ICILS 2013

Preparing for Life in a Digital Age: Results for Ontario and Newfoundland and Labrador

International Computer and Information Literacy Study

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Preparing for Life in a Digital Age: Results for Ontario and Newfoundland and Labrador

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Note of appreciation

The Council of Ministers of Education, Canada, would like to thank the students, teachers, and administrators whose participation in the 2013 International Computer and Information Literacy Study ensured its success. The quality of your commitment made this study possible. We are truly grateful for your dedication to this study, which will contribute to a better understanding of the ways in which students develop computer and information literacy at the lower-secondary level,[2] their learning environment, the contexts and outcomes of ICT-related education programs, and the use of ICT in schools.

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[1] In this report, "ministry" includes "department," and "jurisdictions" includes "provinces" and "territories."
[2] Grade 8 students in Ontario and Newfoundland and Labrador participated in ICILS 2013.

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Introduction: What is ICILS?

The International Computer and Information Literacy Study (ICILS) is a new study that investigates the ways in which young people understand and use information and communication technology (ICT). This study is the first of its kind to assess students' acquisition of computer information literacy (CIL) using an international comparative research perspective. It was designed as a result of the increasing need for ICT-related literacies to be developed for citizens to function effectively in the digital age, and to inform policy-makers and educators on how to better understand the contexts and outcomes of ICT-related education programs in their countries.

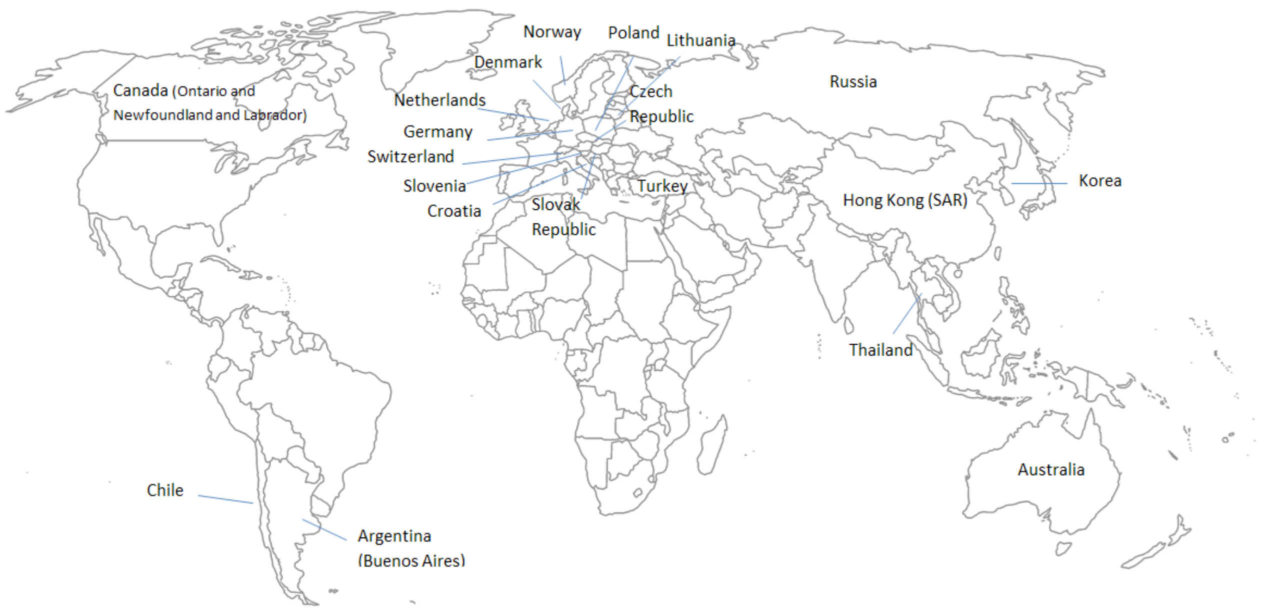
ICILS was administered for the first time in 2013 under the aegis of the International Association for the Evaluation of Educational Achievement (IEA), an independent cooperative of national research institutions and governmental research agencies that has been conducting cross-national achievement studies for more than 50 years. IEA was founded in 1958, with a secretariat based in the Netherlands (Amsterdam), to conduct large-scale comparative studies on the effects of educational policies and practices around the world. Today, representatives from nearly 70 countries, including Canada, are members of IEA.

To determine how young people are developing their CIL capacity, ICILS developed a contextualized computer-based assessment to report on student achievement. The target population for ICILS is Grade 8 students, with the mean age at the time of testing at least 13.5 years. This study also collects data to report on students' use of and attitudes toward computers and other digital media and technologies. Some of these data are considered learning outcomes while others contribute to the broader context in which CIL is developed in young people. Additional contextual information is collected in the form of student background data and data from teachers, information regarding schools and education policies, and resources and pedagogies used to teach and learn CIL.

Who participated in ICILS?

In total, 20 countries participated in ICILS 2013.[3] Participating countries are shown in the map in Figure 1.

FIGURE 1 ICILS 2013: List of participating countries



In Canada, only two provinces participated in this study: Ontario and Newfoundland and Labrador. The results for Canada as a whole are therefore not included in the international report but results for Ontario and Newfoundland and Labrador are reported separately. A representative sample of Grade 8 students from Ontario and Newfoundland and Labrador participated in ICILS 2013 (see Appendix 1 for details on participation rates). This allowed for valid and reliable comparisons between these two provinces and the other international participants.

Conceptual structure of ICILS 2013

In recent decades, societies around the world have witnessed the development and widespread implementation of computer and other information technologies. It goes without saying that the exchange and transformation of knowledge through information technologies is a feature of modern societies. Information technologies provide the tools to create, collect, store, and use knowledge as well as to communicate and collaborate (Kozma, 2003). Many countries' governments have recognized the importance of education and training in information and communication technologies (ICT) so that citizens can have access to information and participate in transactions through these technologies (Kozma, 2008).

[3] The international report states that 21 countries participated because Ontario and Newfoundland and Labrador were reported as two different countries.

Computer and information literacy

ICILS is the first international comparative study of student preparedness for life in the information age. For this study, the definition of computer and information literacy is based on the ICILS parameters as well as on the literature about ICT-related literacies. "Computer and information literacy refers to an individual's ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in society" (Fraillon, Schulz, & Ainley, 2013, p. 17).

Structure of the computer and information literacy construct

The following elements are included in the CIL construct (see Table 1 for the conceptual structure of the CIL framework):

- Strand: An overarching conceptual category for framing the skills and knowledge addressed by the CIL instruments.
- Aspect: A specific content category within a strand.

TABLE 1 Conceptual structure of the CIL framework

Computer and information literacy refers to an individual's ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in society.

Strand 1: Collecting and managing information	Strand 2: Producing and exchanging information
Aspect 1.1: Knowing about and understanding computer use	Aspect 2.1: Transforming information
Aspect 1.2: Accessing and evaluating information	Aspect 2.2: Creating information
Aspect 1.3: Managing information	Aspect 2.3: Sharing information
	Aspect 2.3: Using information safely and securely

(Fraillon, Schulz, & Ainley, 2013, p. 18)

Strands and aspects

The CIL construct contains two main strands. The first one, called "collecting and managing information," includes three aspects while the second strand, "producing and exchanging information," includes four.

Strand 1: Collecting and managing information

This strand focuses on the receptive and organizational elements of information processing and management, including the fundamental and generic skills and understanding that are associated with using computers. There are three aspects of this strand:

> *Aspect 1.1: Knowing about and understanding computer use* refers to a person's declarative and procedural knowledge of the generic characteristics and functions of computers and focuses on the basic technical knowledge and skills that underpin participants' use of computers to work with information.

Aspect 1.2: Accessing and evaluating information refers to the investigative processes that enable a person to find, retrieve, and make judgments about the relevance, integrity, and usefulness of computer-based information.

Aspect 1.3: Managing information refers to individuals' capacity to work with computer-based information and includes the ability to adopt and adapt information classification and organization schemes in order to arrange and store information so that it can be used or reused efficiently.

