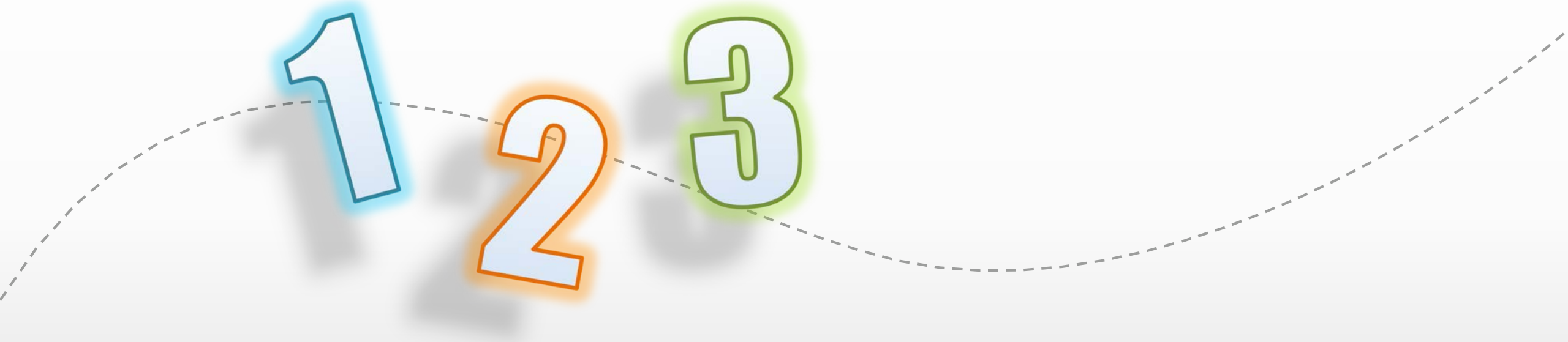


Closing the Numeracy Gap; an Urgent Assignment for Ontario

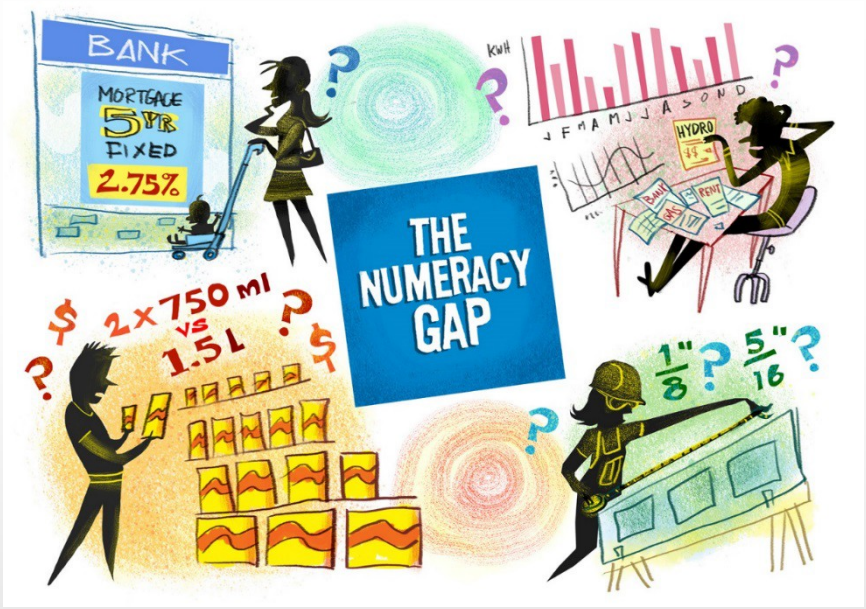
Emily Brown

The numeracy gap paper suggests that a number of assumptions should be articulated and re-examined from time to time:

- That levels of literacy _and_ numeracy in Ontario are steadily rising
- That society understands and appreciates the value of both literacy and numeracy
- That elementary schools students move to secondary school and beyond with good literacy and numeracy skills
- That literacy and numeracy belong in the curriculum of elementary schools
- That teachers have sufficient professional background and institutional support for teaching both literacy and numeracy

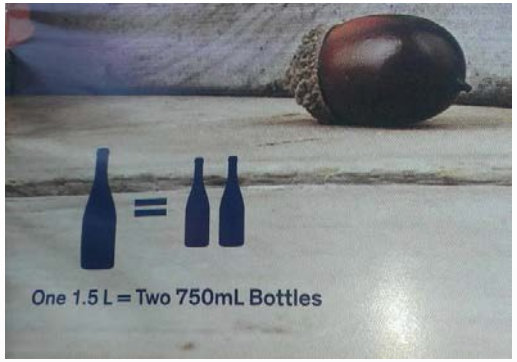
Things the report looked at:

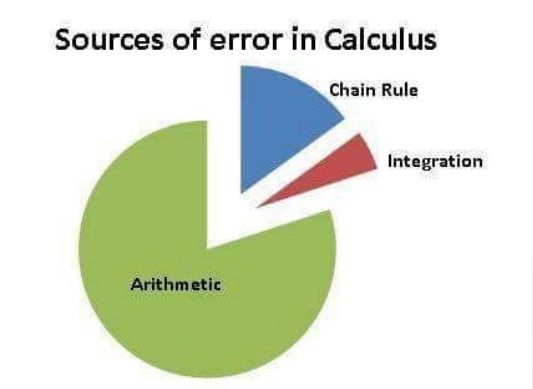
- Evidence that the numeracy skills of Ontario citizens is declining
- Elementary school curriculum
- Secondary school curriculum
- Teacher education programs and in-service teacher deployment
- Student assessment and remediation
- Research in math education, including data collection and information



The numeracy gap is steady or growing across all demographics of Ontario citizens.

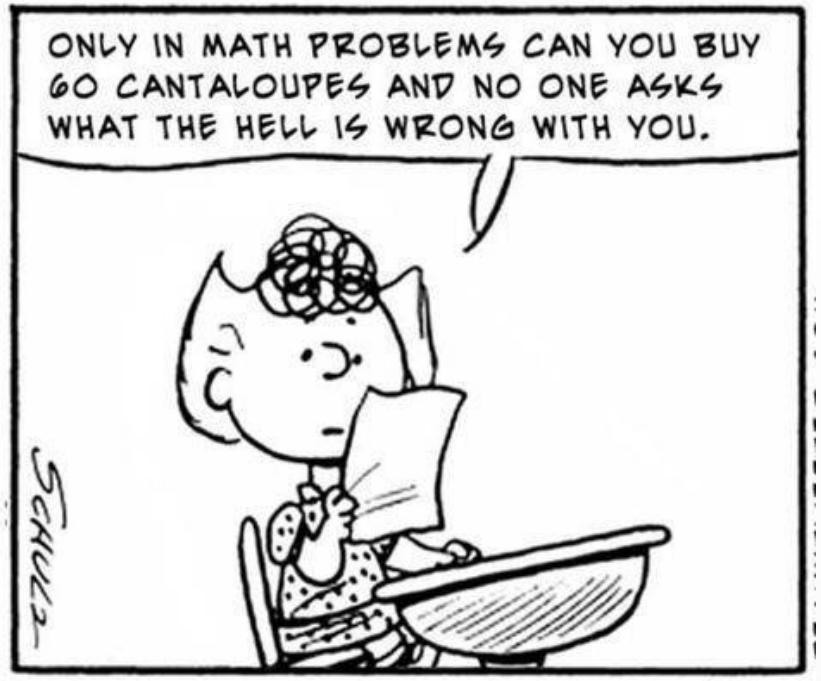
- 2013 OECD survey of adult skills shows that more than half of Canadians score below the level required to fully participate in a modern technological society
- College Student Achievement Project found, over nine years of collecting data from all 24 colleges in the province, that more than 1/3 of all students are at risk of not completing their college program due to weaknesses in numeracy skills
- OECD Pisa which compares numeracy of 15 year-olds around the world reports that Ontario students numeracy levels have declined steadily from 2003 to 2012
- Ontario EQAO have seen a steady decrease in grade 3 and 6 math scores, while reading and writing have shown steady increases





So what is numeracy?

- Involves mathematics knowledge and skills
- For the numerical functioning at work or in society
- The ability to use the mathematical knowledge and skills in concrete, real-world situations
- Is concrete and contextual
- Requires both competence and confidence of a mathematical knowledge base



Why is numeracy so important ?

