeoGebra, for example, make it possible for students to use personal devices to easily explore connections between mathematical representations. These tools also include free activities, developed by educators around the world. Thus, while the curriculum has not changed in terms of the importance placed on using technology in mathematics, the tools that have been available over the last decade have evolved, enabling students to interact with mathematics and even with each other in new ways.

A *turning point* in the new Grade 9 curriculum when it comes to the use of technology is the inclusion of coding expectations (OME, 2021). The new curriculum includes expectations that require students to read, use, and create code. This is the first time coding is an explicit expectation in the secondary mathematics curriculum.

Spiraling Curriculum. The 2005 and 2007 curricula stated that teachers are to "weave" related curriculum expectations:

> When developing detailed courses of study from this document, teachers are expected to weave together related expectations from different strands, as well as the relevant process expectations, in order to create an overall program that integrates and balances concept development, skill acquisition, the use of processes, and applications (OME, 2005, p. 8; OME, 2007, p. 12).

Despite this position, curriculum resources like textbooks still tended to be organized by units. Over the last decade, however, more teachers have been exploring ways to weave, or spiral, curriculum. This has been evidenced in OAME conference presentations and in teachers sharing their experiences and resources online. In Ottawa, for example, Alex Overwijk shared his reasons for spiraling in a blog post (see www.slamdunkmath.blogspot.com/2013/03/replacing-unit-based-teaching-with.html). Mary Bourassa has blogged about her experiences (see www.marybourassa.blogspot.com/2016/06/grade-10-applied-math-february-june-2016.html). Teachers who participated in a large-scale Grade 9 Applied project that began in 2014 also shared experiences with spiraling the Grade 9 Applied course. This project resulted in a professional learning module, or a "workshop in a bag," that provides resources for teachers who are interested in rearranging curriculum (see www.math4thenines.ca/professional-learning.html).

Mathematical Mindset and Social–Emotional Learning Skills. Over this decade, there has been emphasis on growth mindset in mathematics (Boaler, 2015) and, more recently, on social–emotional learning skills. The growth mindset emphasis has been evident in OAME leadership conference programs featuring Jo Boaler in 2014 and 2016, and in annual conference programs. Along the same lines, the newest secondary curriculum includes a strand called "social–emotional learning (SEL) skills in mathematics." For example, throughout all strands in the Grade 9 course, students are expected to have opportunities to develop their social–emotional learning skills, including the ability to identify emotions that support mathematical learning and to build confidence and a healthy relationship with mathematics. This is a *turning point* in the curriculum, as it makes the need to build student confidence in mathematics more explicit.

Destreaming. One of the most significant turning points in the last decade is a move from streaming to destreaming secondary curriculum. For many years, and currently for Grades 10 through 12, secondary courses have been streamed by destination (e.g., Locally Developed, Applied, Academic, Workplace, College, University). This year, with the new Grade 9 curriculum, students no longer need to choose their destination before starting high school.

Concluding Thoughts

The curriculum has remained the same for much of the last decade. New ideas emerged related to this curriculum, however, and some key turning points were prompted by the newest curriculum for Grade 9 mathematics (OME, 2021). More specifically, the need to incorporate mathematical processes in instruction and assessment has become more explicit, technology has made it possible for students to interact with mathematics and with each other in new ways, educators have shared approaches to spiraling the curriculum, and more emphasis has been placed on student mindset in mathematics. Perhaps the biggest turning point in the last decade is the destreaming of the Grade 9 curriculum. This is, however, not entirely new, and destreaming was in place between 1995 and 1998—interested readers can read about this in the June 2021 "Blast from the Past" column.

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▲ Executive Directors

David and Bonnie Alexander were the Executive Directors of OAME/AOEM from 1995 to 2003.



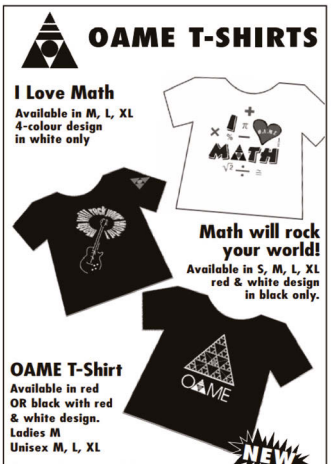
"…times have certainly changed, and even did so into a computer age at that time. Don Attridge set up the computers, but maintained a manually written membership list, which was demanded by the much-loved Morely and Mona McGregor, the last Secretary/Treasurers of OATM—we banished the written/file system!"

BY BONNIE ALEXANDER

Dave and Sue Hessey were Executive Directors from September 1, 2001 to August 31, 2010.



One of the first changes we made was initiating the use of credit cards to make it easier and more convenient to pay for memberships, products, and conferences. We then began developing and sourcing some products to sell at conferences and through the *Gazette*. You may remember T-shirts like *Math will rock your world!*, and teaching supplies like the OAME/AOEM sticky graph pads, to name just a few.



OAME/AOEM saw huge changes in the website during our decade. We hired an outside web designer to revamp and update our website. Then Greg Clarke took over as the webmaster and further modernized it. Greg developed MCIS, an online conference-registration process that was the envy of other subject associations. It streamlined conference planning and moved registration from mail-in with cheques to online with credit card payments. OAME/AOEM had joined the technological world. This was so helpful to organize and support the annual conferences hosted by various OAME/AOEM chapters throughout the province. We personally spent many hours on the Leadership Conference, held in February every year in Toronto over two and a half days. We worried that SARS (see www.health.gov.on.ca/en/public/publications/pub_ sars.aspx) or heavy snowfalls would cause cancellation, but that never happened!

When we began in 2001, we provided *Linking Assessment & Instruction* to teachers. This resource, developed in the 1990's, helped measure learning and understanding by setting goals and demonstrating evaluation techniques to show short-term retention and long-term understanding of mathematics. In the mid-2000's, OAME/AOEM decided to develop a resource called *Growing Up Mathematically*. This resource was created over three years at OAME/AOEM Board of Directors meetings, with video resources from real classrooms. It became fondly known as the *GUM* project. It emphasized teaching for understanding, matching classroom practice, and linking the stages of development in mathematical understanding from K–12. Its primary purpose was to provide professional development for teachers, promoting discussion at staff and department meetings. OAME/AOEM provided a complimentary copy to each board of education and sold over 4000 copies.

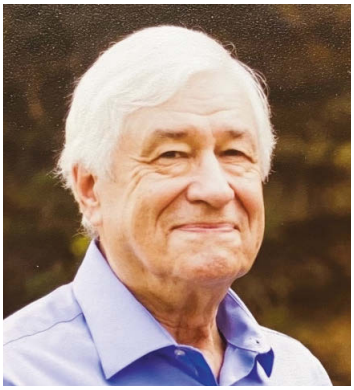
OAME/AOEM partnered with the Ontario Ministry of Education (OME) and Ontario Mathematics Coordinators Association (OMCA) to provide professional development activities and resources for teachers. We saw the *Gazette* and *Abacus* content change to match the OME initiatives. OAME/AOEM itself developed *Vision for Teaching and Learning Mathematics*, which was included with their resources and focused all discussions. OAME/AOEM also partnered with Union Gas to sponsor *GUM*, OMO, and to recognize teacher leaders nominated by their own boards. OAME/AOEM benefited from $125 000 over eight years from Union Gas Ltd.

Toward the end of our term, Dave worked on the Constitution Committee to begin the process of changing the size and composition of the OAME/AOEM Board of Directors. We treasure our time working with the Executive and OAME/AOEM Board members. We met so many talented mathematics educators throughout the province, watched them grow and contribute their expertise, and become lifelong friends.

BY DAVE AND SUE HESSEY▲

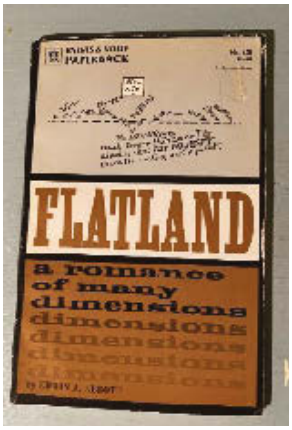
My Early Exposure to the *Ontario Mathematics Gazette*

BY PETER SAARIMAKI



When I started teaching in September of 1966 at Malvern Collegiate Institute in Toronto, my Grade 10 math classes already knew they had a book report due by the end of the month. Now this may seem unusual for a math class, but I had checked it out first with my principal, Duncan Green.[1]

The book in question was *Flatland*, by A. Square, also known as Edwin A. Abbott. When students received their June report with their classes for the next year, they were informed of this expectation. I had arranged with the local corner store/bookshop to bring in a few paperback copies, and the school librarian had arranged for other schools to loan her extra copies for the month, as had the local public library. Each of the librarians put the books on the one-week loan list to increase distribution.



My instructions were to submit a one-page, in those days hand-written, summary and any conclusion or comments. I encouraged students to consider responding to the dedication, which says, in part:

> So the Citizens…
> May aspire yet higher and higher
> To the Secrets of FOUR FIVE OR EVEN SIX Dimensions
> (Abbott, 1963, p. 2).

The submissions were marked with A, B, C, etc., where A represented 90–100%, B was 75–90%, etc. In reality, after class tests and December exams, it would count for less than 5 percent of the Fall mark.[2] I was using the assignment to broaden their math experiences.

The book report was a precursor to their winter term assignment, which was to submit a math essay. The Grade 10 English course included the basics of writing (research) essays, including inserting endnotes and recognizing sources of all quotations. With the approval of the English department, I used their format and substituted math examples. I gave the students many suggestions covering arithmetic strategies, geometry constructions (they could make models, but still needed some written descriptions), how statistics should be viewed, where math is used in life, etc.

Another option was to write a review of *Sphereland*, a sequel to *Flatland*, and relate its message to real life. To ensure everyone could be successful at their own level, I included the option of just writing short biographies of three mathematicians. I did require, though, that at least one be female and that they all be from different centuries and different countries.

One quite bright student (whom I also knew to be, shall we say, lazy?) submitted a very good essay. This is where the *Ontario Mathematics Gazette* comes in. In those days, the Director of Mathematics for the Toronto Board of Education was Wyn Bates. He paid for a subscription to the OATMP journal, the *Ontario Mathematics Gazette*, for every secondary school math department in the city. Articles were often discussed at the monthly math heads meetings at the school board offices.

This was important because I had been hired right after graduating from university with a B.Sc., but I had no formal teacher training. Even so, I was invited in the Spring to Malvern for a two-week induction program. While there, I ended up teaching six different classes (out of a nine-period day) each day. Of note, this was before my official teacher training program in the summer (those days, schools were desperate for teachers). I took the opportunity to read some of the *Gazette* editions in the math department office while I was there, to find some ideas for teaching, and actually made note of a few. Thus, in March, I was able to check in Malvern's math department library and was able to find the student's "essay" in the February 1965 issue of the *Gazette*, published as "Length of the Angle Bisectors of a Triangle" by R. Winterle. Obviously, the student had plagiarized the article in total.

