EQAO develops and administers high-quality province-wide assessments in Ontario. An important part of this work is to investigate and report on trends that will enable the agency to continue to report useful information to educators and the public in a world-class manner. One such trend is the shift in skills that young people need to develop during their school years in order to participate effectively and successfully in the world and workplace of the 21st century.

Many countries have identified the acquisition of 21st-century skills as critical to providing students with meaningful and engaging school experiences and preparing them for their future life and workplace demands. Various groups of educators, policymakers, government leaders, representatives of business and technology firms and others have attempted to identify and describe these critical skills to meet the needs of the next generation of learners. There is general agreement among members of the 21st-century-skills movement that cross-curricular skills are required to live in, function in and contribute to the “knowledge society.” These skills include broad competencies, such as creativity, innovation, problem solving, communication, collaboration, teamwork and critical thinking; different literacies, such as media, technology, financial, health and global literacy; as well as numeracy.

EQAO’s Board of Directors, in developing its strategic directions for the agency to 2014, identified two articulations of 21st-century skills as reference points: one by the Conference Board of Canada and the other by the MTCU. These skills are also referred to as employability skills, essential skills or basic literacy skills. The Conference Board of Canada and the MTCU have identified 21st-century or essential employability skills that can be organized into six skill categories: numeracy; communication; critical thinking and problem solving; personal management; interpersonal skills; and information management.

An examination of the EQAO elementary and secondary literacy and mathematics assessments (including student and teacher questionnaires) indicates that, currently, there is a link to some of the learning outcomes associated with four skill categories: communication, numeracy, critical thinking and problem solving, and personal management (attitudes and behaviours).

Ontario students also participate in several national and international assessments that link to key 21st-century skills. The full reports and highlights for the assessments referenced in these pages can be located on the EQAO Web site (www.eqao.com):

- Pan-Canadian Assessment Program (PCAP), an initiative of the Council of Ministers of Education, Canada, is administered every three years to Grade 8 students. Reading, mathematics and science assessment items are administered to randomly selected students in a random sample of schools through a random assignment of test booklets.
- Program for International Student Assessment (PISA), by the Organisation for Economic Co-Operation and Development (OECD), is undertaken every three years to assess the achievement of 15-year-old students in three domains: reading, mathematics and science.
- Trends in International Mathematics and Science Study (TIMSS) measures the mathematics and science achievement of students in Grades 4 and 8. TIMSS has been administered to Grade 4 students in 1995, 2003 and 2007 and to Grade 8 students in 1995, 1999, 2003 and 2007. Ontario students participated in each assessment.

Each of the three assessments identifies core skills that link to some of the learning outcomes associated with four 21st-century-skill categories: communication, numeracy, critical thinking and problem solving, and personal management (attitudes and behaviours). For example, the OECD framework for PISA lists the following as skills students require to be lifelong learners and meet the challenges of the future: analyzing, reasoning, problem solving and communicating ideas effectively.

Based on an examination of the 2012 EQAO data and the findings from the most recent national and international assessment results, this report updates the information on the progress students are making toward the acquisition of 21st-century skills expected by the end of Grade 12. For each of communication, numeracy, critical thinking and problem solving, and personal management (attitudes and behaviours), the following charts demonstrate the links among the associated learning outcomes, the numeracy and literacy skills assessed by the Grade 9 Assessment of Mathematics and the OSSLT, respectively, and EQAO data.*

* The skill categories and their associated learning outcomes have been adapted from those given by the Conference Board of Canada (2010) and the MTCU (2010).
### 1. Communication

<table>
<thead>
<tr>
<th>21ST-CENTURY LEARNING OUTCOMES</th>
<th>LITERACY SKILLS ASSESSED BY THE OSSLT</th>
<th>EQAO DATA RELATED TO THE LEARNING OUTCOMES 2008–2012</th>
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</table>
| • Communicate clearly and correctly in the written form  
• Respond to written text in a manner that ensures effective communication | In the writing component of the test, students are given multiple-choice questions and are prompted to write two short responses, a series of paragraphs expressing an opinion and a news report. Through their responses, students demonstrate their ability to communicate ideas and information clearly and coherently and use conventions in a manner that does not distract from clear communication. | **OSSLT**  
1) Overall achievement results  
2) Percentage first-time-eligible (FTE) students at top scores for writing tasks averaged over the past five years:  
• Long-writing tasks: average percentage at top scores (Codes 50 and 60) for topic development; average percentage below Code 50  
• Short-writing tasks: percentages at top score (Code 30) for topic development |

| • Read and understand information presented in a variety of forms (e.g., words, graphs, charts, diagrams) | In the reading component of the test, students use reading strategies to interact with a variety of narrative, informational and graphic selections to construct an understanding of explicitly and implicitly stated information and ideas as well as make connections between the meaning of the texts and their personal knowledge and experience. | **NATIONAL AND INTERNATIONAL DATA RELATED TO THE LEARNING OUTCOMES**  
1) PCAP (2010) reading results by jurisdiction  
2) PISA (2009) overall reading achievement results |