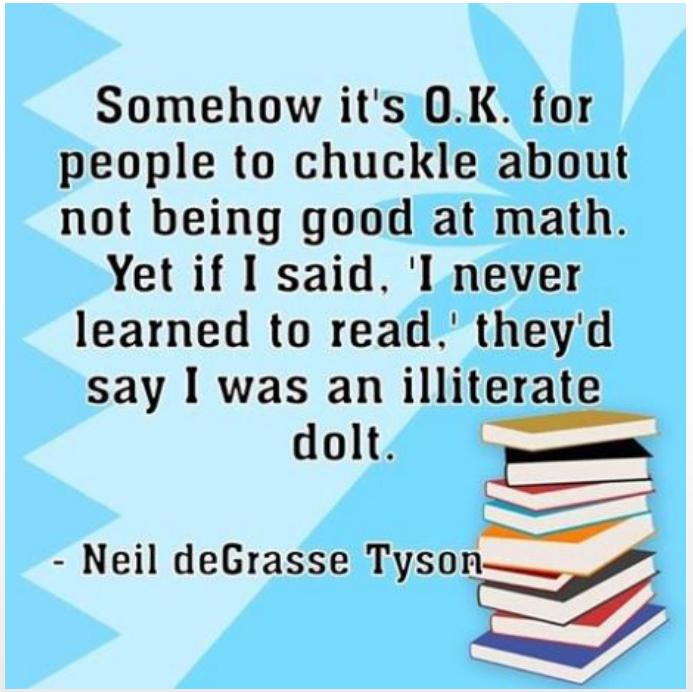
- Clear economic benefits provincially and nationally
- Significant economic benefits to the individual themselves*
- The ability to use the mathematical knowledge and skills in concrete, real-world situations
- Is concrete and contextual
- Requires both competence and confidence of a mathematical knowledge base
- It has become a very real social justice issue

* Wage premium is greatest amongst those with higher levels of numeracy and mathematical ability

Everyone can and must be numerate!

The most important step is changing attitudes around numeracy just as the public's attitude has changed around being illiterate.

We need to dispel the myth that some can do math while others cannot.



Elementary School Curriculum

- Persistent issues stem from the learning outcomes explicitly taught in K-8
- Not as simple as ‘discovery’ versus ‘traditional’ learning pedagogies
- Know where the math curriculum and numeracy can be found both horizontally and vertically
- Curriculum is very dense, less iterative, leading to tendency and pressure to ‘cover’ it
- Concepts tend to be siloed, significant connections across concepts not explored
- Concepts not explicitly contained in curriculum considered unimportant*
- Early and reliant adoption of technology in mathematics

* Multiplication tables

Elementary School Curriculum

What can teachers do?

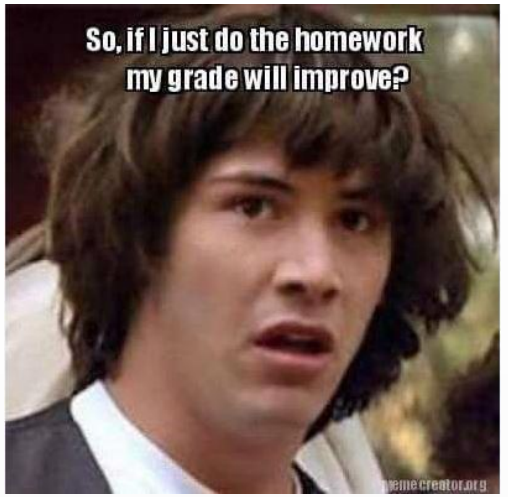
- Continue to make the math interesting for students
- Connect the math to all other curricula; art, physical education, science, social studies.
- Know where the math curriculum and numeracy can be found both horizontally and vertically

Numeracy is everywhere!

- Form strong partnerships with parents, as they will want to support their children in their learning
- Math nights are great!
- Think out loud for students
- Help develop a growth mindset for students
- Collaborate and cooperate with other teachers (in your school, in your board, and beyond). Social media is great for sharing with teachers far and wide.
- Keep learning

Secondary School Curriculum

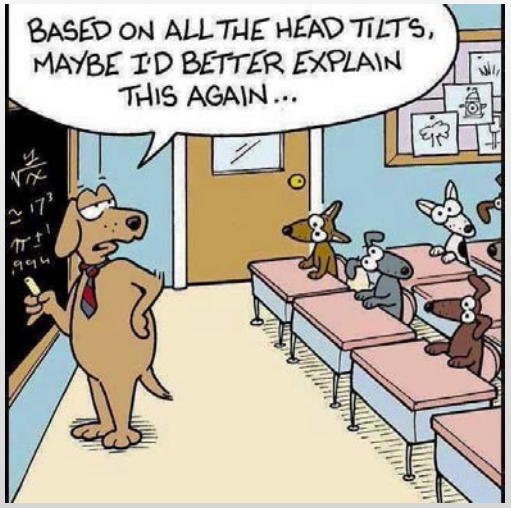
- Current government reports that graduation rate for secondary school has increased to over 78% from 56% in 2004
- Too many courses, too many pathways
- Institutional destination of secondary school courses no longer serves students well whereas career or professional destination would
- Key topics from Grades 5,6,7 and 8, important to post secondary studies, or functioning in society no longer appear
- No focus on numeracy for all
- Demonstrated numeracy skills not imperative to graduate, unlike literacy skills, with Grade 10 mandatory literacy test



Secondary School Curriculum

What can teachers do?