On returning the essay, I commented that he made two mistakes: no quotation marks at the start and end, identifying a direct quotation, and missing credit to the real author, R. Winterle, hence a zero mark.

Aside from the negative impact on one student, many students later expressed positive feelings about the assignment. They had been able to apply their literary interests or athletic skills or musical talents to an oft-dreaded or seemingly uninteresting subject. Many were able to see math and its possibilities in a brand-new light.

So, my reason for this story—even early editions of the *Ontario Mathematics Gazette* were widely read by teachers, and even by some students!!

Notes:

1. Eventually Director of Education for the Toronto Board, and then Assistant Deputy Minister of Education for Ontario.
2. Basically, everyone who handed something in got a 4 or a 5 out of 5. It was meant to encourage some out-of-the-box thinking when it came to mathematics. The discussions following the book reviews did get into non-mathematical topics, such as the depiction of women and the indicators of social status in society. As a sidebar, over the years, several students did make some astute observations, e.g., they wouldn't want to drink the wine, as it would be flat!!

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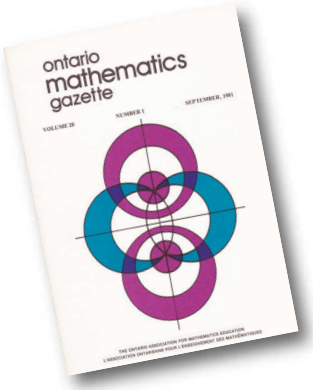
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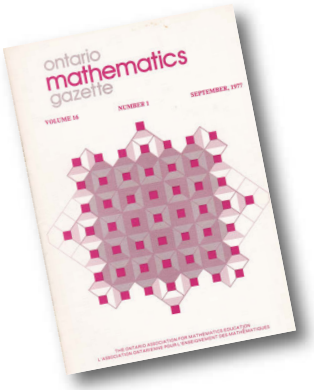
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▲ *Gazette* Editor: Dan Jarvis

I served as Editor of the *Ontario Mathematics Gazette* for seven issues from November 2014 (i.e., 53(2)) to June 2016 (i.e., 54(4)). Given my background in math and visual arts education, I suppose it was only fitting that the first of these seven issues featured cover images of the Golden Section, while the seventh and final issue involved Escher tessellations. It was a lot of fun to learn and tweak the workflow involving *Gazette* authors, reviewers, associate editors Anne and Marilyn, proofreader Gitta, graphic designer Penny, and Excel spreadsheets for tracking progress. Perhaps my favourite part of this role was receiving and reading the many great submissions each quarter, written both by regular column contributors or by new authors equally as excited about sharing from their math teaching experiences—so much talent and energy in our province!

In my editorials, I wrote, in turn, about early *Gazette* history, Abbott's *Flatland* and related novels, the Ontario Ministry of Education's *EduGAINS* website, Papert's "hard fun," the math/technology of *Star Trek* and *Star Wars*, and "making 10" with children in Kenya, Africa. I enjoyed filling some of the leftover white spaces with journal article excerpts and famous math quotations.



By far, the fondest memory was a trip to San Francisco, California, where I had the great pleasure of attending the NCTM "Building Bridges to Student Success" Conference in 2016, and to accept, on behalf of OAME/AOEM, the Outstanding Publication Award from NCTM President, Diane Briars, during the annual meeting of affiliate delegates. This was the first time a Canadian affiliate had been thus recognized (Saskatchewan's *The Variable* also received the award in 2019).

Leonardo da Vinci once mused, "Mechanics is the paradise of mathematical sciences because by means of it one comes to the fruits of mathematics." Where, I wonder, do we likewise find the fruits of mathematics education? Hopefully in a confident, thinking, numerate citizenry, with each person having benefited from the guidance of patient and creative math teachers (i.e., specialists), and teachers of math (i.e., non-specialists), working in our 5000 Ontario schools; but also, undeniably, in the dedicated, grassroots efforts of all of those involved in the production of the *Gazette* over these past 60 years. Thanks, and well done, math folks. ▲

▲ MB4T (Mathematics by and for Teachers): An Anniversary Reflection



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Jennifer Holm is an Assistant Professor at Wilfrid Laurier University and works with Primary/Junior and Junior/Intermediate pre-service teachers, as well as in the field supporting current mathematics teachers. She is interested in developing mathematics knowledge for teaching with both pre-service and in-service teachers. She focuses on the beliefs and opinions that pre-service teachers hold about mathematics and teaching and the connection they have to past experiences. She uses this research to support future teachers in developing beliefs and knowledge that will encourage and support effective teaching practices in mathematics.

For the anniversary issue, I was asked to consider a retrospective look at this column, but I also wanted to think about its position in the future. This column began in the first issue of volume 51 (i.e., in 2012), with Dr. Ann Kajander as the first columnist. Ann was the person who inspired me to start down the path of mathematics education, so being asked to take over the column she began is one of the highlights of my academic career. In many ways, you could say I am where I am today because of Ann. It was her first mathematics education course in my Master's program that inspired my love of mathematics. Learning about mathematics for teaching has changed the way I view mathematics, and inspired me to be a better teacher. Math had always been black and white and boring to me, as I had only ever learned formulas, and it did not have the same beauty as writing or reading books. Ann helped me to see how wrong I was about this amazing subject, and getting to author this column has been a wonderful opportunity to share that love with all of the *Gazette* readers.



Dr. Ann Kajander

The first column in "Mathematics by and 4 Teachers" (as it was called in 2012) was untitled, but the topic was "Areas and Volumes—The Power of Modelling" as the first heading noted (Kajander, 2012). This column focused on using visualizations to explore the units and relationships between units applicable to area and volume of rectangular shapes. The column laid the foundation for what is now almost a decade of columns focused on discussing the mathematics needed by mathematics teachers. The focus on visualizations and models continued throughout Ann's time as the columnist. It is acknowledged by various authors when the column was in transition, and continued it when I took over in 2018. Topics over the time span of this column have included fractions, integers, circle areas, data, algebra, and many more. The overwhelming theme has been to look at mathematics as more than just rules and procedures, instead focusing on how to make the underlying concepts concrete. This focus on the concrete is helpful for considerations related to teaching mathematics for all.

In looking forward with the column, my goal is to continue this long tradition of exploring mathematics concepts, with a vision of making the mathematics come alive for students. Being able to "touch" the mathematics through concrete representations has allowed for many discussions that served to bring mathematics out of the abstract formulaic world to provide alternative representations to improve student learning. This is not to say that formulas and abstract concepts have no place in the classroom or mathematics, but if this is where we start as teachers, then we have already lost many children. In volume 52, Ann had a series of columns that focused on how to connect the different fraction procedures to models (Kajander, 2013a, 2013b, 2014a, 2014b). These four columns highlighted the importance of not only starting with the concrete, but also using these models as the building blocks for ensuring that the formulas or procedures are understood conceptually so that students appreciate the value and are motivated to remember them.

My goal, and I know the goal of most teachers, is for all individuals to understand and be able to use mathematics. By making it realistic and concrete, this goal can be accomplished. A focus on models not only gives this understanding, but also promotes retention of ideas and making connections to new concepts. I love the example of the formulas for area of various two-dimensional shapes, and how those connections are all related to using "base times height" for a rectangle. This adjustment makes it clear to students how all of the formulas are connected and what they mean, instead of feeling like they have to learn different "letter formulas" as I have heard countless times from future teachers. This topic is explored in the column "What's in a name?" (Holm, 2018), if you would like further details.

As a columnist, I have received feedback that my writing

in this column has been, in a word, "flowery." I wish I could say this was the first time I have heard this, but I can vividly remember my lovely Grade 11 English teacher saying something similar, yet not as politely. At first, I worried this was a criticism and something that I should correct because after all, mathematics is not "flowery," but instead, something more succinct or mechanical. I realize now that maybe this is just a realization that mathematics can in fact be more "flowery" and allow for some expression and beauty that we usually associate with writing literature or languages. I defer to the work of Dr. Peter Taylor (2018), who explores *Teach the Mathematics of Mathematicians* and focuses on the beauty and wonder inherent in mathematics that is sometimes removed from the curriculum.

At times, my literacy background makes me feel like I am an imposter in this mathematics education world, but maybe this is my strength in being able to appreciate the creativity of mathematics as a teacher. I speak to too many individuals who view mathematics as cold and lifeless based on their own histories with mathematics. If I can change that view with this column, then I feel as if this could be my most important accomplishment. This is how I explain this column to others, and why I feel this column is the most important writing that I do each and every year. I look forward to seeing what comes next.

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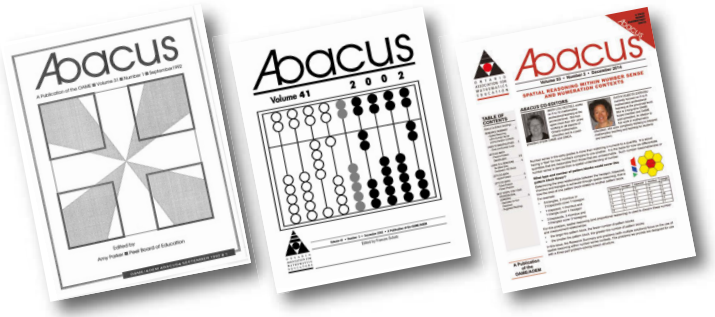
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▲ Interview: The Longest-Serving *Abacus* Editors, MaryLou Kestell and Kathy Kubota-Zarivnij



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Iain has been an elementary school educator for 28 years, and is now into a second career, teaching in-service and pre-service teachers. He teaches face-to-face at Ontario Tech University and virtually at Western University. He is the current editor of the Math+Code 'Zine*, www.researchideas.ca/mc/.*



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Beyza is a former teacher and long-term researcher. She is currently a graduate student in education at Western University, and her research focus is the integration of computational thinking into mathematics education. She is an editor at Math+Code 'Zine*, www.researchideas.ca/mc/.*

Direct quotations may have been edited for clarity in the written form.

At 13 years, Kathy and MaryLou had the longest run of any Editors of the *Abacus*, just a smidge more than one-quarter of the time the *Abacus* has been published. MaryLou and Kathy have been inseparable for many years, kept together by their love of mathematics education. They have been together in the Literacy and Numeracy Secretariat as the only two mathematics Education Officers. They created an adaptation of Japanese lesson study into the Collaborative Inquiry and Learning in Mathematics (CILM) program, from which so many of us have benefited. In short, many good things happened to mathematics education in Ontario because of this pair, including the wonderful resources for teachers published in each edition of the *Abacus*.

It was with considerable excitement that we got to sit down and interview these two women, who had an incredible influence on the shape of mathematics education in Ontario—especially on my own (Iain) practice. It was like being able to sit down and interview your favourite rock stars. We talked about a wide-ranging set of topics, starting off with their work

on the *Abacus*. We'd like to share a few tasty morsels of our conversation to entice you to listen to the full meal that was our interview with MaryLou Kestell and Kathy Kubota-Zarivnij.