### 2. Numeracy

|--------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------|
| • Execute mathematical operations accurately  
• Decide what needs to be measured or calculated  
• Use relevant mathematical knowledge and skills to explain or clarify ideas  
• Access, analyze and apply knowledge and skills from various disciplines | Students are expected to apply several cognitive skills and mathematical processes. To be successful on the assessment, they have to demonstrate a considerable understanding of mathematical concepts and procedures and to apply their knowledge and skills with considerable effectiveness. Students are also expected to select and use a variety of computational strategies; make connections among mathematical concepts and procedures; communicate their thinking in writing using mathematical vocabulary and conventions; connect, compare, select and apply the appropriate representations of mathematical ideas and monitor their thinking. | **NATIONAL AND INTERNATIONAL DATA RELATED TO THE LEARNING OUTCOMES**  
1) PCAP (2010) mathematics results by jurisdiction  
2) PISA (2009) overall mathematics achievement results  
3) TIMSS (2007) Grade 4 and Grade 8 trends in mathematics achievement results (Canadian provinces), percentage of students reaching TIMSS intermediate benchmark and results by jurisdiction |

* First-time eligible students (FTE) typically entered Grade 9 during the 2009–2010 school year. These students (and any others placed in this cohort) were required to write the OSSLT for the first time in April 2011. “FTE” includes all students in the FTE cohort who are working toward an Ontario Secondary School Diploma (OSSD).
### 3. Critical Thinking and Problem Solving

|--------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------|
| • Apply a systematic approach to solve problems                                  | Students are expected to solve problems by selecting and applying a variety of problem-solving strategies. They have to follow an effective process to find a complete solution and look back at it: make a plan and carry it out; identify the most important elements of the problem, understand relationships between elements, and draw appropriate conclusions with supporting evidence. | 1) Overall achievement results  
2) Item analysis for multiple-choice and open-response questions related to skill of problem solving |
| • Use a variety of thinking skills to solve problems                             |                                                                                   |                                                 |
| • Analyze ideas and information to draw conclusions and make judgments          |                                                                                   |                                                 |

#### LITERACY SKILLS ASSESSED BY THE OSSLT

Students are expected to analyze ideas and information presented in reading selections and respond to questions that require them to make and justify interpretations of the text.

#### EQAO DATA RELATED TO THE LEARNING OUTCOMES 2008–2012

1) Average results among FTE students for clusters of items (multiple-choice and open-response questions) by Reading Skills 2 and 3: making inferences and interpreting reading selections by integrating information and ideas in them with personal knowledge and experiences  
2) Item analysis for multiple-choice and open-response questions related to Reading Skills 2 and 3

### 4. Personal Management: Attitudes and Behaviours

|--------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------|
| • Feel good about yourself and be confident                                      | Students are expected to demonstrate the mathematical skills required by The Ontario Curriculum up to the end of Grade 9 and connect their mathematical thinking to daily life. | 1) Student Questionnaire data: student engagement, self-perception and confidence  
2) Student Questionnaire data: perceptions of mathematical learning and its connection to real-life contexts |
| • Show interest, initiative and effort                                            |                                                                                   |                                                 |

#### LITERACY SKILLS ASSESSED BY THE OSSLT

Students are expected to demonstrate the literacy (reading and writing) skills required by The Ontario Curriculum across all subject areas up to the end of Grade 9, and connect their literacy skills to daily life.

#### EQAO DATA RELATED TO THE LEARNING OUTCOMES 2008–2012

1) Student Questionnaire data: time spent reading and the variety of reading done outside school  
2) Student Questionnaire data: time spent writing and the variety of writing done outside school
AN EXAMINATION OF 21ST-CENTURY SKILLS

The following information from the Grade 9 Assessment of Mathematics, the OSSLT and the relevant national and international assessments provides indications of how Ontario secondary school students are progressing toward acquiring the 21st-century skills described above.

1. Communication

Since 2008, more than 82% of fully participating FTE students have been successful on the OSSLT. Students successful on the test have acquired the basic cross-curricular literacy skills in reading and writing and are progressing toward the acquisition of the 21st-century skills related to communication (writing clearly, correctly and effectively and understanding information presented in a variety of forms).