Strand 2: Producing and exchanging information

This strand focuses on using computers as productive tools for thinking, creating, and communicating and has four aspects.

Aspect 2.1: Transforming information refers to a person's ability to use computers to change how information is presented so that it is clearer for specific audiences and purposes. It involves using the formatting, graphics, and multimedia potential of computers to enhance the communicative effect or efficacy of information.

Aspect 2.2: Creating information involves a person's ability to use computers to design and generate original information products for specified purposes and audiences.

Aspect 2.3: Sharing information refers to the person's understanding of how computers can be used, as well as his or her ability to use them to communicate and exchange information with others. It focuses on a person's knowledge and understanding of a range of computer-based communication platforms.

Aspect 2.4: Using information safely and securely refers to a person's understanding of the legal and ethical issues of computer-based communication from the perspectives of both publisher and consumer.

Research questions

The main aim of ICILS is to examine how young people develop computer information literacy (CIL) to effectively participate in the digital age. As such, the overarching research questions for this first study refer to the contexts in which CIL is developed and to describe students' proficiency in CIL (Fraillon, Schulz, & Ainley, 2013). The study answers the following set of questions:

1. What variations exist between countries, and within countries, in student computer and information literacy?
2. What aspects of schools and education systems are related to student achievement in computer and information literacy with respect to:
    a. the general approach to computer and information literacy education;
    b. school and teaching practices regarding the use of technologies in computer and information literacy;
    c. teacher attitudes to and proficiency in using computers;
    d. access to ICT in schools; and

e. teacher professional development and within-school delivery of computer and information literacy programs?

3. What characteristics of students' levels of access to, familiarity with, and self-reported proficiency in using computers are related to student achievement in computer and information literacy?

   a. How do these characteristics differ among and within countries?

   b. To what extent do the strengths of the relations between these characteristics and measured computer and information literacy differ among countries?

4. What aspects of students' personal and social background (i.e., gender, socioeconomic background, language) are related to computer and information literacy?

Sampling features of ICILS 2013

ICILS 2013 examines the outcomes of student computer and information literacy (CIL) in 20 different countries. The targeted grade to survey represents eight years of schooling, counting from the first year of ISCED Level 1. The first year of ISCED Level 1 corresponds to primary education, indicating the beginning of systematic apprenticeship in reading, writing, and mathematics.[4] In Canada, as in many education systems in the world, the target grade is Grade 8 and the mean age of students at the time of testing is at least 13.5 years.

ICILS 2013 used a two-stage stratified random sample design. The first stage consisted of a sample of schools. Participating jurisdictions provided a list of all eligible schools with Grade 8 students. In Canada, these consisted of all schools under the jurisdiction of the ministry of education in the participating provinces. In general, schools with Grade 8 students were randomly selected in proportion to the size of the province's Grade 8 population (Probability Proportional to Size or PPS). Given the small number of schools in Newfoundland and Labrador, all schools with Grade 8 students were selected.The second stage consisted of a sample of students. Once the schools were sampled, each school provided a list of all Grade 8 students. Among all the students within the sampled schools, 20 Grade 8 students were randomly selected to participate in the study (or all students in schools with fewer than 20 Grade 8 students).

Each sampled school also provided a list of all Grade 8 teachers who were teaching regular subjects during the testing period and employed at the school from the beginning of the school year. While 15 teachers were randomly selected to respond to the teacher questionnaire in most participating countries, in Ontario and Newfoundland and Labrador, only five teachers were randomly selected.

In Ontario and Newfoundland and Labrador, the following two types of exclusions were permitted:

- *School-level exclusions:* schools that were geographically remote, had very few students (i.e., four students or less in Grade 8), offered a grade structure or curriculum that was radically different from the mainstream education system, and/or provided instruction solely to students with special needs.
- *Student-level exclusions:* students with functional or intellectual disabilities, or non-native language speakers as determined by school staff and according to international guidelines.

[4] ISCED, the International Standard Classification of Education developed by the UNESCO Institute for Statistics, provides an international standard for categorizing levels of schooling throughout the world (UNESCO, 2006, 2012).

Here are a few highlights from countries participating in ICILS 2013:

- In total, approximately 60,000 students from about 3,300 schools in 20 countries participated in ICILS 2013.
- In Ontario, a sample of approximately 3,700 students from nearly 200 schools participated in ICILS 2013.
- In Newfoundland and Labrador, about 1,800 students from close to 120 schools participated in ICILS 2013.
- In Ontario, approximately 600 teachers responded to the Teacher Questionnaire while about 500 teachers completed the Teacher Questionnaire in Newfoundland and Labrador.

Further details on school and student participation and exclusion rates can be found in Appendix 1.

General design of the assessment

The design of the assessment instruments is unique. ICILS is a contextualized computer-based assessment and the first international comparative study that assesses students' computer and information literacy skills. The objective of the test is to provide valid, reliable, and comparable information about students' range of knowledge and skills in ICT and to relate it to contextual factors that might influence students' computer and information literacy skills.

Computer-based testing environment

The ICILS test is designed to provide students with a contextualized computer-based assessment experience that closely mirrors their lived experiences of using computer and information literacy and allows them to demonstrate their competency in realistic settings. To make the assessment as contextualized as possible, the test uses a combination of purpose-built applications and existing live software. Throughout the assessment, students need to navigate the test and complete the questions and tasks presented to them. As a result, the test environment is made up of two functional spaces: the test interface and the stimulus area (Fraillon, Schulz, & Ainley, 2013).

The test interface provides background information about the test (e.g., test progression, time remaining, instructions for tasks). It also includes navigation controls so that the student can move from one test question/task to another. The stimulus area, by contrast, includes either interactive content (e.g., electronic texts) or static content (e.g., image of a log-in screen).

Test instrument

Students were asked to complete the test modules on a computer using a USB key. As such, no Internet access was required. After completing the test modules, students answered a Student Questionnaire. The computer-administered test instrument included a total of four 30-minute modules and each participating student completed two of the four modules for a total of 60 minutes of testing. The assessment used a rotating design to allow for a greater number of items of different levels of difficulty to be administered to students.

Each test module included a series of questions and tasks assessing different CIL skills that were unified by a theme and a plausible narrative. The themes for the test modules and tasks were selected based on their suitability for Grade 8 students, the students' level of interest and engagement, and fairness considerations (i.e., sex, racial, ethnic, and religious considerations as well as linguistic characteristics).

Each student responded to a series of five to eight smaller tasks per module, which would normally take less than one minute to complete per task. After completing this series of small tasks, each student responded to one larger task at the end of each module, which would take approximately 15 to 20 minutes to complete.

Test strands and aspects

As indicated earlier, the CIL construct includes two strands and seven aspects. Strand 1 includes three aspects while Strand 2 has four. The ICILS assessment was not designed to test equal proportions of all aspects of the CIL construct but to ensure some coverage of all aspects (Fraillon, Schulz, & Ainley, 2013). Table 2 summarizes the percentage of score points attributed to each strand and their respective aspects. The table shows a higher percentage of score points in Strand 2 because the first three aspects in the second strand measure the larger tasks that students are asked to perform.

TABLE 2 **Percentage of score points for each strand and aspects within each strand**

Strand 1	**Collecting and managing information**	**36%**
Aspect 1.1	Knowing about and understanding computer use	13%
Aspect 1.2	Accessing and evaluating information	17%
Aspect 1.3	Managing information	6%
Strand 2	**Producing and exchanging information**	**64%**
Aspect 2.1	Transforming information	20%
Aspect 2.2	Creating information	22%
Aspect 2.3	Sharing information	10%
Aspect 2.4	Using information safely and securely	12%

Assessment tasks

Each student is asked to complete a variety of tasks within each module. In total, there are three complementary types of tasks in the computer-based CIL assessment.