[The full audio of this interview can be listened to by going to our OAME Talks website or wherever you get your favourite podcasts.]

IB: What was your vision for what the *Abacus* could be for the teachers of Ontario?

MK: We really wanted something that teachers could use in the classroom. There was a big movement for teachers to be working together with special education teachers, librarians, and administrators on learning mathematics for teaching, and there was a big push on professional learning communities. Over the years, math leaders have said that they found our format of the *Abacus* to be very useful in the study that they were carrying on with their teachers.

IB: What was it like to develop the CILM out of [a] lesson study? What were some of the things you came to realize?

KKZ: It was the most honourable, most invigorating experience I've ever had in terms of professional learning and teacher education, to see principals and teachers who had to co-teach at their schools in between sessions. The superintendent had to co-teach with the co-teaching team, [and] the principals had to co-teach with each teacher during that month. I've got to tell you, these are all schools that were low achieving, and I can tell you, every one of them improved—I would say generally above 70–75 percent, and the lowest schools were at 85 percent in the EQAO [testing] in one year. They were shocked. We were shocked.

MK: One teacher said, "I've been teaching for 26 years, and I didn't think—I didn't know—they [the students] were so smart."

IB: Who influenced *you* the most?

KKZ: So, from my point of view, Brent Davis and complexity theory. Akihiko Takahashi and his understanding of geometry and Japanese-structured problem solving was really important. Then, I say the third person who really informed us was Deborah Ball. She was our very first webcast [guest], and I believe it is still the most-watched webcast that the Literacy [and] Numeracy Secretariat has ever produced.

MK: James Stigler, [who] did research in American, German, and Japanese schools, videotaped and then transcribed it all [for the TIMSS study]. What he was really sharing was that the challenge was what kept kids engaged in mathematics. He said, of all the studies, the countries that do the best are the countries that let children struggle. Instead of saying, "Oh, let me help you with that," or "Let me tell you how to do it," but rather [they allowed children] to figure it out themselves.

IB: What were some of your struggles?

MK: Teaching teachers mathematics? Like, it is really hard. Because, again, our culture thinks it's okay to hate mathematics. They don't see the beauty and the excitement and the love of it. And it's something that's hung over our heads for decades, centuries maybe. I mean, I am encouraged by the stuff in the Grade 9 curriculum, and maybe even the K to 8 stuff about culturally responsive and relevant pedagogy. But I don't think that teachers know how to do it. [...] Because we teach as we were taught, just as we parent as we were parented. But if we would only believe in kids, and trust other people, to know that we are all in this together, I think we [would] do a better job.

IB: Looking back at your time editing the *Abacus*, what comes to mind?

KKZ: It was an honour and a privilege to contribute to the math community. And that's why we did it, to contribute to the math community. So, we were able to do anything and everything that we wanted to do. When we had new ideas, we would put them out there and we'd get feedback. It was a wonderful experience. ▲



▲ Continuing to Foster Connections in Ontario Math Education: A Congratulatory Message from OMCA

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PAST PRESIDENT AND LIFE MEMBER OF OAME

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OMCAmath@gmail.com
OMCA PRESIDENT
OMCA REPRESENTATIVE TO OAME

The Ontario Mathematics Coordinators Association (OMCA) heartily congratulates OAME/AOEM on the celebration of their 50th anniversary! OMCA, which welcomes instructional leaders with responsibilities for mathematics programs within publicly funded Ontario school boards or school authorities, and OAME/AOEM, have a long history of co-operation and crossover. The intersections have come about because of a shared vision and goals for math education, and the many mathematics educators who have been members of both organizations.

Our History

The seeds of OMCA were planted about 65 years ago, during a period of educational reform, spurred on by the Cold War, with a renewed focus on mathematics and science. In that period of dynamic change, experimental math courses and course materials for Grades 7 to 13 were developed for Ontario schools. Many of the teachers involved in the writing went on to become curriculum leaders in some of the larger school boards. The first such leaders were Wyn Bates (Director of Mathematics, Toronto), John Del Grande (Coordinator, North York), Joe Perrell (Consultant, Hamilton), Norm Sharp (Supervisor, Etobicoke), and Jack McKnight (Coordinator, Scarborough). The "Super-Con-Dirs," as they were called, reflecting their varying titles (Superintendent, Consultant, and Director), met informally over lunches at first, and then more formally for full-day meetings as more educators with K–13 school board responsibilities for mathematics joined.

As the group became larger, it was formally named OMCA. A constitution was written in the mid-1970's, and the group was expanded to also include consultants from many smaller boards. By 2010, membership was over 100, and our membership continues to remain strong today, with well over 100 members. Many members of OMCA are also members of other organizations, such as the National Council of Supervisors of Mathematics (NCSM), the Canadian Mathematical Education Study Group, the Association of Teachers of Mathematics (UK), the Fields Institute, the Mathematical Association (UK), and the Canadian Mathematical Society.

The primary purpose of OMCA is to provide a framework for sharing ideas, professional development, and an avenue for a collective impact on the direction of education, particularly in the area of mathematics in the province of Ontario. In keeping with tradition, OMCA continues to host monthly members' meetings that focus on these priorities. These meetings have typically been held in person across southern Ontario, with various boards taking turns hosting. However, with advances in teleconference and video-conferencing technology over the past two decades, more and more members have been able to remotely join regular meetings from afar.

With digital connections becoming the norm, this year, OMCA welcomed its first President from a Northern Ontario board. A complete listing of Presidents and their boards appears in this issue, with those listed in bold typeface having served as Presidents of both OMCA and OAME/AOEM over time.

Along with OAME/AOEM, OMCA continues to evolve as the teaching profession evolves. Over the past two years, as the emergence of COVID-19 made in-person gathering an impossibility, members' meetings have become exclusively digital events. Province-wide members-only "armchair sessions"—with stakeholder groups sharing similar interests as OMCA (such as EQAO and the Ontario Ministry of Education); networking opportunities to discuss equity and the destreaming initiative in Grade 9 mathematics; and new digital spaces, where between-board sharing can transpire—are examples of some of the events that are now regular occurrences.

The association's Annual Retreat brings leaders in mathematics education together to learn and engage with inspirational leaders and advocates. It has also changed with the times. OMCA's first "consultants' seminar" in November 1983 evolved into a two-day in-person event, and

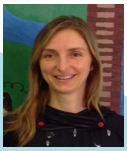
$O_3$4ME formerly COMA

In 2019, COMA (Carleton-Ottawa Mathematics Association) was rebranded the Ottawa Zone for Mathematics Education. Our chapter serves Ottawa-Carleton along with our neighbouring counties of Renfrew, Lanark, Prescott Russell, and Stormont Dundas Glengarry. O34ME endeavours to foster enthusiasm, innovation, and growth in mathematics education, with the goal of making teaching and learning accessible to all.

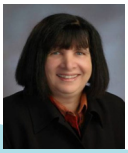
Over the last ten years, our "Welcome Back!" September Socials have featured the expertise of Dr. Marian Small, Dr. Christine Suurtamm, and Dr. Lynda Colgan—along with "Voices from the Field" in 2017 and "A Virtual Conversation" in 2021. Ongoing learning opportunities for our members have included an online book study of "Building Thinking Classrooms in Mathematics," as well as an ongoing series of Grade 9 virtual support sessions.

O34ME is one of OAME's largest chapters. We have always been very proud of our collegiality, collaboration, and leadership in our region's math communities. We have a reputation of "paying it forward" in the pursuit of professional learning and excellence in teaching.

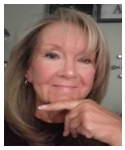
A Decade of OAME Award Winners



Carolyn Crosby
2013
Exceptional & Creative Teaching Secondary



Dr. Marian Small
2018
Leadership in Mathematics



Cathy Hall
2019
OAME Lifetime Membership Award

We look forward to co-hosting the 2024 OAME Annual Conference with QSLMA as we head into the next 50 years!

Secondary School Mathematics Staff



West Carleton SS
2012



St. Patrick's HS
2016



Bruce McLaurin & Alex Overwijk
Glebe Collegiate Institute
2017

2017 Leadership Conference

2019 Annual Conference

most recently (2020 and 2021) into a one-day virtual symposium. Though the latter evolution was to accommodate public health restrictions, as with the shift to the virtual OAME/AOEM conferences, our virtual symposia experienced the added benefit of being able to welcome together both speakers and participants from a wide geographical area.

Our Connections with OAME/AOEM

OMCA and OAME/AOEM have often joined together in many provincial curriculum reviews, curriculum supports and resources, and Ministry of Education-funded projects. These have included TIPS, PLMLP, CLIPS, MathGAINS, CAMPPP, among others. OMCA members have also played critical roles for OAME/AOEM provincial and chapter conferences, such as conference or committee (co-)chairs. When the world pivoted to digital media with the pandemic, OAME/AOEM was invaluable in assisting OMCA in getting meetings and events off the ground.

Further solidifying our alliance, both OAME/AOEM and OMCA have representatives in the other's organization to facilitate communication and collaboration between the two associations. OMCA has also been grateful to contribute updates on its activities in the *Gazette* as a regular column.

As with the recent changes to both the elementary curriculum and the new destreamed Grade 9 math program, OMCA will continue to work with OAME/AOEM to ensure that the teachers and mathematics leaders of Ontario have reasoned, cogent, and coordinated input whenever the mathematics curricula come up for review or revision.

The Executive and members of OMCA look forward to the ever-changing challenges in mathematics and education, and to ongoing collaborations with OAME/AOEM. We congratulate the *Gazette* on a momentous 60th anniversary, and OAME/AOEM on its golden 50th anniversary. For a more detailed history of OMCA, as well as to learn about our upcoming events, please visit our association's website, www.omca.website.

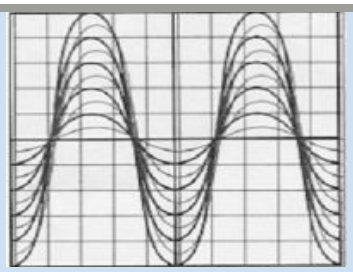
OMCA Presidents and Their School Boards

Presidents listed in **bold** have served as President of both OMCA and OAME.