Over the past five years,
• more than one-third of students have reached the top scores (Codes 50 and 60) for topic development on the long-writing tasks. Students who reached the top scores were able to communicate clearly and effectively by organizing specific and relevant ideas and by developing a clearly stated opinion or a clear, consistent focus. The other two-thirds of the students require continued support to ensure that they become able to communicate effectively and develop clear, well-organized writing.
• on average, two-thirds of students have reached the top score (Code 30) on topic development on the short-writing tasks. These students were able to communicate clearly by supporting a main idea in complete sentences.
• students have performed well on reading questions assessing all three reading skills, which means that they were able to read, understand and respond to information presented in a variety of forms (narrative, informative, graphic text). Unsuccessful students have had difficulty with questions assessing all three reading skills.

The following observations are based on the relevant national and international assessments.

The 2010 PCAP results show that
• Ontario Grade 8 students were above the Canadian average in all three subjects tested—reading, mathematics and science—on the 2010 PCAP test. In 2007, Ontario students were at the Canadian average in all three subjects.
• in reading, Ontario Grade 8 students were above the Canadian average and performed significantly better than students in all other jurisdictions.
• the average score for female Ontario Grade 8 students was higher than that for their male counterparts (530 compared with 503).

Each PISA administration focuses on one major assessment domain. In 2009, reading was the major domain, whereas mathematics and science were minor domains. The 2009 PISA results show that
• 92% of 15-year-old Ontario students met or exceeded PISA’s achievement benchmark at which students begin to demonstrate the kind of knowledge and skills needed to use reading competencies effectively. Ontario students have maintained high-average scale scores in overall reading achievement since 2000, and in 2009 they performed significantly better than the Canadian average on all five reading subscales (accessing and retrieving, interpreting, reflecting and evaluating, continuous text, non-continuous text).

2. Numeracy

Students performing at or above the provincial standard (Level 3) were able to apply their knowledge and skills in mathematics with considerable effectiveness and were progressing toward the acquisition of the 21st-century skills related to numeracy (perform mathematical operations accurately, decide what to measure or calculate, and explain or clarify mathematical thinking).

Academic Mathematics Course

Since 2008, more than three-quarters of students taking the academic mathematics course have performed at or above the provincial standard (Level 3).

Over the past five years,
• more than two-thirds of students have performed well on multiple-choice questions assessing knowledge and understanding, and the application of mathematical concepts. This suggests that students were able to select and use computation strategies and apply formulas related to the assessed concepts.
• on average, more than one-half of students have received the top scores (Codes 30 and 40) on the open-response questions assessing the application of mathematical concepts. Students who reached the top scores were able to use relevant mathematical knowledge to represent their mathematical thinking.
In 2012,
• the Student Questionnaire data have shown that 47% of students indicated that they connect new mathematics concepts to what they already know about mathematics or other subjects.

**Applied Mathematics Course**

Since 2008, over one-third of students taking the applied mathematics course have performed at or above the provincial standard (Level 3). This indicates a gradual increase over the past five years.

Over the past five years,
• almost two-thirds of students have performed well on multiple-choice questions assessing knowledge and understanding and more than one-half of students have performed well on multiple-choice questions assessing the application of mathematical concepts. These students were able to demonstrate their understanding of mathematical concepts and were able to select and use computation strategies and apply formulas related to the assessed concepts.
• on average, fewer than one-third of students have received the top scores (Codes 30 and 40) for the open-response questions assessing the application of mathematical concepts. Students who received the top scores were able to use relevant mathematical knowledge and skills to represent and explain their answers.

In 2012, the Student Questionnaire data have shown that 29% of students indicated that they connect new mathematics concepts to what they already know about mathematics or other subjects.

The following observations are based on the relevant national and international assessments.

The 2010 PCAP results show that
• in mathematics, 92% of Ontario Grade 8 students achieved Level 2 — the expected level of performance — or above. Fully half of Ontario students (50%) performed at the two highest levels of achievement (Levels 3 and 4).
• Ontario Grade 8 student results were above the Canadian average on two of the four math subdomains assessed — geometry and measurement, and patterns and relationships. They were at the Canadian average in the other two math subdomains — numbers and operations, and data management and probability.
• there were no significant differences between the average scores of male and female Ontario Grade 8 students in mathematics.

The 2009 PISA results show that
• the achievement of 15-year-old Ontario students in mathematics was at the Canadian average. Ontario students’ achievement in mathematics has remained relatively unchanged since 2000.