1. *Information-based response tasks.* The stimulus area is mostly non-interactive so for these tasks, students respond to a series of multiple-choice, constructed-response, or drag-and-drop questions in which their responses are recorded automatically. The purpose of using a computer-based environment for these tasks is to assess students' basic knowledge and understanding of CIL.
2. *Skills tasks* require students to complete a series of actions using interactive simulations of generic software or universal applications. A student may need to complete one single action where s/he will be asked, for example, to copy a document or click on a specific link. In other instances, the student

will need to follow a sequence of steps to complete the task. For example, the student could be asked to save a document. The actions or responses given by the students are recorded automatically by the testing software. In these types of tasks, the students are required to execute specific commands while processing information.

3. *Authoring tasks* ask students to modify and create information products. To complete these tasks, they use simulated computer software applications built for ICILS purposes, which adhere to software application conventions (e.g., the use of standard icons). Students may need to use multiple applications at the same time (e.g., e-mail, Web pages, spreadsheets) as one would generally do when completing these more complex tasks in real life. The testing software automatically saves the students' work.

Contextual questionnaires

The following questionnaires were administered to provide contextual information that would contribute to interpreting the achievement results.

A *Student Questionnaire* was administered to Grade 8 students participating in the study. It covers students' background characteristics and their experience of and attitudes toward computer use and ICT.

A *Teacher Questionnaire* was administered to a random sample of Grade 8 teachers in the selected school. It focuses on their background characteristics, the use of ICT in teaching, and their attitudes about ICT use in teaching and learning.

A *Principal Questionnaire* was completed by the principal of each participating school. Some of its questions concern school characteristics and school approaches in the use of ICT in teaching and learning.

The *ICT-Coordinator Questionnaire* was administered to the ICT coordinator of each participating school. The questionnaire asks about ICT in schools and in particular the resources and support available for its use.

The *National Context Survey* was completed by the National Research Centre of each participating country. In Canada, educators and specialists in ICT at the lower-secondary level from 11 jurisdictions responded to the survey. The responses were aggregated at the Canadian level, taking into account commonalities and differences between provincial/territorial education systems. This questionnaire seeks information about approaches to developing CIL to support student capacity to function in the digital age. Questions are related to the structure of the education system, plans and policies for using ICT in schools, ICT and student learning at the lower-secondary level, ICT and teacher development, and ICT-based learning and administrative management systems.

Administration of ICILS 2013 in participating countries and provinces

In Canada, Ontario and Newfoundland and Labrador were the only provinces to participate in ICILS 2013. The Council of Ministers of Education, Canada (CMEC) was appointed by the provinces to coordinate this study and act as the National Research Centre (NRC).

The NRC was responsible for: representing these provinces at international meetings; drawing a sample of students and teachers from the participating schools; adapting, translating, approving, and preparing all assessment materials and the contextual questionnaires for the field trial and the main administration; arranging quality control monitoring of the test administration; coordinating the scoring of all test modules; capturing and analyzing data; and writing and publishing the Canadian report.

International meetings

The IEA and the Australian Council for Educational Research (ACER) were responsible for the planning, implementation, and reporting of all aspects of the study at the international level. A group of experts from these organizations developed the assessment framework as well as the test instruments and contextual questionnaires. NRCs met regularly to comment on, discuss, and approve all materials as well as the procedures to follow for the administration of ICILS.

Sampling

The NRC was responsible for submitting a list of all eligible schools in the participating provinces to the international consortium. More details regarding the sampling and participation and exclusion rates can be found in Appendix 1.

Adaptation, translation, approval, and preparation of the assessment materials

All materials (i.e., test instruments, contextual questionnaires, administration documents, and coding guides) were developed by the international consortium and approved by participating countries. In Ontario and Newfoundland and Labrador, the test was administered in both English and French and all of the materials were adapted and translated before the test administration.

The international consortium provided materials to participating countries in English. Each NRC was expected to follow rigorous procedures for the adaptation and translation of the materials into the target language, taking into account the cultural context of their country. In fact, all of the materials were reviewed by independent international verifiers to ensure: 1) a high degree of instrument standardization across countries, 2) accurate translation and adaptation, and 3) international comparability.

Quality monitoring

During the main administration of ICILS, selected schools in all participating countries were visited for quality control monitoring. In Ontario and Newfoundland and Labrador, monitoring took place in 15 schools. This rigorous approach was used to provide documentary evidence that the data collection procedures were strictly followed at all times, and to verify that all countries were complying with standard procedures.

Scoring test modules

The scoring of the test modules for the field test took place in May 2012 while the scoring for the main administration took place in July 2013 in Toronto in both English and French. Prior to the scoring session, scorer leaders from all participating countries including Canada received detailed training on how to score student tests. In Canada, all selected scorers had experience teaching Grade 8 students, had strong computer skills, used information and communication technology (ICT) extensively in the classroom, and were student teachers, current teachers, substitute teachers, or retired teachers.

Scoring was done on a computer and all scorers received extensive training on how to score each item according to international standards. Reliability among scorers was closely monitored during the session with the on-line scoring system, which provided reports on each scorer's reliability. If the percentages for reliability did not meet the international requirements, additional training was provided and items were rescored. Detailed scoring guides and student exemplars were used throughout the process.

Data capture and analysis

Data for the test modules were collected using an on-line scoring system. The data for the Student Questionnaires were collected with a USB stick and the student tests and results were uploaded to a central system after completion. Teachers, principals, and ICT coordinators responded to the assigned questionnaire on-line. Therefore, all data from the student tests and the questionnaires were collected automatically.

Objectives and organization

This report presents the first international and provincial results of the International Computer and Information Literacy Study 2013 (ICILS). The assessment results are reported for the two Canadian provinces that participated (Ontario and Newfoundland and Labrador) and they are compared with participating countries.

Chapter 1 reports the achievement of Grade 8 students on the ICILS 2013 assessment. Chapter 2 provides contextual information, collected through the Student, Teacher, School, and ICT-Coordinator questionnaires, in relation to students' achievement. Chapter 3 uses information collected through a National Context Survey conducted by 11 Canadian jurisdictions to provide an overview of approaches to CIL teaching and learning as it relates to the various jurisdictional education systems, plans and policies for using ICT in schools, ICT and student learning at the lower-secondary level, ICT and teacher development, and ICT-based learning and administrative management systems.

1 Students' Results in Computer Information Literacy (CIL)

This chapter presents students' achievement in ICILS 2013 for all participating countries and provinces. It also presents the average scores for all participating countries and provinces and compares the results for Ontario and Newfoundland and Labrador to the other participants. (In Canada, Ontario and Newfoundland and Labrador were the only two provinces to participate.) The chapter then describes the four CIL proficiency levels and provides the percentage of students at each of these levels for all participating countries. Next, it reports the difference in average scores between girls and boys across participating countries and provinces. Then, for Ontario only, the chapter describes results according to the immigration background of the students and results for students attending anglophone and francophone school systems, as well as the differences among these systems.

The average scores in international studies such as ICILS are listed according to country rankings, that is, from the highest to the lowest average score. However, comparing results based on the average scores is misleading because there is a margin of uncertainty associated with each score. Therefore, it is important to take into account the sampling error and the error of measurement to determine whether or not the differences in the averages are statistically significant. See the statistical note here for more detailed information about terminology.

A note on the terminology used for statistical comparison

Differences

In this report, the terms *difference* or *different*, used in the context of achievement results, refer to difference in a technical sense. They refer to a statistically significant difference. A difference is statistically different when there is no overlap of confidence intervals between different measurements being compared. In this report, if there is a significant difference between two average scores with their confidence intervals, this difference is indicated using bold font and/or an asterisk (*).