1981 – George Knill – Hamilton
1982 – John Clark – Toronto
1983 – Jim Fencott – Scarborough
1984 – **Alex Norrie** – Peel
1985 – John Del Grande – North York
1986 – Lorna Morrow – North York

1987 – Shirley McIntyre – East York
1988 – Brendan Kelly – Halton
1989 – Paul Zolis – Scarborough
1990 – Ron Sauer – Waterloo
1991 – Jeff Martin – Etobicoke
1992 – **Judy Crompton** – Niagara
1993 – **Peter Saarimaki** – Toronto
1994 – Rad de Peiza – East York
1995 – **George Knill** – Hamilton
1996 – **Mary Lou Kestell** – Hamilton-Wentworth
1997 – Mike Weirzba – Etobicoke
1998 – **Marg Warren** – Peel
1999 – **Stewart Craven** – Toronto
2000 – Tom Steinke – Ottawa-Carleton Catholic
2001 – Ruth Dawson – Halton
2002 – Jay Speijer – Niagara
2003 – Jay Speijer – Niagara
2004 – Shelley Yearley – Trillium Lakelands
2005 – Pat Milot – Niagara
2006 – Mark Kolohon – Bluewater
2007 – Joyce Tonner – Thames Valley
2008 – Cheryl McQueen & Scott Armstrong – Thames Valley (first joint Presidents)
2009 – **Jacqueline Hill** – Durham
2010 – Amy Lin – Halton
2011 – Sandie Rowell – Hamilton-Wentworth
2012 – Mary Fiore – Peel
2013 – Cam MacDonald – Grand Erie
2014 – Erik Teather – Niagara
2015 – Dan Allen – Durham Catholic
2016 – Chad Richard – Durham Catholic
2017 – Cathy Chaput – Wellington Catholic
2018 – Mike Jacobs – Durham Catholic
2019 – Livia Covino – Peel
2020 – Rhonda Hewer – Waterloo Region
2021 – Heather Theijsmeijer – Rainbow

▲



York 4 Mathematics Association

Executive Directors
Don and Carol Attridge, 1989–1994

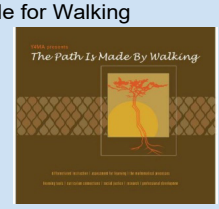
Chapter President
Keith Auyeung, 2019–2021

OAME Life Members
Don Attridge, 1987
Bill Nimigon, 1994
Myrna Ingalls, 2009

OAME Annual Conference
OAME 1992: Perspectives
OAME 1999: Mathematics—New Visions, No Limits
OAME 2008: The Path Is Made for Walking

Past Presidents
Don Attridge, 1972–1973
J Symington, 1988–1989
Shirley Dalrymple, 2001–2002
Connie Quadrini, 2011–2012





Don Attridge Award: Exceptional and Creative Teaching Secondary Mathematics Teaching
Janet Scully, 1999
Myrna Ingalls, 2000
Mike Morin, 2003
Shawn Perry, 2008
Cheryl Costigan, 2010

Morley MacGregor Award: Exceptional and Creative Elementary Mathematics Teaching
Helen Hart, 2001

Kenneth D. Fryer Award
Unionville SS, 1992
Markville SS, 1995
Middlefield CI, 1998, 2008
Dr. Denison SS, 1999
St. Joan of Arc CHS, 2010

OMO Champions
Cummer MS, 2011

Mona MacGregor Award for Outstanding Contribution to OAME and Math Education in Ontario
Carol Attridge, 1995
John Kearns, 2001

Union Gas Award for Outstanding Leadership in Mathematics Education
Connie Quadrini, 2003

Y^{4}MA Partners: York University, York Region DSB, York Catholic DSB, and Toronto DSB

▲ The Ontario Mathematics Olympics (OMO)

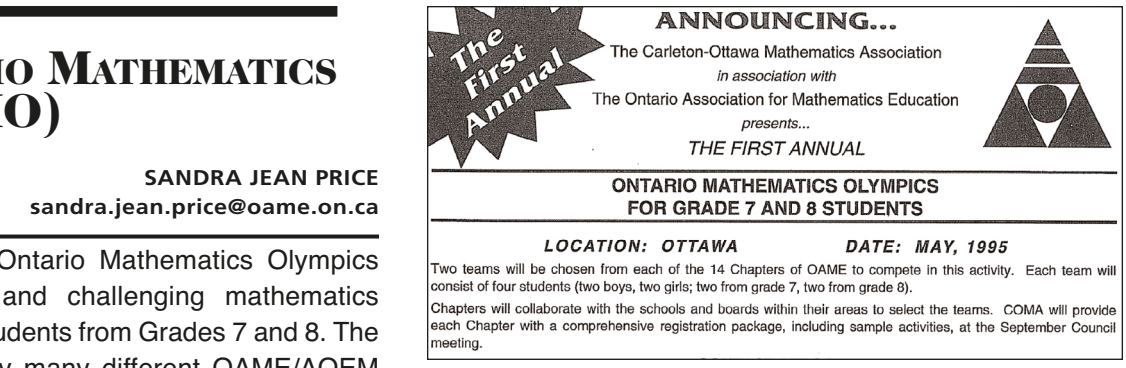
SANDRA JEAN PRICE
sandra.jean.price@oame.on.ca

For many years, the Ontario Mathematics Olympics (OMO) provided a fun and challenging mathematics competition for teams of students from Grades 7 and 8. The event has been hosted by many different OAME/AOEM chapters throughout the province since its inception in 1995. It was originally created to encourage, among other things, gender equity in terms of mathematics education at a time when more males were seeking higher education and careers in math and sciences.

Each OMO would begin with a round of chapter-based competitions, and teams could progress to the annual provincial event. For the provincial round, teams consisted of four students, requiring two females and two males, as well as two students from Grade 7 and two from Grade 8. Teams solved problems based on the Grades 7 and 8 Ontario mathematics curricula. Different problems required answers to be generated individually, in pairs, or using a team approach. Students demonstrated their understanding of the mathematical concepts, their ability to solve problems and communicate their thinking, and their capacity to apply their mathematical knowledge in various situations.

Throughout the multi-day event, students celebrated mathematics by creating team chants and posters representing their local chapters, and engaging in activities such as minute-to-win-it competitions, math trails, scavenger hunts, and creative activities such as inventing and performing a math poem or interviewing a math concept.

The last provincial event was hosted in 2018. However, many local chapters of OAME/AOEM continue to offer Regional Math Olympics events in their geographical areas. The OAME/AOEM continues to support and encourage these local events to ensure that students have an opportunity to celebrate mathematics and the collaborative environment in which real problem-solving occurs.


ANNOUNCING...

The First Annual

The Carleton-Ottawa Mathematics Association
in association with
The Ontario Association for Mathematics Education
presents...
THE FIRST ANNUAL

ONTARIO MATHEMATICS OLYMPICS
FOR GRADE 7 AND 8 STUDENTS

LOCATION: OTTAWA ***DATE: MAY, 1995***

Two teams will be chosen from each of the 14 Chapters of OAME to compete in this activity. Each team will consist of four students (two boys, two girls; two from grade 7, two from grade 8).

Chapters will collaborate with the schools and boards within their areas to select the teams. COMA will provide each Chapter with a comprehensive registration package, including sample activities, at the September Council meeting.

1995 COMA	2004 PRMA	2012 SWOAME
1996 SAME	2005 NOMA	2014 MAC^2
1997 MAC^2	2006 SAME	2015 COMA
1999 TEAMS	2007 COMA	2016 SAME
2000 QSLMA	2008 PRMA	2017 TEAMS
2001 NWOAME	2009 PRMA	2018 CHAMP
2002 TEAMS	2010 MAC^2	
2003 WOMA	2011 TEAMS	▲

CCS *for your Math supplies!*

Congratulations to the* Gazette *and the OAME on their 60th Anniversary.

It's been quite a journey that we at CCS have been honoured to watch. Its improvements have been truly staggering but it could not have happened without contributions by the Math teachers, editors and other supporters.

We at CCS are looking forward to see what they have in store for us in the years to come.

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▲ Elementary Math Matters: 1998—Monster Ice Storms, Megacities, Massive Amalgamated School Boards, and Major Math Makeovers



LYNDA COLGAN
lynda.colgan@queensu.ca

Lynda Colgan is Professor Emerita, Faculty of Education, Queen's University. Lynda is currently working on a number of research, resource-creation, and teacher-education projects, funded by the Natural Sciences and Engineering Research Council (NSERC), the Social Sciences and Humanities Research Council of Canada (SSHRC), and the Mathematics Knowledge Network (MKN). She will carry on her long-established commitment to STEM outreach by continuing to seek out creative avenues to engage students, parents, and educators in mathematics at home and in the classroom.

I began my tenure as a professor at the Faculty of Education at Queen's University, nearly one-quarter century ago, in 1998—a momentous year in many ways, certainly one that changed everything for mathematics education in Ontario, and for me, professionally. It seems only fitting that as we celebrate this special anniversary of the *Gazette*, to reflect on that impactful year.

"Unprecedented" is *the* word of the first three years of this current decade because of the unparalleled societal, economic, and educational upheaval caused by the 2020–2022 COVID-19 pandemic. True, there have been changes to mathematics in Ontario during these angst-ridden years—specifically, revisions to content and attention to affect in the 2020 Grades 1–8 curriculum and the more significant destreamed Grade 9 mathematics program, rolled out for September 2021. Both were poorly timed: announced in late June of both school years for September implementation. And yet, as one who has been fortunate enough to have survived unscathed by the successive waves rolled in by virus variants, and, consequently the most recent curricular modifications to Ontario math programs, I still believe that no changes can compare to the magnitude of those mandated in 1998.

As I looked back, I found it no surprise that 1998 began with the Great Ice Storm. Nicknamed the "storm of the century," 100 mm of freezing rain and ice pellets pummelled eastern Ontario and parts of Quebec (as well as the Eastern seaboard of the United States) from January 5 to 10, toppling power and phone lines, trees, utility poles, and electrical transmission towers. It left some four million people without electricity, heat, food, and water; devastated farming communities (for example, 10 million litres of milk had to be discarded) and causing immeasurable damage to forests.

Kingston, Ontario, home to Queen's University, was hardest hit on Thursday, January 8, 1998, and many streets in the older neighbourhoods of the city were impassable for days because of downed wires and trees. Schools were closed and bus services were suspended for two weeks as crews worked around the clock, first to restore power for essential services such as the hospital and emergency shelters, and then to respond to businesses and homeowners.

It was shortly after the first state of emergency in Kingston's history had ended that I travelled to the beleaguered city that still bore deep scars from the massive ice storm for a two-day interview process, filling a position in elementary mathematics education at the Faculty of Education.

Until then, I had been the K–12 Mathematics Coordinator for the Scarborough Board of Education (SBE), one of the largest school districts in Canada, with 160 elementary schools and 27 secondary schools providing programming to some 81 000 students.

But everything changed on January 1, 1998, when the provincial government, under the leadership of then Premier Mike Harris, mandated the formulation of the "superboards," which remain to this day. In the process of reducing the number of school districts from 129 to 72, the Toronto District School Board was created by amalgamating the Scarborough, North York, East York, Etobicoke, (City of) York, and (City of) Toronto districts into a mammoth conglomeration of more than 500 schools, 800 administrators, and 19 000 teachers and staff.

In the process, because the original board-level Mathematics Coordinator positions were eliminated and departments simultaneously slashed in numbers and centralized, I made the difficult decision, after 25 happy and fruitful years with the board, to resign. It was not easy to say farewell to visionary leaders who were my mentors. SBE had a one-of-a-kind mathematics resource-lending library/professional development centre; a talented cadre of gifted colleagues in the curriculum branch; enthusiastic workshop participants, who in turn, led by example in their home schools; hundreds of impressive students, who participated in mathematics clubs and leagues; families, who attended

and led *Family Math* nights; and the close community—that *was* SBE.