- Everything that elementary teachers do….and…
- Continue to make the math interesting and relevant
- Understand the curriculum's landscape
- Communicate and collaborate with elementary teachers, math coordinators, guidance counselors and post secondary institutions
- Choose to attend math focused professional conferences



What can administrators do?

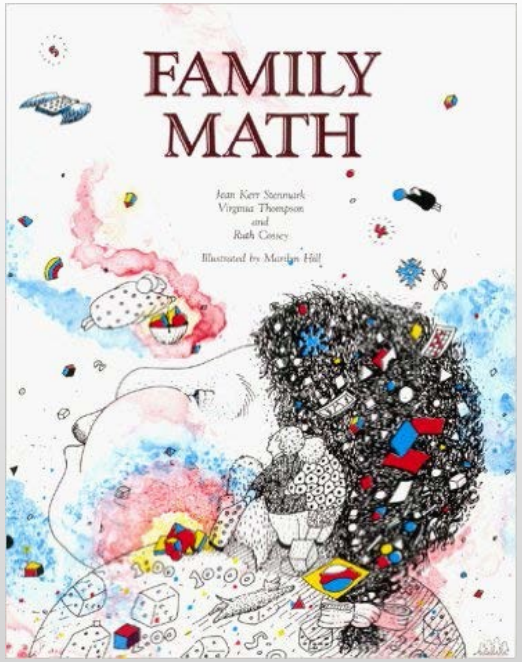
- Support mathematics and numeracy in the school and in board initiatives
- Engage and support teachers by listening to what they need and working from their strengths
- Set time aside for teachers to collaborate, cooperated and to share best practices and ideas. Teaching can be very isolating
- Be creative in how teachers skills are utilized in the school
- Support effective professional development

Teacher education and in-service teacher deployment

- EQAO survey of Grades 3 and 6 teachers reports that about 80% have no post secondary mathematics
- Very few hours devoted to mathematics pedagogy
- Inadequate mathematics pre-requisite for entering a teacher education program
- Business model applied to education, results in poor decisions with respect to teacher deployment
- Effective mathematics teaching should not rely on teachers taking supplementary professional development

What can parents do?

- Support your child, your teachers, and your administration
- Be aware of the messaging you give to you child
- Support a growth mindset in your child
- Allow your students to engage in productive struggle. Learning should not be easy
- Employ and articulate numeracy skills in your day to day lives with your children
- Make your number thinking transparent for your children



Student Assessment and remediation

- Make better use of current assessment practices
- Provide assessment for learning
- Support immediate remediation
- Rethink EQAO’s goals and purpose
- Consider equivalent Grade 10 numeracy test

Research in math education and data collection

- Continue to conduct original research
- Follow others’ reseach
- Implement good research informed ideas
- Use data to support best practices

Wrap Up:

Ministry of Education, 2014-2015 Mathematics Action Plan,
Released January 21, 2015

Ministry of Education

Deputy Minister

Mowat Block
Queen's Park
Toronto ON M7A 1L2

Ministère de l'Éducation

Sous-ministre

Édifice Mowat
Queen's Park
Toronto ON M7A 1L2

Ontario

Memorandum To: Directors of Education

From: George Zegarac
Deputy Minister

Date: January 21, 2015

Subject: 2014-15 Mathematics Action Plan

Emily Sandford Brown

Emily is a graduate of the University of Calgary with both an BEd and MEd where the focus of her work was on impediments to the learning and teaching of mathematics, and the mathematics teachers need to know to be effective mathematics teachers. She taught mathematics and science at the Calgary Science School (now Connect Charter) before moving to Ontario and joining the College Student Achievement Project team, first as a researcher then as Project Coordinator for the college mathematics assessment development project. Emily is now a professor, teaching business applications of calculus and algebra at the Pilon School of Business, Sheridan College and mathematics coordinator at the college.

Contact information:

emilyabrown@bell.net

Numeracy Gap report download www.numeracygap.ca

Numeracy Gap, Economic Club of Canada Panel Discussion full videos http://www.numeracygap.ca/event.html

In the news:

http://www.thestar.com/opinion/commentary/2016/04/17/the-importance-of-closing-the-numeracy-gap.html

http://www.thestar.com/yourtoronto/education/2016/04/12/new-report-pitches-mandatory-math-test-as-part-of-education-overhaul.html

And interviews by Steve Paikin on The Agenda, one on one with me, then Steve Paikin with the Economic Club panelists

http://tvo.org/video/programs/the-agenda-with-steve-paikin/closing-the-numeracy-gap

http://tvo.org/video/programs/the-agenda-with-steve-paikin/numbers-matter