Confidence intervals

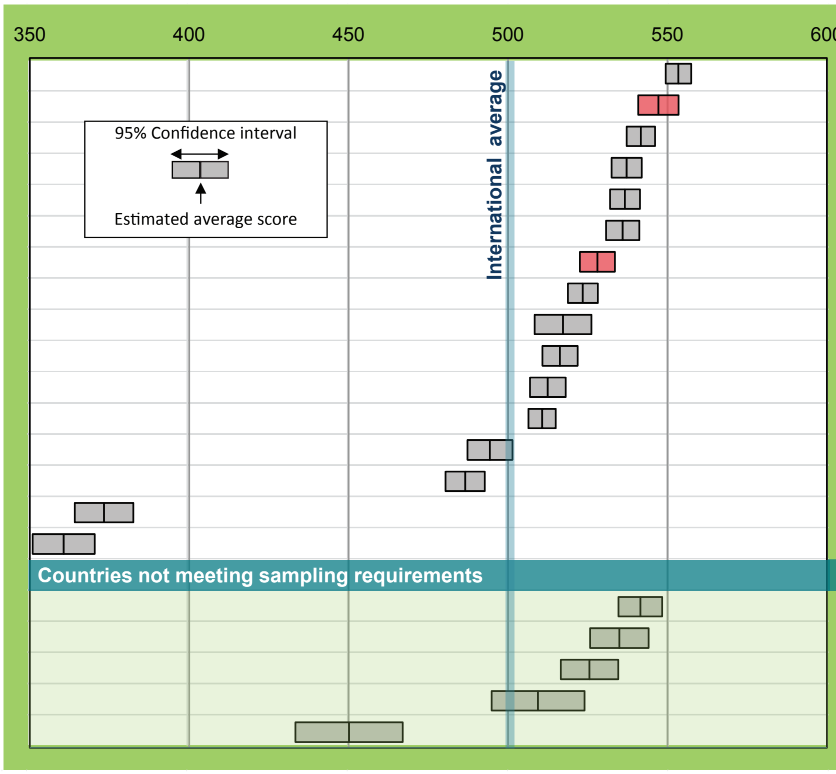
The purpose of ICILS is to report results on the Grade 8 student population in CIL achievement. A random sample of Grade 8 students was selected to complete the assessment. The average scores were computed based on these students' responses. Thus, the reported achievement scores provide estimates of the achievement results that would have been demonstrated if all students in the population had participated in this assessment. However, this process introduces what is known in statistical terms as a sampling error. In addition, a degree of error is associated with the scores describing the students' skills because these scores are estimated, based on student responses to test items. This error is called the error of measurement. Because an estimate that is based on a sample is rarely exact, and because the error of measurement exists, a standard error (SE) is computed. In large-scale assessments such as ICILS, it is a common practice when reporting average scores to provide a range of scores within which the "true" achievement level might fall. This range of scores expressed for each average score is called a confidence interval. A 95 per cent confidence interval is used in this report to represent the high and low end points between which the actual average score should fall 95 per cent of the time (and is computed as ± 1.96 SE). It is important to consider the standard error when comparing the results among groups in order to determine whether the scores are statistically different from one another.

In other words, one can be confident that the actual achievement level of all students in a population would fall somewhere in the established range 19 times out of 20 if the assessment were repeated with different samples randomly drawn from the same student population. In the charts in this report, confidence intervals are represented by the symbol ⊢. If the confidence intervals overlap, the differences are defined as not statistically significant. When the confidence intervals overlapped slightly, an additional test of significance (t-test) was conducted to determine whether the difference was statistically significant.

Overall results in CIL for participating countries and provinces

The following chart presents the CIL average scores for each participating country. In total, 20 countries participated in this study including the provinces of Ontario and Newfoundland and Labrador as benchmarking participants in Canada. It is worth stating that the data of five countries presented in this chart did not meet the sampling requirements: Argentina (Buenos Aires), Denmark, Hong Kong (SAR), Netherlands, and Switzerland. Consequently, they are listed with an annotation throughout this report and their results must be interpreted with caution. Countries are ranked from the highest CIL average results to the lowest. Table 1.1 presents a summary of the countries performing better than, as well as, or less well than Ontario and Newfoundland and Labrador.

CHART 1.1 Average scores and confidence intervals in CIL for countries and provinces



Countries and provinces	Average score	SE
Czech Republic	553	2.1
Ontario	**547**	**3.2**
Australia	542	2.3
Poland	537	2.4
Norway (Grade 9)	537	2.4
Korea	536	2.7
Newfoundland and Labrador	**528**	**2.8**
Germany	523	2.4
Slovak Republic	517	4.6
Russian Federation	516	2.8
Croatia	512	2.9
Slovenia	511	2.2
Lithuania	494	3.6
Chile	487	3.1
Thailand	373	4.7
Turkey	361	5.0
Denmark	542	3.5
Netherlands	535	4.7
Switzerland	526	4.6
Hong Kong (SAR)	509	7.4
Argentina (Buenos Aires)	450	8.6

The CIL scores are expressed on a scale with an average of 500 points and a standard deviation of 100, meaning that approximately two-thirds of all students scored between 400 and 600 points. The average CIL scores range from 361 (Turkey) to 553 (Czech Republic) points.

Overall, Grade 8 students in both participating provinces performed very well on the assessment. Students in Ontario had an average score of 547 points, which is 47 points above the ICILS international average of 500. Meanwhile, students in Newfoundland and Labrador had an average score of 528 points which is also well above the international average.

Table 1.1 shows how participating countries did relative to Ontario and Newfoundland and Labrador. No participating country performed significantly better than Ontario although the Czech Republic and Australia performed as well as Ontario. Newfoundland and Labrador was outperformed by the Czech

Republic, Australia, Poland, Norway (Grade 9), Korea, and Ontario, while Germany performed as well as Newfoundland and Labrador.

TABLE 1.1 Results of participating countries/provinces relative to Ontario and Newfoundland and Labrador[5]

Province	Countries/province performing significantly better	Countries/province performing the same	Countries/province performing significantly lower
Ontario		Czech Republic, Australia	Poland, Norway (Grade 9), Korea, *Newfoundland and Labrador,* Germany, Slovak Republic, Russian Federation, Croatia, Slovenia, Lithuania, Chile, Thailand, and Turkey
Newfoundland and Labrador	Czech Republic, *Ontario*, Australia, Poland, Norway (Grade 9), and Korea,	Germany	Slovak Republic, Russian Federation, Croatia, Slovenia, Lithuania, Chile, Thailand, and Turkey

Results by level of proficiency for participating countries and provinces

Table 1.2 presents the CIL scale's four levels of proficiency where level 4 is the highest and level 1 is the lowest. Each level is defined according to the skills and competencies students should have at each level. The table provides a brief description of each level and concrete examples of what students should be able to do at each one.

[5] Countries not meeting the sampling requirements are not presented in Table 1.1.

