

Country Reports

Canada

1.1 Relevant Policy

Canadian schools are run at the provincial level: they are the only federated OECD member where the federal government is not able to intervene. Education has been exclusively the jurisdiction of provincial and territorial governments since 1867.¹ Even though Canada lacks a national education strategy, school systems across the country tend to be similar and education is compulsory between the ages of six and 16.²

Across the Canadian provinces, mathematics is compulsory up to Grade/Year 9 or 10 (ages 14/15+).³ In 2001, 64% of 13-year-olds and 50% of 16-year-olds reached expectations in maths; 68% of 13-year-olds and 47% of 16-year-olds met expectations in mathematical problem solving.⁴ The 2013 OECD PISA results indicated that Canada is facing significant challenges in terms of mathematics skills; criticism in the Canadian media focused on the government response to the results, which was to allocate CAD\$4 million of funding for the upgrade of teachers' mathematics skills, rather than to consider any reforms to the way in which mathematics is taught.⁵

SAMPLE STATE: QUÉBEC

Over 20 years ago, Québec embarked on a comprehensive reform of its vocational and technical training (VTT) system to align it with a competency-based approach. The new *'program-development process'* aimed to ensure consistency between the competencies taught in school and those required by employers. The reforms aimed to increase the number of qualified graduates by:⁶

- Defining new vocational training paths.
- Adopting a competency-based approach for programme design.
- Redistributing programmes to correspond better to the social and economic profile of each region.
- Investing in major capital investment (buildings and equipment).

A wide range of partners is involved in the planning and delivery of Québec's VTT services. These include school boards, post-secondary colleges (Collège d'enseignement général et professionnel; CEGEPs) and government schools, the private sector, government ministries and sector organisations.⁷

While Québec has undertaken reforms in 1986 and 1997, challenges are still apparent in the vocational and technical training system: there are low youth enrolment rates, and students are not completing their studies and struggle to find employment without a relevant diploma. School drop out levels are exacerbated because vocational education suffers a poor public image.⁸

Businesses play a leading role in Québec's VTT system. They participate in surveys and studies to help in the development and revision of programmes. They help to analyse the labour market. Specialists from different occupations identify the *'competencies and attitudes'* they require. Businesses also help provide students with on-the-job training or in work-study or apprenticeship programmes that pair up students with journeymen.⁹ The Commission de la Construction du Québec (CCQ), for example, plays a vital role in developing VTT programmes; it is mandated to coordinate the construction industry training system, making sure that it corresponds to industry needs and realities.¹⁰

1.2 Institutions and Courses

GENERAL SYSTEM (QUÉBEC)

Québec's education system has four levels: preschool and elementary, secondary, college, and university. From the age of five, children attend pre-school kindergarten for one year. Elementary education normally lasts six years; secondary education, five year.¹¹

¹ <http://www.cea-ace.ca/publication/public-education-canada-facts-trends-and-attitudes-2007>

² <http://www.cea-ace.ca/publication/public-education-canada-facts-trends-and-attitudes-2007>

³ http://www.edu.gov.mb.ca/ael/all/educators/transitions/et_bridging_num.pdf

⁴ <http://www.cea-ace.ca/publication/public-education-canada-facts-trends-and-attitudes-2007>

⁵ <http://www.theglobeandmail.com/globe-debate/editorials/canadian-education-the-math-just-doesnt-add-up/article16274423/>

⁶ <http://www3.mels.gouv.qc.ca/fpt/Bibliotheque/17-9828A.pdf>

⁷ <http://www3.mels.gouv.qc.ca/fpt/Bibliotheque/17-9828A.pdf>

⁸ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

⁹ <http://www3.mels.gouv.qc.ca/fpt/Bibliotheque/17-9828A.pdf>

¹⁰ http://www.edu.gov.mb.ca/ael/all/educators/transitions/et_bridging_num.pdf

¹¹ <http://www.cea-ace.ca/sites/default/files/EdCan-2007-v47-n4-Taylor.pdf>

VOCATIONAL COURSES (QUÉBEC)

In Québec there are two pathways in vocational and technical training: through a secondary-level vocational training programme or through technical training programmes offered in CEGEPs. Within secondary schools, vocational training is integrated in two ways. Within school based VET programmes, learners' time is focused on preparation for a post-secondary vocational training programme. Some learners also enter the workforce directly after a VET programme. The second route is through 'vocalionalisation' of secondary school in which a small portion of learners' time, typically 10% - 20%, is dedicated to vocational education and the remaining time is spent on general education.¹² Those who obtain vocational diplomas, either in public or private schools, generally move into related occupations.¹³

Some schools offer two optional courses: Exploration in Vocational Training and Entrepreneurship. The objectives of Exploration in Vocational Training are '*for students to discover the variety of vocational programs offered in Québec and for students to contemplate their suitability to different vocational trades*'. Learners on these courses visit vocational centres and may shadow a real worker to experience the culture of the job.^{14/15}

Depending on the programme, learners can enrol in vocational training in their third, fourth or fifth year of secondary school. General education students who earn a Secondary School Diploma (SSD) can go on to college for a two-year pre-university programme or a three-year technical programme.¹⁶

Since 1986, the vocational system in Québec excludes students who are unable to complete secondary III. The minimum requirement for most vocational programmes is a passing grade in three secondary IV subjects: English, French and maths.¹⁷ The change was made to '*increase the secondary school graduation rates and to disassociate vocational education from students with learning difficulties*'. Nevertheless, learners who do enrol in vocational programmes often lack the maths skills to complete the course – despite having completed the prerequisite mathematics courses.¹⁸