The TIMSS results over time show that
• Ontario has shown significant improvement from 1995 to 2007. Ontario is now performing on par with the other participating Canadian provinces.
• since the 1995 administration, the percentage of Grade 8 students meeting the intermediate benchmark has increased by nine percentage points, from 65% to 74%. The percentage of Grade 4 students meeting the intermediate benchmark has increased by 12 percentage points, from 59% to 71%. (No participating jurisdiction had an average scale score at the advanced benchmark.)
• the results of the TIMSS assessment of Grade 4 students and EQAO’s province-wide primary division assessment, administered in Grade 3, are not directly comparable. However, the significant improvement in Ontario student achievement on TIMSS since it was first administered in 1995 is consistent with the substantial improvement in student achievement on the mathematics component of the EQAO primary assessment over a similar period.

3. Critical Thinking and Problem Solving

Students who performed at or above the provincial standard (Level 3) on the Grade 9 Assessment of Mathematics and met the minimum standard for literacy on the OSSLT were progressing toward the acquisition of the 21st-century skills related to critical thinking and problem solving (apply a variety of thinking skills and a systematic approach to solving problems, and analyze information to make judgments and draw conclusions).

**Academic and Applied Mathematics Courses**

Over the past five years,
• the overall performance of students taking the academic mathematics course has been better than that of students taking the applied mathematics course; however, students in both courses have performed least well on multiple-choice and open-response questions assessing the skill of problem solving, indicating that they had difficulty solving multi-step problems and require continued support in selecting and using problem-solving strategies to determine a solution and support their thinking.
OSSLT

Over the past five years,

• approximately three-quarters of students have performed well on multiple-choice questions assessing the reading skills of making inferences and constructing interpretations based on the ideas and information presented in different reading selections.

• one-third to three-quarters of the students have received the top score (Code 30) for open-response questions related to the same reading skills, indicating that they could interpret texts and support their interpretations. However, there has been a gradual decline in the percentage of students who have received the top score.

• unsuccessful students have had difficulty analyzing ideas and information in texts to make judgments, draw conclusions and support their answers.

4. Personal Management: Attitudes and Behaviours

More than 90% of students responded to the Student Questionnaires for the Grade 9 Assessment of Mathematics and the OSSLT, which gather information about students’ attitudes toward their reading, writing and mathematics learning, and related behaviours. Schools are encouraged to use this contextual data when reviewing achievement data to inform their decisions for targeting strategies and resources for student improvement.

Academic Mathematics Course

Over the past five years, the Student Questionnaire data have shown that

• one-half of students indicated that they liked mathematics and were good at mathematics.

• although nearly three-quarters of students indicated that they understood most of what they have been taught, fewer than one-half stated that the mathematics they were learning was useful for everyday life, suggesting that many students did not see real-life connections to the mathematics they were learning.

Among students in academic and applied mathematics courses, fewer females than males indicated each of the following: that they liked mathematics, that they understood most of what they had been taught and that the mathematics they were learning was very useful for everyday life. This suggests that many females do not have a positive self-perception of their mathematical learning.

Applied Mathematics Course

Over the past five years, the Student Questionnaire data have shown that

• one-third of students indicated that they liked mathematics and were good at mathematics.

• although almost two-thirds of the students indicated that they understood most of what they have been taught, fewer than one-half stated that the mathematics they were learning was useful for everyday life, suggesting that many students did not see real-life connections to the mathematics they were learning.

OSSLT

Over the past five years, the Student Questionnaire data have shown that

• more than 90% of students applied their skills to write e-mail and chat messages. However, only one-third to one-half of students applied their skills to write in other forms for their own use outside school, including personal and work-related writing. Fewer than one-third of students wrote in English outside school for more than three hours a week.

• more than 90% of students read Web sites and e-mail and chat messages, and more than one-half of students read a variety of texts, such as magazines, newspapers, song lyrics, poems and fiction, for their own use outside school. However, fewer than one-half of students read in English outside school for more than three hours a week.

Summary

Although the full range of 21st-century skills is larger than what is discussed in this report, data from the Grade 9 Assessment of Mathematics and the OSSLT provide one indication of how Ontario secondary school students are progressing toward acquiring the 21st-century skills in communication, numeracy, critical thinking and problem solving, and personal management (attitudes and behaviours). The findings, confirmed by the data from relevant national and international assessments, suggest that the majority of students were well on their way to acquiring these essential and enduring skills. However, the findings also suggest areas for continued consideration when providing support for students. These include

• using critical-thinking skills to solve problems;

• communicating ideas clearly, coherently and effectively and

• making real-life connections for applying numeracy and literacy skills.
The findings and areas for consideration of the 21st-century skills report for elementary students are consistent with those identified in this secondary report. Acquiring the communication, numeracy, critical thinking and problem solving and personal management skills (attitudes and behaviours) occurs on a learning continuum that begins in the elementary grades. Ensuring that all students acquire these skills requires a committed and collaborative response from all educators, Grades 1 to 12. The 21st-century skills are enduring and have a lifelong impact. All students today—not only a select few—need to acquire them.

References