Table 1.2 Description of the CIL proficiency levels

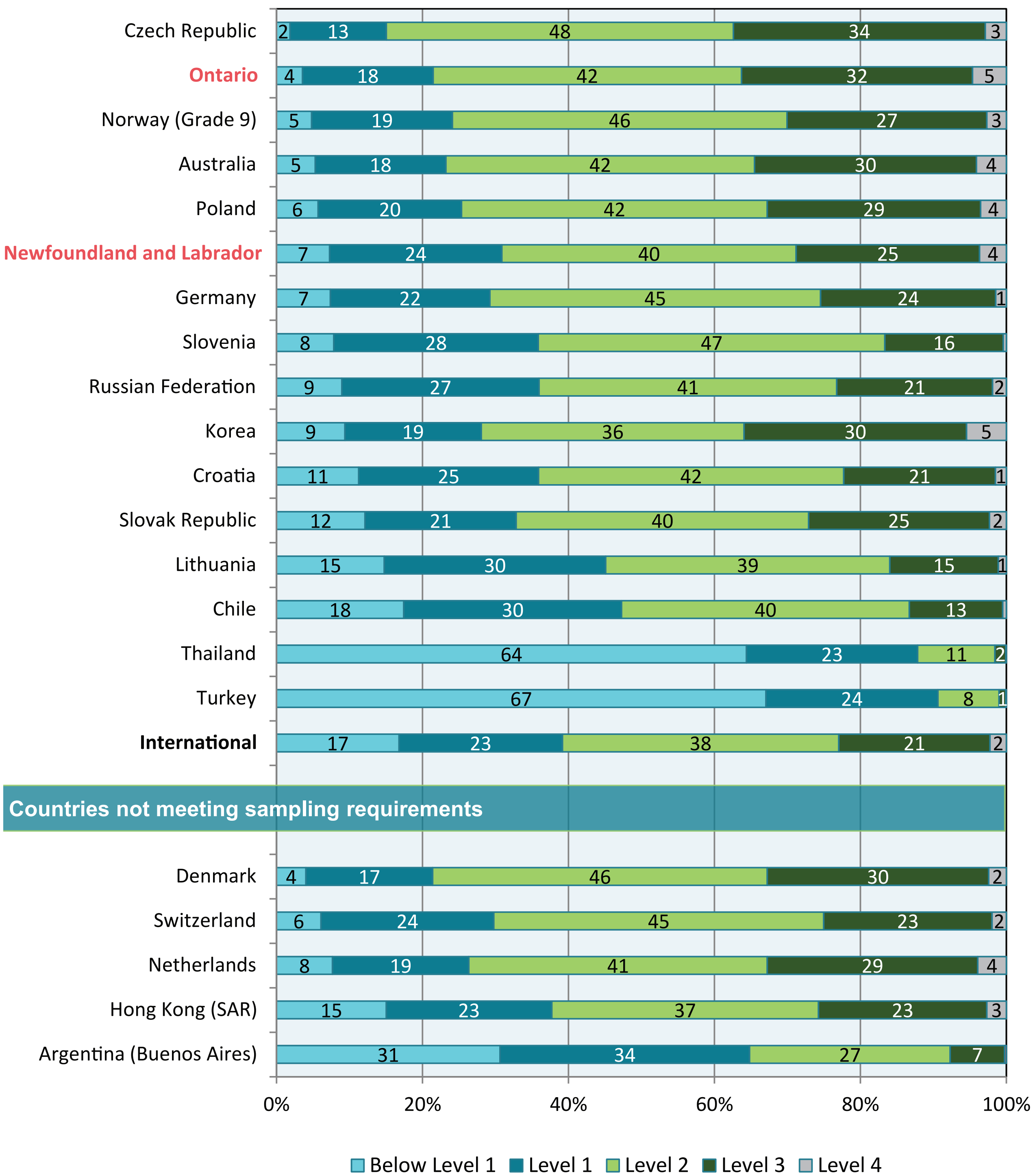
Level 4 (661 score points and more)	
Students working at level 4 select the most relevant information to use for communicative purposes. They evaluate the usefulness of information based on criteria associated with their need and evaluate the reliability of information based on its content and probable origin. These students create information products that demonstrate a consideration of audience and communicative purpose. They also use appropriate software features to restructure and present information in a manner consistent with presentation conventions and adapt that information to suit the needs of an audience. Students working at level 4 demonstrate awareness of problems that can arise regarding the use of proprietary information on the Internet.	Examples of what students working at level 4 can do: • evaluate the reliability of information intended to promote a product on a commercial Web site • select a result that meets specified search criteria from a large set of results returned by a search engine • select relevant images from electronic sources to represent a three-stage process • select from sources and adapt text for a presentation so that it suits a specified audience and purpose • demonstrate control of colour to support the communicative purpose of a presentation • use text layout and formatting features to denote the role of elements in an information poster • create balanced layout of text and images for an information sheet • recognize the difference between legal, technical, and social requirements when using images on a Web site.
Level 3 (from 576 to 661 score points)	
Students working at level 3 demonstrate the capacity to work independently when using computers as information-gathering and management tools. These students select the most appropriate information source to meet a specified purpose, retrieve information from given electronic sources to answer concrete questions, and follow instructions to use conventionally recognized software commands to edit, add content to, and reformat information products. They recognize that the credibility of Web-based information can be influenced by the identity, expertise, and motives of the information's creators.	Examples of what students working at level 3 can do: • use generic on-line mapping software to represent text information as a map route • evaluate the reliability of information presented on a crowd-sourced Web site • select relevant information according to given criteria to include in a Web site • select an appropriate Web site navigation structure for given content • select and adapt some relevant information from given sources when creating a poster • demonstrate control of image layout when creating a poster • demonstrate control of colour and contrast to support readability of a poster • demonstrate control of text layout when creating a presentation • identify that a generic greeting in an e-mail suggests that the sender does not know the recipient.

Level 2 (from 492 to 576 score points)	
Students working at level 2 use computers to complete basic and explicit information-gathering and management tasks. They locate explicit information from within given electronic sources. These students make basic edits and add content to existing information products in response to specific instructions. They create simple information products that show consistency of design and adherence to layout conventions. Students working at level 2 demonstrate awareness of mechanisms for protecting personal information and some consequences of public access to personal information.	Examples of what students working at level 2 can do: • add contacts to a collaborative workspace • navigate to a URL presented as plain text • insert information to a specified cell in a spreadsheet • locate explicitly stated simple information within a Web site with multiple pages • differentiate between sponsored and organic search results returned by a search engine • use formatting and location to denote the role of a title in an information sheet • use the full page when laying out a poster • demonstrate basic control of text layout and colour use when creating a presentation • use a simple Web page editor to add specified text to a Web page • explain a potential problem if a personal e-mail address is publicly available • associate the breadth of a character set with the strength of a password.
Level 1 (from 407 to 492 score points)	
Students working at level 1 demonstrate a functional working knowledge of computers as tools and a basic understanding of the consequences of computers being accessed by multiple users. They apply conventional software commands to perform basic communication tasks and add simple content to information products. They demonstrate familiarity with basic layout conventions of electronic documents.	Examples of what students working at level 1 can do: • open a link in a new browser tab • use software to crop an image • place a title in a prominent position on a Web page • create a suitable title for a presentation • demonstrate basic control of colour when adding content to a simple Web document • insert an image into a document • identify who receives an e-mail by carbon copy (CC) • suggest one or more risks of failing to log out from a user account when using a publicly accessible computer.

(from Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014)

Chart 1.2 presents the percentage of students reaching each proficiency level on the CIL scale for participating countries and provinces. This provides an overall picture of the CIL proficiency of Grade 8 students. The tasks being performed at level 1 are easier and less complex than those being performed at level 4. Students who are below level 1 will unlikely be able to execute the most basic skills (e.g., clicking on a hyperlink). Participating countries and provinces are listed in ascending order from those with the lowest percentage of students below level 1 to those with the highest.

CHART 1.2 Percentage of students by proficiency level on the CIL scale across participating countries and provinces[6]



[6] The difference in the numbers may not add up because of rounding.

The highest percentage of students among all participating countries and provinces, except for Thailand and Turkey, are found at level 2 of CIL proficiency for Grade 8 students. While the bulk of students in Ontario and Newfoundland and Labrador are performing at level 2 (42% and 40% respectively), there are also a number at level 3 (32% and 25% respectively). Upon closer examination, we see how the results also demonstrate that more than a third (37%) of the students in Ontario achieve the highest levels of proficiency, levels 3 and 4, while in Newfoundland and Labrador, close to a third (29%) of students are reaching these levels. The percentages of students achieving the highest levels for both of these provinces are higher than the average percentage of students across all countries (ICILS average of 23%).

Results by sex for participating countries and provinces

The differences in the scores between boys and girls have been closely examined in large-scale assessments. Previous studies have shown a noticeable difference in reading achievement between these two groups in most countries including Canada. For example, when looking at the recent results of the Pan-Canadian Assessment Program (PCAP) 2013, one sees that girls performed significantly better in reading than boys in all provinces (O'Grady & Houme, 2014). At the international level, the 2012 Programme for International Student Assessment (PISA) compared the gender gaps between print and digital reading and between paper-based and computer-based assessments in mathematics (OECD, 2013). The Canadian results for PISA 2012 show that girls performed significantly better in reading than boys in all provinces, but the gender gap was smaller in digital reading (Brochu, Deussing, Houme, & Chuy, 2013). In contrast, boys outperformed girls in both paper-based and computer-based assessments in mathematics. Table 1.3 shows the average scores and gender differences in CIL for all participating countries and provinces, which are listed from the largest difference to the smallest.