Bridging courses for compulsory subjects required for entry into a CEGEP (including maths) are taught at adult education centres. Further maths courses to those required are also offered.¹⁹ A few semiskilled vocational programmes require just a passing grade in secondary III English, French and mathematics. These programmes, which include trades such as bricklaying and butchery, grant a Training Certificate for a Semiskilled Trade.²⁰

1.3 Practice and Pedagogy

Examples of practice and pedagogy in Canada are comparatively sparse. Resources and research projects tend to focus on adult numeracy or school-based maths, rather than maths in vocational contexts.²¹

One study interviewed eight vocational training instructors to gain an insight into the difficulties learners are having in mathematics. This suggested that vocational learners are experiencing difficulties with elementary and early secondary level mathematics. The instructors felt that '*integrating mathematics into the vocational curriculum so that it is hands-on or applied would be the most effective way to remediate students' difficulties*'.²² In addition, those interviewed thought that '*secondary schools should offer pre-vocational mathematics courses*' to enable those intending to enter vocational training programmes to experience applied mathematics.²³ Such courses could '*explore realistic workplace-related situations and develop elementary and early secondary-level mathematics in increasingly complex educational contexts*'.²⁴

A 2009 case study showed how students training to become electricians learned to produce graphical representations of Ohm's Law. They were expected to identify a dependency relationship between resistance, voltage and current. Students collected data from a circuit with an ampere meter and a voltmeter, tools with which they are familiar from their occupation training. After constructing a graph with the data collected, learners then derived the relationship between the variables.²⁵

They were able to attain the learning goals even though the participants reported not having the requisite knowledge to understand a dependency relationship from a graphical representation. In another study, vocational students performed surveys and represented the data in bar graphs. The students, enrolled in the health and social care programme, conducted a survey on bullying. The students were able to achieve the requisite mathematics content of

¹² <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

¹³ <http://www3.mels.gouv.qc.ca/fpt/Bibliotheque/17-9828A.pdf>

¹⁴ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

¹⁵ <http://www3.mels.gouv.qc.ca/fpt/Bibliotheque/17-9828A.pdf>

¹⁶ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

¹⁷ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

¹⁸ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

¹⁹ http://www.pearsonskills.com/pages/adultED/page_info.asp?mycatrequest=3_page

²⁰ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

²¹ See, for example: <http://www.socialnumeracy.ca/PDF/SocialNumeracyResources.pdf>

²² <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

²³ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

²⁴ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

²⁵ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

building a bar graph and analysing the data but the mathematics was embedded in the vocational topic of studying the effects of bullying.²⁶

The Centre for Education in Mathematics and Computing at Waterloo University, Ontario, offers a number of online resources that are aimed at students (until Grade 12), parents and teachers. One of these resources, Real World Math, aimed at students from Grades 9 and upwards, focuses on the ways in which mathematical concepts and skills can be applied in real world situations.²⁷ Other resources include Math that Matters, which links maths with social justice through content which *'captures and increases student interest and awareness in justice, fairness and kindness'*.²⁸

DISCOVERY MATHS

Alberta province refocused its maths literacy and numeracy curriculum to *'ensure its students have the skills required for the 21st Century'*. They were motivated by recent PISA results showing that the maths scores of Canada's 15-year-olds are 14 points lower than they were nine years ago. Schools are considering the use of 'Discovery Math' and other recent innovations in education to make sure children have both the basic skills they need, as well as the capacity to think critically and work creatively.²⁹ Discovery Math is an approach that encourages learners to apply problem solving skills to mathematical problems, rather than utilising traditional memorisation and rote learning techniques: *'the more problem-solving that you've done whether it's in math class or in science class or in one's job in the real world, the better able you are to solve the next problem that comes along'*.³⁰ The programme includes learning principles such as the *'discovery of basic facts through concrete experiences; using language to think about those experiences; using mental imagery to further internalize and understand basic math experiences, operations and principles; and integrating and applying the understanding to problem solving'*.³¹

These kinds of *'discovery techniques'* are also being used by Ontario, according to media sources, and are planned for use in British Columbia.³²

1.4 Key Points of Learning

Policy levers may not lead to anticipated outcomes. Québec attempted to disassociate VET from low-achieving students by introducing a minimum requirement for vocational courses, including a requirement that secondary IV maths had been passed. This appears not to have translated, necessarily, to better outcomes, as learners still often lack the maths skills to complete the course.

The maths skills of many vocational learners is only at the elementary or early secondary level, suggesting a need for pre-vocational maths courses (to enable learners to experience applied maths at an earlier date) and greater use of applied maths in vocational contexts.

The Discovery Math model, piloted in Alberta, is an approach that encourages learners to apply problem solving skills to mathematical problems, rather than utilising traditional memorisation and rote learning techniques. The programme includes learning principles such as the *'discovery of basic facts through concrete experiences; using language to think about those experiences; using mental imagery to further internalize and understand basic math experiences, operations and principles; and integrating and applying the understanding to problem solving'*.

²⁶ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

²⁷ <http://www.cemc.uwaterloo.ca/resources/real-world.html>

²⁸ http://www.ctf-fce.ca/publications/pd_newsletter/PD2007_Volume7-1English_Article7.pdf

²⁹ <http://www.nadiahardy.com/Project%20Megan%20Tremblay.pdf>

³⁰ <http://www.theglobeandmail.com/news/politics/provinces-stick-with-discovery-math-despite-back-to-basics-push/article16250862/>

³¹ <http://www.readingfoundation.com/programs/discover-math-program>

³² <http://www.theglobeandmail.com/news/politics/provinces-stick-with-discovery-math-despite-back-to-basics-push/article16250862/>