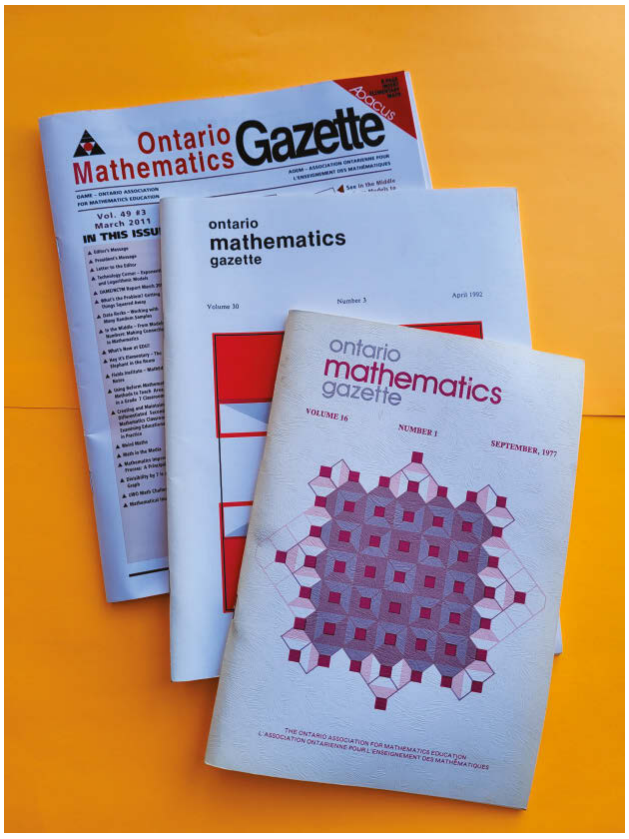
The blues that came with leaving the only professional home that I had ever known, diminished when I recognized the exciting opportunities that my new role as an Assistant Professor afforded me as an implementer for, and influencer of, the "new curriculum" of 1998.

While in 1985, new guidelines were introduced that described approaches to teaching mathematics through inquiry, problem solving, and the use of technology—the main tenets of all subsequent documents for curriculum renewal in Ontario—the "new curriculum" of 1998 was certainly the most massive shift in content, pedagogy, and assessment that the province had ever experienced. *The Ontario Curriculum, Grades 1–8: Mathematics* was born in an era of measurability:

> Teachers and parents wanted more clarity about the required learning outcomes for each and every grade, while the province wanted a curriculum that was standard across the province. Ideally, the mathematics delivered in a Grade 2 classroom in Thunder Bay would be the same as the mathematics delivered in Grade 2 classrooms in Sarnia or Ottawa (Craven, 2003, p. 1).

The 1998 Ontario policy was adapted principally from the 1989 National Council of Teachers of Mathematics (NCTM) Curriculum and Evaluation Standards document—and was built on the principles of constructivism, qualitative evaluation based on the communication of mathematical ideas, real-world context, and equity (defined as high standards for all students). In keeping with the guiding principles of the NCTM framework, the traditional major focus on number in elementary grades was superceded by a broader suite of mathematics content, delineated by (the now familiar) distinct strands: Number Sense and Numeration, Spatial Sense and Geometry, Data Management and Probability, Measurement, and Patterning and Algebra. There was also new rigour, concretized by the 80 to 100 specific curriculum expectations per strand, per grade, and the standardized four-point achievement scale detailed in a rubric (a new type of assessment tool), organized by process (not quantitative) descriptors: problem solving, understanding of concepts, application of mathematical procedures, and communication.

In keeping with the NCTM focus on conceptual understanding through guided discovery, in contrast to direct instruction, the 1998 Ontario curriculum document also placed a heavy emphasis on inquiry as the vehicle for teaching and learning in mathematics. It invested many



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pages to differentiate how "inquiry" manifests itself across the grades, from informal, experiential processes in Kindergarten to the use of explicit metacognitive strategies by Grade 8. The inquiry approach represented a radical shift away from traditional teaching methods, and was conceptualized as open-ended tasks best solved using manipulatives and technology (calculators, computers) as "thinker tools" by small groups of students working collaboratively to describe their solutions as well as debugging strategies.

While none of this may sound "new" to today's reader, at the time, the changes to content and philosophy were extraordinarily radical and highly controversial. The backlash from some educators and academics, parents/guardians, and community watchdogs constituted a storm surge far stronger than the Great Ice Storm. The change was deemed to be too much, too soon. As a result, front-line classroom teachers were not only required to accept and implement the mandated changes to teaching and evaluation, they were left to defend what the press broadcast, and the public perceived, as the erosion of basic mathematical skills that would jeopardize the future of Ontario's children.

At the same time, those same educators were called upon to uphold their professional reputation, since in 1998, the results of the first provincial assessment of reading and mathematics, led by the Education, Quality and Accountability Office (EQAO), were announced. While the intent of the Ontario-wide test had been constructive (i.e., to inform professional development and guide resource development), the published, disappointing announcements about student achievement were punitive: quantifying student success (and, by extension, teacher effectiveness) as a return on dollars invested.

To say that 1998 was a stressful time for elementary educators would be a gross understatement. In addition to the new mathematics curriculum and a standards-based assessment for all Grades 3 and 6 students, the year marked the introduction and implementation requirement for revised curricula in virtually every other subject area: Language, Science and Technology, The Arts, Health and Physical Education, and Social Studies. It was a year of unrelenting, tsunami-like change.

While remote learning and reliance on the World Wide Web may have become the bane of education between 2020 and 2022, access to the Internet has also been a savior during this time, providing opportunities to enhance, extend, and enrich teaching in innumerable ways via endless resources and idea sharing. In contrast, and often difficult to recall or imagine, 1998 was a time when the Internet was nascent, digital sharing was in its infancy, and widespread access to technology was limited and rarefied. Even PowerPoint was only eight years old for non-Mac users.

The year 1998 was also in the age of the biggest-ever cuts in government spending and school district budgets. One of the departments most affected was the Ontario Ministry of Education (OME). Prior to the mid-1990's, the OME and its large cadre of subject-specific experts provided direct support, not only in the development of curriculum documents, but more importantly, in their implementation across all regions of the province. When the Harris regime assumed power in 1995, there were massive financial cuts to education and the dismissal of huge numbers of civil servants. Prior to that, it was common practice for regional Education Officers across the province to go "into the classrooms of the province to provide direct instructional assistance (and sometimes supervision) to the classroom teacher and the school more generally" (Puk & Haines, 1998, p. 190).

As a result of the budget cuts, by 1998, the responsibility for implementing these profoundly new provincial policy/curriculum documents was left almost entirely to each school district, each school, and each teacher, with minimal support from the OME (Puk & Haines, 1998).

In spite of, or more likely because of, these barriers and context, the community galvanized as never before in constructive and productive ways because the "new curriculum" was ground zero at the base of a near-vertical learning curve for all Ontario mathematics educators—classroom teachers, school leaders, and university faculty.

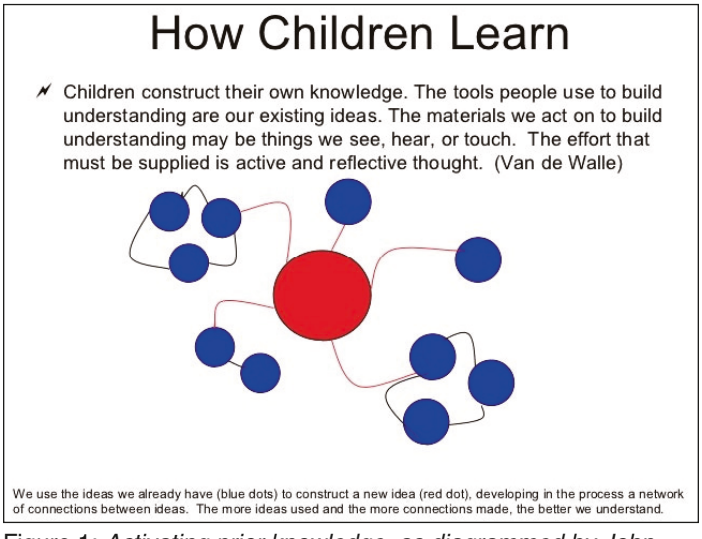


Figure 1: *Activating prior knowledge, as diagrammed by John Van de Walle (https://ptgmedia.pearsoncmg.com/imprint_downloads/merrill_professi onal/Van_de_Walle_9780132824828.pdf)*

It was a heady, "we're all in this together" time. Everyone,

from classroom teacher to pre-service instructor and in-service facilitator shared the same status: novice. At every level, as a collective body, we grappled with complex concepts and practices. This included "hands on, heads in" learning (rich tasks, visual representations); mathematical processes (inquiry, problem solving, reasoning, communication); new computational strategies (e.g., addition by decomposition); formative, summative, and diagnostic assessment; the integration of technology (graphing data, using Excel); and models for cognition (e.g., activating learners' prior knowledge, as diagrammed by John Van de Walle (Van de Walle et al., p. 5) (see Figure 1).

The "rapid response" of 1998 came in the form of a deep dive by provincial mathematics education leaders—members of the OMCA, as well as emerging and creative contributors, who added their voices and resources in joining forces with the OAME/AOEM. With its responsive regional workshops, programmatically rich province-wide conferences, and *Gazette* publications, not only was OAME/AOEM the supporting body for the implementation of the "new curriculum," it was the "driver" of change for the era.

The generous sharing of "early adopters" about the priorities, principles, and practices described in *The Ontario Curriculum, Grades 1–8: Mathematics* allowed others to see the document come to life—the content expectations, approaches to process-oriented instruction, and constructive evaluation became concrete, transparent, and "do-able," rather than theoretical and impractical.

As we celebrate the *Gazette*, it seemed like the right time to thank those authors, workshop leaders, and resource developers for being the antidote that empowered me to do my job. Participatory sessions about learning carpets and cube-a-links, rubric design and open-ended tasks, as well as articles about managing manipulatives and learning portfolios, fuelled my B.Ed. and graduate classes at Queen's University. They informed my workshops with teachers, administrators, and parents across Ontario, and ignited my own inquiries into many related issues, from using origami and paper-doll chains as concept visualization aids, to examining the role of a digital community of practice as a shared repository for early-career teachers.

I am not sure if it was serendipity, karma, luck, fate, blessing, or fluke, but it was during the weird and wired time of the implementation of the "new curriculum" from 1998 that I became a columnist for the *Gazette*. I joined the esteemed body of regular, featured, and guest writers, upon whom I relied to navigate the "mathematics reform storm of the century." Their example set a high bar for me and set my trajectory in two directions—outreach to the broader community and giving back to my mathematics education community—the criteria upon which my work as a Professor of mathematics education has been judged.