TABLE 1.3 Average scores and differences in CIL by gender for participating countries and provinces

Participating countries and provinces	Girls		Boys		Difference (girls-boys)[7]
	Average score	Standard error	Average score	Standard error	
Korea	556	3.1	517	3.7	**38**
Newfoundland and Labrador	544	4.1	509	3.7	**35**
Slovenia	526	2.8	497	2.8	**29**
Ontario	560	4.0	535	3.4	**25**
Chile	499	3.9	474	3.9	**25**
Australia	554	2.8	529	3.3	**24**
Norway (Grade 9)	548	2.8	525	3.1	**23**
Lithuania	503	4.2	486	3.8	**17**
Germany	532	2.9	516	3.2	**16**
Croatia	520	3.1	505	3.6	**15**
Russian Federation	523	2.8	510	3.4	**13**
Slovak Republic	524	4.8	511	5.1	**13**
Poland	544	2.9	531	3.1	**13**
Czech Republic	559	2.0	548	2.8	**12**
Thailand	378	5.7	369	5.3	9
Turkey	362	5.2	360	5.4	2
International	509	1.0	491	1.0	**18**
Countries not meeting sampling requirements					
Hong Kong (SAR)	523	7.5	498	9.2	**25**
Netherlands	546	5.1	525	5.4	**20**
Denmark	549	4.7	534	4.1	**15**
Switzerland	529	5.5	522	4.6	6
Argentina (Buenos Aires)	453	8.9	448	9.7	6

It is interesting to note how the average scores in CIL show that girls perform significantly better than boys in most participating countries and provinces (except for Thailand and Turkey), with a difference ranging from 38 to 12 points. Considerable differences of 35 and 25 points are observed in Newfoundland and Labrador and Ontario, respectively. The gender gap is larger in both provinces when compared to the difference in the international average scores (18 points) and most other participating countries.

[7] The difference in the numbers may not add up because of rounding.

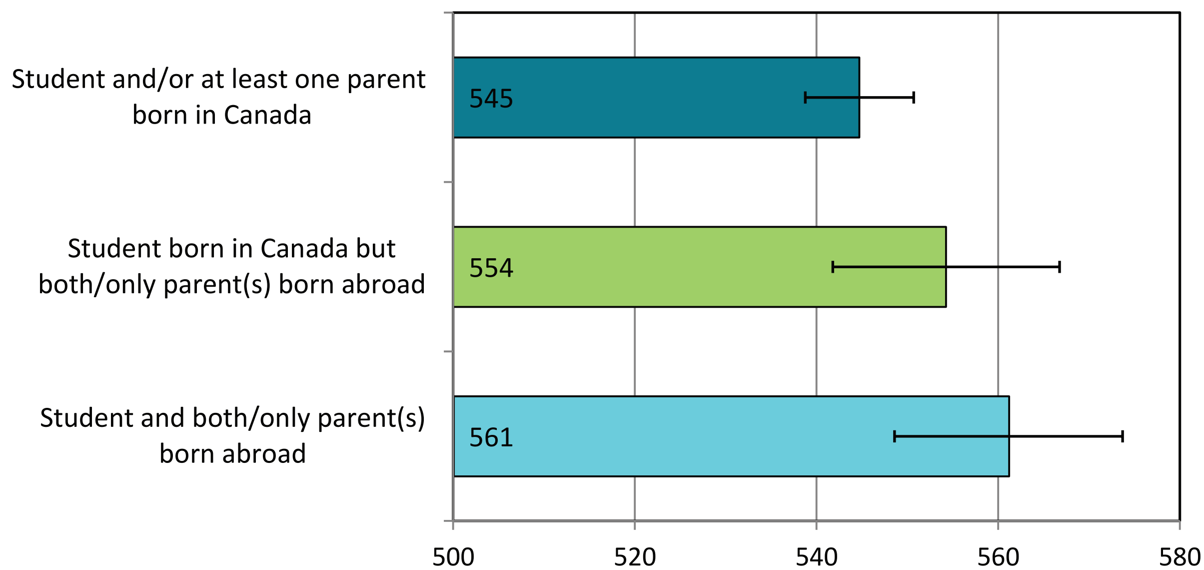
Results by immigration status for Ontario

The difference in achievement results between students born in Canada and students with an immigration background has been explored in previous large-scale assessments. The 2014 edition of *Assessment Matters*, called “How Good Are Canadian 15-Year-Olds at Solving Problems?” (CMEC, 2014), examined the difference in the results for the problem-solving component of PISA 2012. There was no difference in the results found between students born in Canada and students with an immigrant background in computer-based problem solving. Chart 1.3 presents the CIL average scores in Ontario comparing:

- students who were born in Canada or who had at least one parent born in Canada,
- students who were born in Canada but whose both/only parent(s) were foreign born, and
- students who were born in another country and whose both/only parent(s) were also foreign born.

The results for Newfoundland and Labrador were not reported due to an insufficient sample size.

CHART 1.3 Average scores and confidence intervals in CIL by immigration status for Ontario

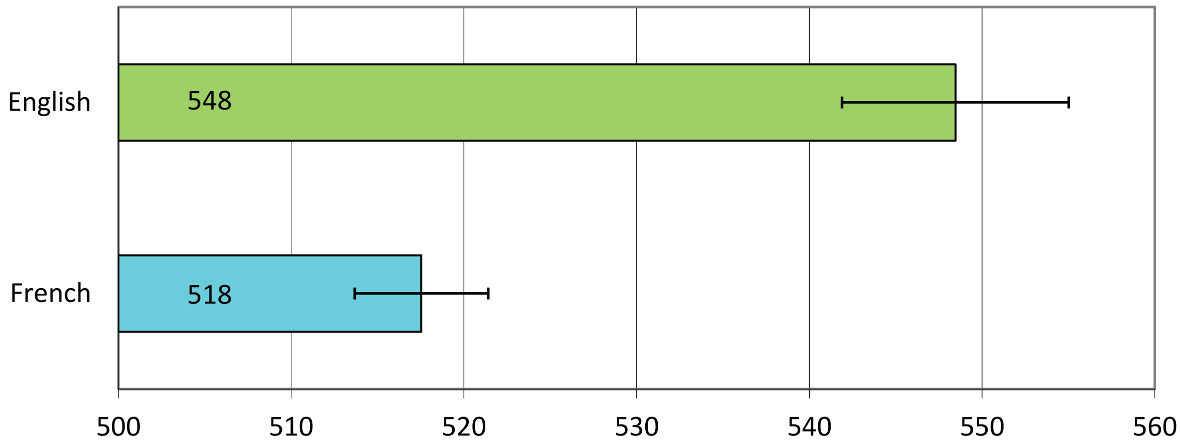


The results show a significant difference in the CIL scores between students with at least one parent born in Canada and students with both/only parents born in another country.

Results by language in Ontario

The results between students enrolled in the English- and French-language schools systems have been examined in Canada in previous large-scale assessments. The latest results of PISA 2012 looked at the differences by province between these two school systems for both computer-based mathematics and digital reading. Results for Ontario demonstrate that students enrolled in the English-language school system outperform those enrolled in the French-language school system (Brochu et al., 2013). The ICILS performance of students enrolled in English and French school systems is reported for only Ontario in Chart 1.4. In Newfoundland and Labrador, the performance of students for both systems was not examined because of an insufficient sample size.

Chart 1.4 Average scores and confidence intervals in CIL by language for Ontario



Consistent with previous large-scale assessments, the results for ICILS for Ontario show that students enrolled in the English school system perform significantly better than students enrolled in the French one with a score difference of 31 points.[8]

[8] The difference in the numbers may not add up because of rounding.

2 Canadian Results in Relation to Contextual Questionnaires

In large-scale assessments (e.g., PISA, PIRLS, and TIMSS), a set of questionnaires is often administered in order to investigate the different factors that influence or help to explain students' results.[9] ICILS 2013 administered a Student Questionnaire, a School Questionnaire, an ICT-Coordinator Questionnaire, and a Teacher Questionnaire. This chapter presents the questionnaire results for Ontario and Newfoundland and Labrador and compares them to the international average. The percentages are reported for particular items in questionnaires and in relation to student CIL achievement whenever relevant. The mean scale scores are also presented, based on sets of items. Their purpose is to provide an overall picture of differences among provinces in relation to the international average. All scale scores are derived from a factor analysis with an international mean of 50 and a standard deviation of 10.

