CLOSING THE NUMERACY GAP

EXECUTIVE SUMMARY

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Numeracy is an essential skill not only for individuals who want to participate fully in a modern technological society but also for Ontario as a whole, as increasingly high levels of numeracy are fundamental to many areas of the economy. Yet evidence has been mounting for a number of years that many Ontarians, both children and adults, are lacking basic levels of numeracy. We describe this difference – between necessary numeracy and actual numeracy – as a numeracy gap, a gap that needs understanding, explaining and most important of all, closing.

The paper documents a range of research reports that together paint a gloomy picture of the numeracy gap in Ontario.

- The 2013 OECD survey of adult skills shows more than half of Canadians now scoring below the level required for full participation in a modern technological society, a decline in the level of numeracy a decade ago.
- The College Student Achievement Project, using data from all 24 Ontario colleges, has found that, consistently over the past nine years, more than one-third of all students taking mathematics (over 12,000 every year) are at risk of not completing their college programs because of weakness in numeracy.
- The OECD Programme for International Student Assessment (PISA) compares the numeracy of 15 year-olds internationally; in this study, Ontario students have shown a steady decline from 2003 to 2012.
- Provincial assessments of reading, writing, and mathematics at the Primary (grade 3) and Junior (grade 6) divisions have shown steady increases in reading and writing achievement over the past five years but steady decreases in mathematics achievement over the same period.

Numeracy is related to mathematics but is not exactly the same thing. Where mathematics is abstract, numeracy is concrete. Where mathematics is about conceptual knowledge and procedural skill, numeracy is about using these to solve practical problems. Where mathematics education is about obtaining correct answers to simplified problems, acquiring numeracy is about fluency and confidence in grappling with real-world and often open-ended problems. Where the agenda of mathematics education is drawn from the canon of mathematical knowledge, the process of becoming numerate draws from the tasks and challenges of everyday life. Numeracy is, in summary, the ability and the confidence to use mathematical knowledge and skills in concrete real-world situations.

It follows that while relatively few students – those entering the fields of science, technology, engineering, and mathematics (STEM) – require an educational background in relatively advanced mathematics, all students require strong numeracy skills. Some of these students will apply these in career or occupation-specific contexts (such as business, health care, social services, or teaching) but all require them for everyday living, including personal finance, leisure activities and parenting. **Numeracy for all** is therefore key to Ontario's future and to that of its citizens.

Research cited in the paper has underscored the economic benefits of improved numeracy both for individuals and society

- A Stanford University study, using OECD data, shows that a modest increase in numeracy scores corresponds with almost 20% higher wages;.
- A Harvard University study estimates that poor mathematics skills in the United States could cost that country's economy $75 trillion over the next 80 years.
- A UK report entitled "The Fear Factor" argues that "mathematics is a social justice issue" because outdated science, entrenched attitudes and the lack of role models have systematically disadvantaged women and girls. Similar factors can account for the lower levels of numeracy among aboriginal people and members of some ethnic groups.

The most important step is one of changing public and private attitudes. Whereas lack of literacy is a matter of personal shame and embarrassment in our society, a corresponding lack of numeracy is not. Indeed, many people openly claim to be unable to do mathematics. This is not an attitude found in Canada alone; it is encountered in many western (but few Asian) societies and is one that we dismiss as the "myth of the math gene". Instead, we invite Ontario to adopt and then act on the following two principles:

- Everyone can be numerate as well as literate;
- Everyone needs to be numerate as well as literate to function fully in the 21st century.

Changing public attitudes to align with these principles is key to closing the numeracy gap. We therefore recommend a province-wide public awareness campaign. The aims of this campaign would be to promote numeracy for all, to dispel "the myth of the math gene," and to raise the numeracy expectations of parents and students, employers and employees, and educational institutions and those who teach in them.

Along with this public awareness campaign, we call on the Premier of Ontario to set up a **Provincial Roundtable on Numeracy,** to develop a comprehensive strategy for closing the numeracy gap and to advise on its implementation. While schools are central to closing the numeracy gap, they cannot be left to solve the problem alone. There are roles for the private sector, for the voluntary sector as well as for the public sector. For this reason, a roundtable with a broad range of stakeholders is an appropriate vehicle to design and oversee change.
The roundtable would address a broad range of questions, some of which have already been suggested by the paper:

- How can elementary and secondary school mathematics be refocussed to the goal of numeracy for all?
- How can elementary, secondary and postsecondary education systems (including apprenticeships and adult training) be better integrated so as to increase student success especially in regard to numeracy?
- How should the mathematics curriculum for Grades 1-12 be modified to be more supportive of numeracy for all?
- How can provincial assessment play a part in advancing numeracy?
- How can teachers be better supported by improved teacher education?
- How can parents support their own and their children's numeracy development?
- What research is required both to monitor numeracy levels and to support more effective mathematics teaching?
- How can the private sector and the voluntary sector support improved numeracy?

The paper has proposed a number of suggestions in response to these questions and we invite the roundtable to consider these as part of its deliberations. If these deliberations can be translated into real changes in public attitudes and educational policy and practice, the numeracy gap can be closed and Ontario and all its citizens will be the beneficiaries.