And so, in closing, with humility and appreciation, I attribute all of the consequential accomplishments of my career—The Marshall McLuhan Award, Golden Apple Teaching Award, Jonathan Borwein Mathematics Ambassador Award, NSERC Science Promotion Prize, Queen's Distinguished Service Award, and the 2022 nomination for the Sir David Attenborough Medal (in increasing order of importance)—to Mike Harris, the storm of the century, the viral curriculum, events of 1998, the OAME/AOEM, and the *Gazette*.

To those in the eye of the 2022 COVID-19 pandemic, I extend sincere good wishes. I also ask you to remember, as I tried to illustrate in this column by using "big ideas" that I learned from a blog written by Dr. Adrianne Pinkney: Storms bring people closer together; storms humble us into new patterns of behaviour; storms teach us about our foundations; storms offer us opportunities to discover new strengths and skills; and storms offer perspective.

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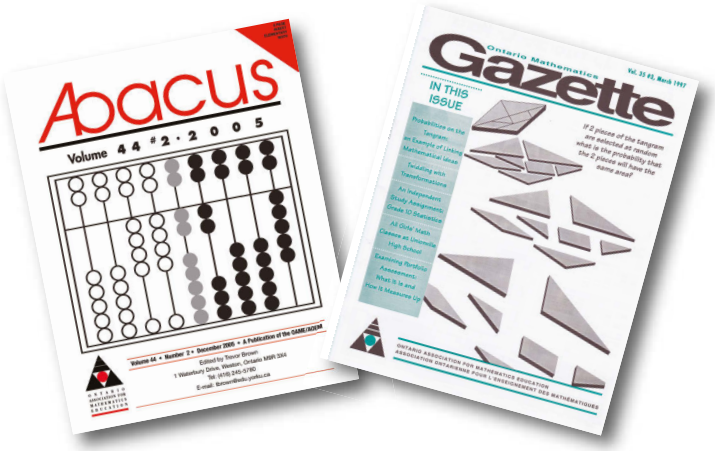
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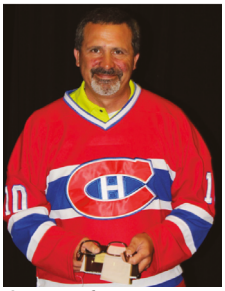


▲ Past-President Reflections

Paul Alves, 2014–2015

Attempting to recall my time as President of OAME/AOEM, I went back to my final President's Message—a sign of my failing memory, rather than the lack of memorable events. The year started out with a Leadership Conference that was notable for being very well attended. It marked the return of Jo Boaler after her keynote at the OAME 2014 Annual Conference—*CHAMPions for Change*—for a full day of learning with leaders, as well as highly engaging talks from Amy Lin, Dr. Cathy Bruce, and Shelley Yearley.

The euphoria of the Leadership Conference was replaced with the anxiety of increasing labour tensions between the Province and teacher unions, and the possible impact on the OAME 2015 Annual Conference—*Building Mathematical Mindsets*. The annual conference marks a defining moment for every President, but this year was of special significance, as the OAME 2015 Annual Conference marked the first time that the OAME/AOEM Board was organizing the conference. With no chapter hosting the conference that year, it fell to the Board to host and run the conference at Humber College. Despite the challenges that presented themselves, the conference was once again a high point for the mathematics education community in the province.



Registration had to be closed due to overwhelming demand, and there were many highlights over the course of the three days. The photo below captures some of those involved in the conference organization, as well as a picture that sums up some of the lengths I had to take/endure to attend the conference—a staunch Leafs fan wearing a Habs jersey!



The end of my term brought with it a mixture of sadness and relief. I had survived a year of challenge professionally, and OAME/AOEM had maintained its commitment to its mission during a tumultuous year. A part of me wished that there could have been fewer bumps in the road during the year, and it was hard to recall a more difficult year for the organization. Perhaps I could have had a little more foresight and been able to anticipate those bumps in the road. If I were to get the chance again, surely it couldn't be any tougher than 2014–2015. And then I was President again in 2019–2020.

Paul Alves, 2019–2020



The plan had never been to run again for OAME/AOEM President. However, when I was approached about a possible second term, I recalled my previous term (see 2014–2015) and seriously considered a term where my energy could focus on fulfilling a vision of service to the OAME/AOEM membership and furthering some work that had been started around restructuring the provincial conference.

Starting off my term, I was looking forward to hosting the Leadership Conference again. My goal for the conference was to focus on the work being done around the province supporting progressive moves in pedagogy and assessment, instructional leadership, as well as equity, access, and inclusion with a specific focus on anti-Black racism. The program focus was a response to the challenges presented by a political climate that looked to disrupt some of the positive work that had recently been accomplished.

In between the big events on the OAME/AOEM calendar, much of the work of the President focuses on guiding the organization through regular Executive and Board meetings. Of particular note this year were the new ad-hoc committees that were addressing important needs for the organization, including document management, technology, conference planning, and advocacy. I engaged with the Advocacy Committee, and by the time June rolled around, we were very proud to produce OAME's first position statement. The topic was Access, Equity, and Inclusion, but a lot would happen in the interim.



The new year brought with it news of the emerging COVID-19 virus. It didn't take long for the impact of the pandemic to change OAME's trajectory for the year. The decision to cancel the OAME 2020 Annual Conference—*In Focus* (hosted by SAME and PRMA)—was made

early in the year. It is difficult to encapsulate how difficult a decision this was, given the amount of time and effort provided by the volunteers from these two chapters. OAME/AOEM owes them a great debt of gratitude. However, all that work was not in vain. From the session proposals that had been submitted, the Executive Committee made the decision to host a free virtual conference. The result and response were overwhelmingly positive. Over 5000 educators participated in the virtual conference. It is a testament to the dedication of the volunteers that we were able to reaffirm our commitment to our mission and vision.

In the midst of the pandemic, we also witnessed the horror of the murder of George Floyd. In response to what we were all experiencing, OAME/AOEM published a statement affirming that the mathematics classroom is a space where conversations around racial justice can, should, and must occur.

Among all that was happening on a variety of fronts, there was also a new Grades 1–8 mathematics curriculum that was set to be released in the Spring. The Spring turned out to be late June. OAME/AOEM partnered with AFEMO, a historic collaboration, to engage in a project, with Ontario Ministry of Education funding, to support the implementation of the new curriculum. This was followed with a project to transform a few mathies apps to HTML5.

The end of my term marked the last of the one-year term presidencies. A constitutional change would now mean that Presidents would serve two years—a welcome change to ensure that a vision is given adequate time for implementation. I was a little pained in thinking that perhaps I could serve one more year, but at the same time, that one year was quite a ride.

Sonia Ellison, 2013–2014

During my time as President, 2013–2014, OAME/AOEM focused on working to ensure educators and students continued toward teaching and learning in the twenty-first century. Even though we were well into the twenty-first century, provincial competencies were a part of the focus of our Leadership Conference as we worked with Karen Hume to take a closer look at meeting students where they were and further developing lessons that addressed key skills for their futures. TEAMS hosted the Annual Conference that year, and we were challenged to "Think BIG!" I was also thrilled to be part of the organizing committee for CHAMP, that took the lead on the 2014 Annual Conference. I will always be grateful for my time as President and continue to be proud to belong to an organization that reminds all math educators that we can make a difference for every student in our province and beyond. Congratulations, OAME/AOEM, on your 50th anniversary! Here's to another 50. Cheers!

Cathy Hall, 2012–2013



Making Math Happen... my "catch phrase" during my year as President!

Yes, we did accomplish a lot that year... despite budgetary constraints and outside challenges!

(Cathy paused for reflection and a deep breath.)

Real-time virtual professional development offerings were piloted by several chapters to better serve their members.

Excellence in math education and service to our membership remained everyone's goal.

Constitutional changes realigned the structure of the Board of Directors, as well as its "year."

Ongoing job actions and unrest across school boards made conference and event planning more difficult.

Learning and leading remained, as always, the hallmarks of our professional organization.

Leadership Conference 2012, "On the Leading Edge," featured Doug Duff and a stellar team of presenters!

Everyone was inspired to "Think BIG" at the 2013 Annual Conference, hosted by TEAMS at Seneca College.

Chapters continued to deliver exciting professional learning within their regions during a difficult year!

The Financial Literacy Writing Team produced the first unit in a set of targeted teaching resources.

Informed feedback was offered to the Ontario Ministry of Education regarding the upcoming curriculum review.

Outreach Committee initiatives and "outside the box" thinking helped us grow our membership.

Needs of teachers, students, and parents were, as always, at the forefront of all our OAME/AOEM initiatives.

S-o-o-o quickly, it seemed, my one-year term as President was over!!!

A huge thanks to all those who played a part in making 2012–2013 so impactful for OAME/AOEM! I have fond memories of my year at the helm—an amazing year of community, collaboration, and collegiality!

My best wishes as OAME/AOEM enters its next half century of "making math happen" across Ontario and beyond!

Jill Lazarus, 2017–2018



Looking back at my time as OAME/AOEM President, from September 2017 until August 2018, some of the key events included:

- the OAME Leadership Conference being held in Ottawa for the first time
- the Board of Directors organizing the OAME Annual Conference for a second time
- the Ad Hoc Conference Committee (formed in 2016) reporting recommendations on key areas related to the annual conference
- the Board of Directors and Executive Committee reflecting on and revising the OAME/AOEM mission, vision, and strategic priorities
- the Executive Committee reviewing the roles of different committees, the Board of Directors, and Executive, and considering new possibilities

A key challenge at the time involved organizing a growing annual conference. This was not a new challenge. For instance, an OAME/AOEM Ad Hoc Conference Committee was formed in 2016 to examine various aspects of the conference, including the challenges. This work culminated in a report on recommendations that was presented to the Board of Directors in 2018.

As the OAME Annual Conference continued to grow in size, organizing this conference was becoming more challenging for regional chapters. With no chapter volunteering to organize the 2018 Annual Conference, the Board of Directors took on this task. As a result, many of the more typical Board meeting activities were on the back burner during my year as President.



The Leadership Conference

Even though we had to replace some of the regular Board meeting activities with conference planning, reviewing and updating the OAME/AOEM mission, vision, and strategic priorities became a central focus. This work culminated in a summer meeting, facilitated by Dr. Chris Suurtamm, which involved the Executive Committee and special guests in identifying our mission and vision, as well as both long-term and short-term goals, and reviewing various Board of Director and Executive roles. This work resulted in some changes to the Board committees, including the addition of more flexible "ad hoc" committees to address current issues (e.g., position statements, podcasts, and webinars, the annual conference, document management, technology).



Vertical non-permanent surfaces

Thus, my time as President entailed a re-examination of some structural features in the leadership of the organization. This was necessary to address the growing size of the organization and to address new systemic challenges such as the size of the annual conference.