Students' and home characteristics, attitudes, confidence, and use of computers

According to recent studies, home background factors influence how students learn and acquire ICT skills (MCEECDYA, 2010; Nasah, DaCosta, Kinsell, & Seok, 2010). For example, socioeconomic factors such as parental occupation and the number of books at home relate to students' CIL achievement results at school. In addition, students' overall experience and attitudes and confidence toward computers can have an impact on their achievement.

Parental occupation

The relationship between parents' occupations as an indicator of socioeconomic status (SES) and student performance has been explored in many previous studies. For instance, a recent edition of *PISA in Focus,* called "Do Parents' Occupations Have an Impact on Student Performance?" reveals that students whose parents work in professional occupations (skilled workers) generally outperform students whose parents do not, especially in mathematics achievement. Meanwhile, students whose parents work in elementary occupations (unskilled workers) tend to underachieve compared to their peers (OECD, 2014).

Students were asked, through an open-ended question in the Student Questionnaire, what the main job of each of their parents is. Using their own words, they had to describe their parents' occupations. Their responses were then coded using the International Standard Classification of Occupations (ISCO-08) framework (International Labour Organization, 2007).

The scale for parental occupation, called the International Socio-economic Index (SEI), ranges from 16 to 90 score points. It is divided into three categories: "low occupational status" (below 40 score points), "medium occupational status" (40 to 59 score points), and "high occupational status" (60 score points or more). The SEI scores for both parents were derived. The higher of the two SEI scores was the indicator of the parents' highest occupational status whereas for single parents, only their individual SEI score was used.

The proportion of students with parents in each occupational status category is shown in Table 2.1. In both Ontario and Newfoundland and Labrador 22 per cent and 28 per cent of students respectively reported that their parents were in the low occupational status category, 34 and 40 per cent in the

[9] PIRLS refers to the Progress in International Reading Literacy Study done by the IEA; TIMSS is the Trends in International Mathematics and Science Study.

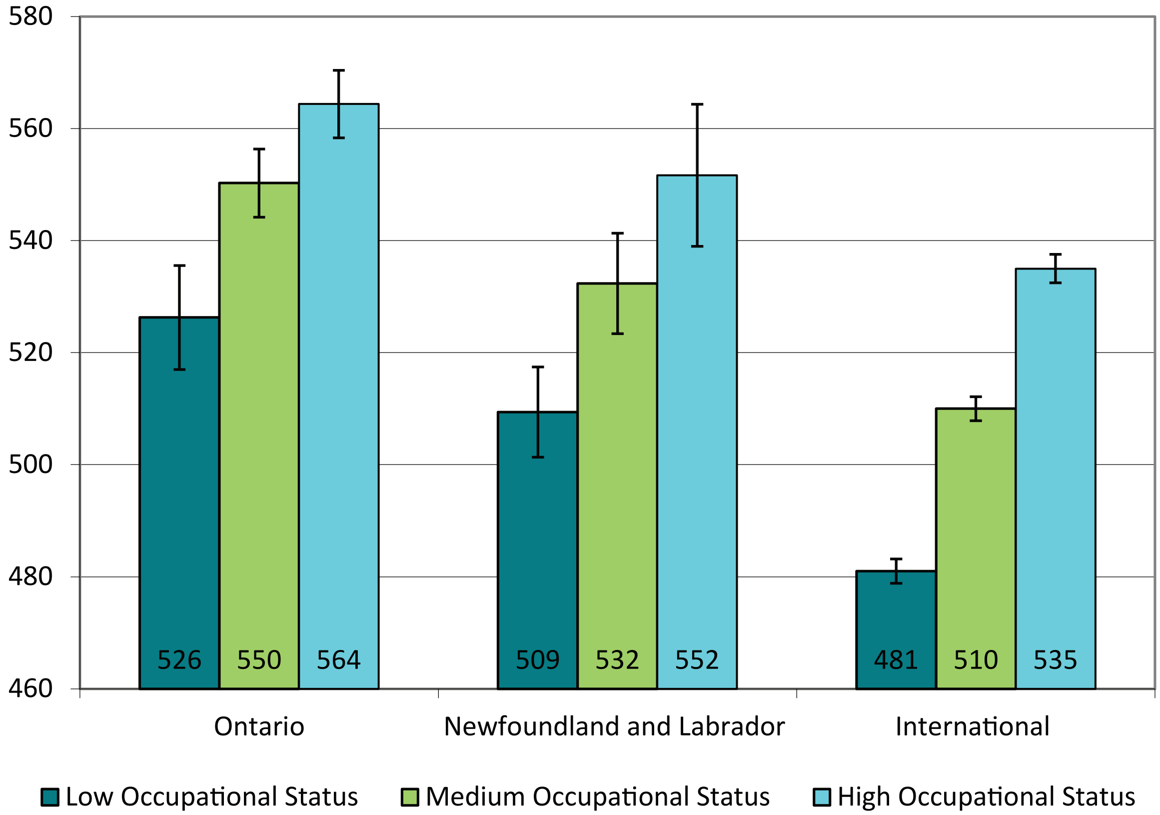
medium occupational status category and 44 and 32 per cent in the high occupational status category. It is noteworthy that the percentage of students in Ontario whose parents are in the high occupational status category is higher than among all participating countries. In Newfoundland and Labrador, the percentage is significantly higher than the average across participating ICILS countries. However, close to 25 per cent of students in both provinces are in the lowest category — this proportion is lower than the international average.

TABLE 2.1 Proportion of students with parents in each occupational status category

	Low occupational status (%)	Medium occupational status (%)	High occupational status (%)
Ontario	22	34	44
Newfoundland and Labrador	28	40	32
International	39	37	24

Chart 2.1 shows the differences in student CIL scores for each parental occupation status category. As expected, parental occupation has a strong relationship with students' performance, particularly at the international level. In Ontario and at the international level, students with parents in the high occupational status category are performing better than students whose parents are in the medium category (with an advantage of 14 points in Ontario and 24 points internationally) while in Newfoundland and Labrador, students are performing the same. In both provinces and internationally, students whose parents are in the high occupational status category performed better than students whose parents are in the lowest category (with an advantage of 38 points for Ontario, 42 points for Newfoundland and Labrador, and 54 points among participating countries).