During the preparation of this piece, a mystery arose! Jill has an annual conference ring, and we were unable to find out the story behind it. How many are there? Who was the ringleader? Any idea? Send a letter to the Editor if you can help solve the mystery.

David Petro, 2018–2019



I was President of OAME/AOEM from September 2018 to September 2019, but I was nominated in the early part of 2017. At that time, it seemed out of the blue. I had previously been on the OAME/AOEM Board of Directors as a chapter representative (starting in 2002), but I had been out of that role for a decade, so I was surprised that someone thought of me. Having no experience in that kind of leadership role apparently was not a deterrent for me (I am always up for a challenge). I am happy to say that during the year that I was President, things ran pretty smoothly (and not because of anything that I did).

I think that things ran smoothly because it's clear that you're never doing the President's job alone. You have a Past President and a President-Elect, essentially all working together. During the three years, I worked with Jill Lazarus, Judy Mendaglio, and Paul Alves. With that crew (and the rest of the OAME/AOEM Executive), I was happy to say that I had my fingers in organizing the 2018 annual and leadership conferences, converting the 2020 conference to virtual, creating the Executive Emeritus position, turning the presidency into a two-year term, coming up with new mission and vision statements, setting up what became the support project for the new math curriculum, and even getting the ball rolling to support the revamping of the Mathies.ca apps.



2018 Leadership Conference in Windsor

As President, I was told that I had to have some sort of vision for my presidency. What I really wanted was to make OAME/AOEM a household name. I don't think I was able to do that during my time, but what I was able to do was to fulfill an idea that Greg Clarke and I came up with many years ago—to start a math-based podcast. And so, OAME Talks was born (talks.oame.on.ca). We have had three seasons now of turning face-to-face OAME conference sessions into podcast interviews and online webinars (well beforehand, there was this thing called a pandemic). I guess, as I look back, maybe my time on the OAME/AOEM Executive was fairly eventful, and even for a newbie such as myself, I was able to (help) get stuff done.

Tim Sibbald, 2015–2016



My recollections of being Past President are somewhat muddled because I have held a variety of positions over a period of years. The conversations specific to one year blur with the discussions from other years, other positions, and the ebb and flow of issues requiring attention. What I do recall is bringing a vision of co-operation among math education organizations. With a view that there are a wide variety of partners within Ontario, across Canada, and even beyond Canada, I put in efforts to strengthen connections.

There were various seeds and conversations that have subsequently shown improved connections as a result. None are overly obvious, but conversations reinvigorated during my presidency caused change. Not abrupt change—that was not the vision—but, like a well-tended garden, it has slowly grown. I recall this distinctly because of the OAME/AOEM mandate for Presidents to bring a vision to the role.

The year saw many issues addressed, and here is where the recollection becomes muddled. When I think back, do I recall the view from the presidency? Or was it time as a Director, a Vice-President, or another role? The lasting perspective of my year as President and all the other leadership roles OAME/AOEM has welcomed me into is not one of individual perspective. It is an ongoing collective effort with many supporting colleagues. It is a flow of processes with which one engages.

Along the way, there were small actions, such as leading a revamping of the leadership conference binder, while wondering if subsequent visions of Presidents would support the change in vision of the document. This became a relevant detail in later discussions around how the OAME/AOEM manages the various documents that it has. Similarly, there are many actions that arose during the year as President that I have seen develop further in subsequent years (such as suggesting moving the Leadership Conference year to year). I recall also causing difficulties, knowing that solutions would be found to remedy the difficulties. For example, as Past President, one is supposed to chair the Election Committee, but I decided to run in the election again and pointed out the conflict of interest—a novel process was instigated. I also ran on the ballot for multiple positions, which later led to constitutional changes so that voting facilitates people running for multiple positions, which gives the membership additional choice.

As a Past President, what I do recall is the support that was provided by the Executive Directors—Lynda and Fred, the Executive, the Board of Directors, and the membership. I always felt that I was representing the team, and I always felt the strength of the organization was the team. Nowadays when I am at Board of Director meetings, I find it inspiring to see members growing and maturing within that team environment. As such, I see my Past-President role as one of encouraging the next generation of leaders. My year as President played a pivotal role in recognizing it is incumbent on all leaders, past and present, in the OAME/AOEM to be developing a legacy for the next 50 years, something in which everyone reading this has a role.

Judy Mendaglio (2016–2017)



Let me introduce myself. I am Judy Mendaglio, and I am currently President of OAME/AOEM. Those of you who follow such things will know that this is my second opportunity to lead this amazing organization as its President. The first time I served in this role was in 2016–2017. I had served on the OAME/AOEM Board of Directors as Director and Vice-President, but had never considered running for President. Honestly, when I looked at the roster of Past Presidents, I did not feel up to the challenge. Luckily, people convinced me that I should run in the election because I cared about the organization and had the necessary skills to lead it. I was promised lots of support, which I knew I would get. I say "luckily" because during my three years as President-Elect, President, and Past President, I learned more about the people and the working of OAME/AOEM than I could have learned in any other role, and I grew, both professionally and personally, as a result.

I feel extremely honoured to have been given the opportunity, not once, but twice, to represent this organization.

In April 2016, as President-Elect, I was able to represent OAME/AOEM at the NCTM Annual Conference. It was at this conference that the *Gazette* was recognized for its excellence, and I was there when Dan Jarvis, then *Gazette* Editor, was presented with the NCTM 2016 Affiliate Publication Award. At the conference, while waiting in lines for an hour to get in to see a speaker or enter a workshop (they do not have pre-registration for sessions the way the OAME Annual Conference does), I learned a lot about what the environment is for math teachers in the United States, and it is very different from here. I was continuously grateful to be an educator in Ontario, as I heard many stories from American teachers about challenges they face.



The Leadership Conference

I have lots of wonderful memories of my year as President, but the highlights are definitely our two extraordinary conferences. We had an exceptional Leadership Conference with Jo Boaler and Cathy Williams in November 2016. This was an amazing opportunity for math educators to spend a whole day with Jo and Cathy, doing math and discussing mathematics teaching and learning. As wonderful as Jo Boaler is as a keynote speaker, she is even more extraordinary when leading a workshop. In May 2017, the OAME/AOEM Annual Conference, organized by QSLMA (Kingston), was such fun and offered an amazing selection of great sessions.

I am also proud of the action research conducted by the Math4theNines folks, the Math4theNines Adobe Connect Professional Learning Series that they hosted (at which I learned about *5 Practices for Orchestrating Productive Mathematics Discussions*), and the "Workshop in a Bag" resources that they shared (that are still available on the Math4theNines website). The work done by these communities of practice speaks loudly about the innovative and forward thinking of this group of mathematics educators as they tackled some of the biggest issues facing our Grade 9 Applied students.

My year as President felt as though I was just getting my footing and then it was over. Thankfully, I was well supported by Past President Tim Sibbald, President-Elect Jill Lazarus, and the rest of the Executive Committee team. The feeling of "just getting started and then you're done" was common among other recent Past Presidents, and during my year as Past President, we brought the idea of a two-year presidency to the Executive Committee and the Board of Directors. This led to the Board starting to examine the pros and cons of creating a two-year presidency and its ramifications to the organization. I am happy to report that this change was eventually adopted.

Another change that happened during my presidency was that the Executive Committee agreed that its regular meetings were always packed with the day-to-day business of running the organization and left little time for the hard work of planning into the future. In the summer of 2017, we met for two days to develop longer-term (two-year, five-year, and ten-year) goals for the organization that align with the Mission Statement. As well, we developed a plan to create critical paths for each Executive role of OAME/AOEM, which would later serve as models for the writing of a critical path for each role in the organization structure. As we talked about our Mission Statement, we recognized that it was time to re-examine our Mission, Vision, and Goals (later called Strategic Priorities) in light of how much the math education environment, and correspondingly, the work of OAME/AOEM, had changed since these statements were last revised. We quickly realized that two days were insufficient to complete these tasks, and decided to have an annual summer meeting (albeit a modified one during the pandemic when we are required to meet virtually). I believe that both these changes are vital to the ongoing health and prosperity of OAME/AOEM.

So once again, congratulations to everyone who has ever been a member of this illustrious organization. Kudos to you for your part in making it such a warm and welcoming community. Here's to another 50! ▲

▲ Quotable Moments from the *Ontario Mathematics Gazette*

"Young people today are not as linear-minded as they used to be. They are much more aware of what is going on in 'the global village,' and because of TV, radio, movies, etc., they are used to soaking up all kinds of useful and exciting information (and misinformation) in a non-linear, spontaneous, simultaneous, non-programmed way" (Edwards, G., 1973, *Gazette,* 12(2), p. 13).

"It is very difficult to predict in our age of rapid change just what mathematical skills we will need in the future. It becomes increasingly apparent, however, that we are on the threshold of adopting the metric system" (Routledge, J., 1973, *Gazette,* 12(2), p. 7).

"The Publication Committee has initiated the *Abacus*, a newsletter for members of OAME. The first issue was available at the Toronto NCTM Meeting and has already proved itself a valuable companion for the *Gazette*" (1973, *Gazette,* 12(2), p. 3).

"…there is the computer. The computer, everyone agrees will in the future affect more aspects of our lives in more significant ways, and our education must gear itself to that fact. However, the method is not clear; just how we can best adjust secondary mathematics education to the computer age is certainly not at all obvious. But start we must (Hogarth, J.E., 1966, *Gazette,* 5(1), p. 1).

"…the first draft of the Constitution of the Mathematics and Physics Association of Ontario, made in 1891, as found on page six of 'Historical Highlights' published last spring" (1962, *Gazette,* 1(2), p. 12). January 18, 1891 was the first meeting according to the 100th-anniversary *Gazette* (*Gazette,* 29(3), p. 4). This makes it 130 years of math teachers having an association in Ontario.

In 1950, the predecessor of OAME/AOEM became an affiliate of the NCTM.

"Thus, we come to the end of the life of this journal and mark its conclusion with the journalist's traditional – THIRTY –" (*Gazette,* 11(4), p. 226). BUT wait, there is more… "Just as we were going to press, we heard the good news that some unexpected funds will allow the *Gazette* to continue. This will allow us even more than we hoped, to concentrate on producing practical classroom ideas for you, in future issues" (*Abacus,* 1(1), p. 2).

Editor: There are many more quotable moments in the Gazette *and* Abacus *that can be found in the archive in the members-only area. Please share by sending any interesting quotation you find to the Editor.* ▲

▲ Columnist Reflection



ANGELICA MENDAGLIO
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I began reporting about activities at the Fields Institute for Research in Mathematical Sciences for the *Gazette* in March 2018. However, I have been participating in events at the Fields for over ten years. During that time, my engagement has shifted, as my context has changed, first as a math student, then as a math education student, and then as a math education professional. Now, I come to the Fields as a columnist for the *Gazette* as well. It has been a new and intriguing lens through which to view the presentations and discussions at the Forum—I find myself asking, not only what I find interesting or helpful, but what would someone from a different background find interesting or helpful? It keeps my mind open to ideas that I might have otherwise skimmed over as not being immediately applicable to my work. It has been an enriching shift.

The *Gazette* and the Fields Institute MathEd Forum are alike in many ways. Both represent communities of like-minded mathematics educators who are passionate about their work and want to share ideas and experiences that they are excited about. I am grateful to be a part of two such enthusiastic communities. I also appreciate the opportunity to share what goes on at the Fields with all of you, and I hope that you have gained some insight into the goings-on at the Institute and perhaps even ventured over to the Fields website to peruse their event offerings. ▲



▲ Reflections on Being a Member of OAME/AOEM

BY RON LANCASTER



I am fairly certain that the very first talk (it was about the Rubik's cube) that I gave for teachers was at the 1983 OAME Annual Conference, held that year in Waterloo. I have been a member since 1986.

I know for certain that it was the first professional conference for teachers that I attended. I have some written notes from that conference, and when I read them, I am struck by the lengthy comments I made about the experience. I was amazed by the workshops conducted by classroom teachers, and I am still using ideas that I learned from them. I also enjoyed the social aspects of the conference—the meals included breakfasts, lunches, dinners, and banquets. (How in the world did they pull that off?) There were social gatherings at night and events for spouses that included off-site trips to St. Jacob's and a farmers' market. In addition to the workshops, there were *Nugget Sessions*, where four people presented short sessions during an hour. This was a brilliant idea that probably allowed many teachers to present their first workshop, without having too much pressure. There was even a talent night! I remember doing a magic show that involved effects based on mathematics.

I met or became aware of a number of amazing teachers at that conference, including Ed Anderson, Ed Barbeau, Rick Boychuk, Enzo Carli, Dave Cornwall, Peter Crippen, Ron Dunkley, Sandy Emms, George Fawcett, Gary Flewelling, Don Fraser, Ken Fryer, Elaine Harvey, Brendan Kelly, MaryLou Kestell, George Knill, Murray Major, Doug McDougall, Dave McKay, John McNight, Dave Mitchell, Dean Murray, Gord Nicholls, Alex Norrie, Larry Ridge, Mickey Sandblom, Michael Tabor, Stu Telfer, Jack Weiner, and Lorna Wiggan. Like me, some of these individuals were starting their careers, and others were giants in mathematics education.

Being surrounded by so many teachers who loved working with students and enjoyed mathematics had a lasting effect on me. I have attended and given a talk at every annual conference since then. I learned from that first conference the importance of being professionally involved, building a network of teachers, and how valuable it is to learn from other teachers. I continue to enjoy the annual conferences, although I miss the comradery when they are run virtually.

I have also given workshops at conferences for every one of the OAME/AOEM chapters; in many cases, more than once. These talks have given me a chance to travel around the province and to learn more about what teachers are doing locally. Of all the talks I have given, the ones that stick out for me are those that I co-presented with others. Here is a partial list of those talks—I am honoured to have co-presented workshops with so many talented teachers and students.

1997 OAME Annual Conference

A Toronto Math Trail for middle school and high school students.

Three-hour mini-course, co-presented with my Grade 7 students from St. Mildred's-Lightbourn School.

1999 OAME Annual Conference

Can we go outside today? Say yes! with a Math Trail at the Sheraton Parkway Hotel in Richmond Hill.

Three-hour mini-course, co-presented with senior students from the Bishop Strachan School.

2000 OAME Annual Conference

A Math Trail at the National Gallery of Art in Ottawa.

Co-presented with Mary Bourassa.

2001 OAME Annual Conference

All aboard the TTC for a mathematical tour of Toronto.

Four-hour mini-course, co-presented with Carly Ziniuk, Kimberley Krasevich, and students from the Bishop Strachan School.

2015 OAME Annual Conference

Math Trails: Seeing, doing, and talking about math outside of the classroom at Humber College.

Co-presented with Judy Mendaglio.

2016 OAME Annual Conference

Math Trails: Seeing, doing, and talking about math outside of the classroom at Georgian College.

Pre-planning support from Bruce McKay and Lynn Vause.

2021

A Math Walk at the CNE.

Co-presented with Drorit Weiss, with special guests Samara Stein and Benjamin Stein.

At some point, I started to become aware of how much work was being done to organize these conferences and to run the organization. I decided I needed to contribute to the OAME/AOEM by running for council. I was Director from 1988–1991, President-Elect from 1992–1993, President from 1993–1994, and Past President from 1994–1995. I enjoyed being part of the team and surrounded by people who were passionate about the OAME/AOEM.

I also attempted to contribute to OAME/AOEM by writing articles for the *Ontario Mathematics Gazette*. I created and authored the following four columns for the *Gazette*:

- Mathematical Problems, December 1986 – April 1992
- Mathematics and the World Around Us, 1992 – April 1994
- Photo Math, June 2000 – June 2008
- Mathematical Snapshots, September 2018 – present

Writing for the *Gazette* has been a rewarding experience, and I have learned a great deal from the Editors of the journal and from other writers.

I have been incredibly fortunate to have been associated with the OAME/AOEM for about 40 years. The OAME/AOEM has contributed to my professional growth in a variety of ways, and I cannot imagine what my career would have been like without the OAME/AOEM.

These are my memories and treasures. My wish for all teachers, especially for those starting their careers, is that you too will make OAME/AOEM part of your life. Attend conferences, give workshops on your own and with others, meet teachers, write articles, and be professionally involved throughout your career. We are all on a journey to become great teachers. None of us will ever get there, but the OAME/AOEM can help us get closer to this goal. ▲

The *Abacus* from 2007 to 2021

BY MARYLOU KESTELL



In 2007, Kathy Kubota-Zarivnij and I worked at the Ontario Ministry of Education in the Literacy and Numeracy Secretariat. We were the two Numeracy people among the many Literacy people. The Premier at the time, Dalton McGuinty, promised to support teachers in ways they'd never been supported before. So, the Secretariat was formed with a plan to have specialized educators work directly in classrooms with teachers to improve literacy and numeracy scores on EQAO tests.

As Student Achievement Officers, we were working in schools across the province, researching effective strategies in math education and implementing the research that we found. Deborah Loewenberg Ball's (University of Michigan) work studying Mathematics for Teaching was very influential in our work. Steven Katz (Ontario Institute for Studies in Education) was working with the Secretariat, defining strategies for Action Research, and we were studying the Japanese process of Lesson Study. Taking all this research into practice, we developed CIL-M, Collaborative Inquiry for Learning – Mathematics for Teaching.

Kathy and I were on the road a great deal of the time, so we volunteered to write the *Abacus* in support of these new initiatives. During the first few years, we built on the *Guides to Effective Instruction*, materials the Ministry had developed prior to the Secretariat. There was an edition for addition, from concrete materials to alternative algorithms, followed by an edition for subtraction, one for multiplication, and then for division. In the second year, we studied fractions, and next focused on arithmetic and algebra. During that time, we studied the work of Thomas Carpenter, Megan Loef Franke, and Linda Levi.

Kathy's work as a researcher influenced the content of the *Abacus*. In every edition, she wrote an extensive summary of the research on teaching the mathematics that we were highlighting. In the early years, Pat Margerm wrote a section on "Links to Literature." Kathy wrote "Links to Manipulatives," and I wrote relevant problems and anticipated student solutions. We were teaching teachers to talk about student work and synthesize the instruction going on in their classrooms.

We presented our work at several OAME conferences,

and importantly, math leaders told us they used the *Abacus* issues we had written for their Professional Learning Community meetings. This was excellent motivation for us.

As news of the new curriculum came in 2018, we transitioned to a focus on Building Number Sense. Our content changed to Designing Practice Tasks, Quick Images and Math Puzzles, along with Math Games.

Kathy is still a principal with the Toronto Catholic District School Board, whereas Pat and I are retired. In 2021, we handed the reins over to Marc Husband and Tina Rapke, and we wish them an enjoyable experience in the role as *Abacus* Editors. ▲

OAME AWARDS WINNERS

Secondary School Mathematics Staff Award for Exceptional and Creative Teaching
- O'Neil Collegiate Math Department, 1985

- Trish Maecker, Leanne Oliver, Lisa Salamone, Laura Auld, Lynn Hollingworth, Colleen Morgulis, and Joanna Ooms, 2020

Award for Exceptional and Creative Teaching in Elementary Mathematics
- Kevina Morrison, 2004

- Sandra Jean Price, 2008

Award for Exceptional and Creative Teaching in Secondary Mathematics
- Jacqueline Hill, 2004

Award for Outstanding Contribution to OAME
- Gord Banks, 2005

Lifetime Membership Award
- Jacqueline Hill, 2020

Pine Ridge Math Association

https://prma.oame.on.ca/

PRMA Helping you grow

2004/2008/2009 Exit 3.14

Eat Sleep Math

Ontario Mathematics Olympics

2007 **OAME President** Jacqueline Hill 2008

2021 **OAME President-Elect** Sandra Jean Price 2022

Annual Conferences
OAME 2020
Focus on Virtual
OAME 2003
Primed for Math
OAME 1979





The Grand Valley Mathematics Association (GVMA)
The jurisdictions represented by GVMA include the Ontario counties or regions of Brant, Bruce, Dufferin, Grey, Haldimand, Halton, Huron, Norfolk, Oxford, Perth, Simcoe (until 1995), Waterloo, Wellington, and Wentworth.

Congratulations to OAME/AOEM on the 50th anniversary! GVMA began as NASSMT (The Nameless Association of Secondary School Mathematics Teachers) two years before OAME was formed. In OAME's inaugural year, NASSMT adopted the name The Grand Valley Mathematics Association. As is mentioned in Ed Baumgart's compilation of The History of GVMA, 1972–1997, "The name of this new organization was inspired by its intent to cater primarily to the needs of teachers within the area of the Grand River Watershed. The GVMA was founded on the principles of improving mathematics in the schools of its geographic area, and of providing forums for exchanging teaching ideas and fostering professional growth. From the outset, GVMA was to be an association of classroom teachers, for classroom teachers. It has remained true to this ideal throughout its existence."

GVMA began its affiliation as a chapter within OAME/AOEM in May of 1974, and hosted the OAME conference in 1983, 1995, and 2004.

From its inception, GVMA has held annual conferences. In its first 25 years, it produced 42 publications, all made available to teachers at nominal cost. Math T-shirts and π and e buttons continue to be available through GVMA.

GVMA has had a role in promoting mathematics education not only in the secondary school panel, but also in the elementary panel. In 1973, Jim Mattice designed and implemented a math contest for Grades 7 and 8. In 1974, the contest became a project of GVMA. In 1977, an affiliation with the University of Waterloo was arranged. By 1981, the contest, now known as the Gauss Mathematics Contest, was operating under the umbrella of the Canadian Mathematics Competition.

GVMA continues to provide a forum for teachers of mathematics to come together to discuss the challenges and innovations in mathematics education having direct impact on the classroom. All the best to OAME/AOEM and all the affiliated chapters moving forward!