CHART 2.1 CIL achievement scores by categories of parental occupational status



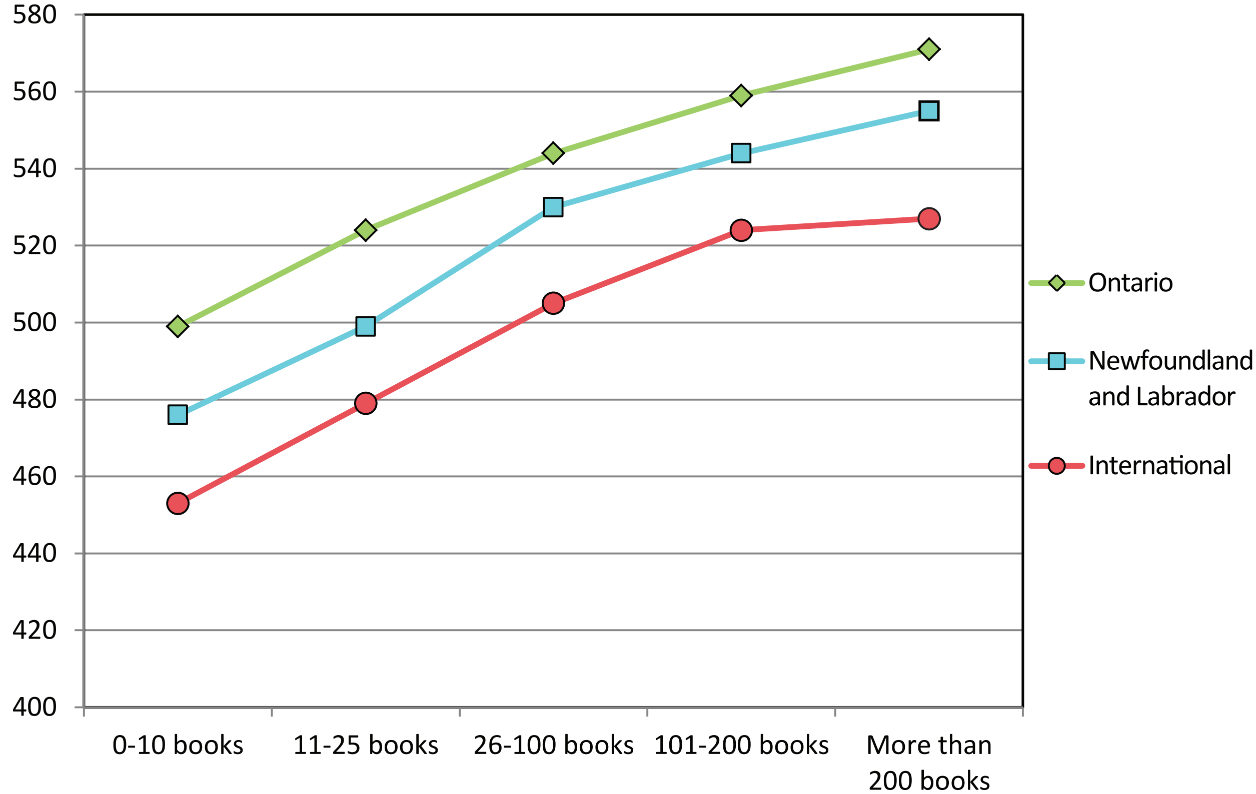
Number of books at home

According to Woessmann (2003b, 2008), the number of books at home is the single most important predictor of student performance in most countries. In large-scale assessments, the relationship has been considerably stronger in reading but it is also positively related to student performance in other core subjects such as mathematics and science.

ICILS examined the impact of home literacy resources on student CIL achievement (see Chart 2.2). Information was gathered through the Student Questionnaire, where students had to report the total number of books at home.

The results reveal that the more books students have at home, the better their performance on the ICILS test. This pattern is consistent with observations across all countries at the international level. The difference in the score points between students who reported having 0–10 books at home and those who reported having more than 200 books is significant across all countries. In Ontario and Newfoundland and Labrador, the difference is 71 and 79 score points respectively while internationally, the difference is 74 score points.

CHART 2.2 CIL achievement scores by number of books at home



Students' experience with computers

With the ever-growing digitization of the world, both policy-makers and academic researchers are increasingly interested in the role that ICT plays in raising educational achievements (Spiezia, 2011). In Canada and many other countries, the majority of students have had access to computers and the Internet both in schools and at home for a number of years. As such, it is interesting to examine how students' use of computers can influence their performance in ICILS.

When completing the Student Questionnaire, students were asked how long they have been using computers. The responses were combined and reported based on four categories.

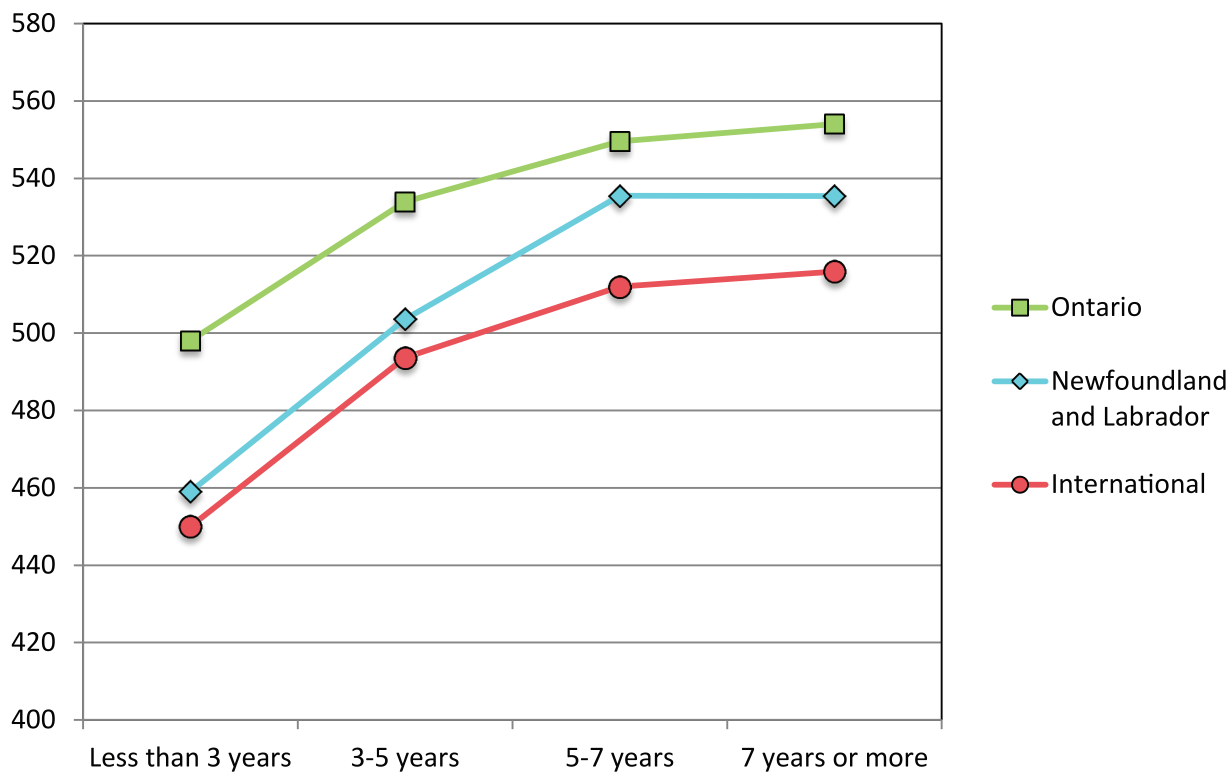
As Table 2.2 indicates, in Ontario and Newfoundland and Labrador, 83 per cent of these Grade 8 students have been using computers for at least five years compared to 65 per cent of students at the international level. Among these students, more than half in both provinces (58% in Ontario and 56% in Newfoundland and Labrador) have been using computers for seven years or more, which means since the beginning of their formal schooling, compared to 36 per cent internationally.

TABLE 2.2 Proportion of students' experience with computers

	Less than three years (%)	At least three years but less than five years (%)	At least five years but less than seven years (%)	Seven or more years (%)
Ontario	4	12	25	58
Newfoundland and Labrador	5	12	27	56
International	15	20	29	36

Chart 2.3 presents students' average scores in CIL for each category. The results show a statistically significant positive relationship between the number of years students have used computers and CIL average scores. In both provinces and internationally, the relationship between students' years of experience with computers and CIL average scores is positive but peaks at five to seven years. Students who had at least three years of experience but less than five obtained higher CIL average scores than students who had less than three years of experience.

CHART 2.3 CIL achievement scores by students' experience with computers in approximate years



Students' attitudes toward computers

Previous international studies, such as PISA, have shown that students' interest in and enjoyment of a particular subject were positively related to their results. For example, the second report of PISA 2009 indicated that there was a strong association between students' enjoyment of reading and their performance in that domain (Brochu, Gluszynski, & Cartwright, 2011). Similarly, the ICILS assessment explored how students' attitude toward, interest in, and enjoyment of ICT are related to their CIL results.

Students were asked to indicate on a four-point Likert scale whether they agreed with a series of statements related to their interest and enjoyment in using computers. Table 2.3 lists all statements and indicates the percentage of agreement among students for Ontario and Newfoundland and Labrador, in comparison to the international average.

In general, students in both provinces agreed with the statements. The percentages range from 72 and 76 per cent for "I use a computer because I am very interested in the technology" to 96 and 95 per cent for "I think using a computer is fun" for Ontario and Newfoundland and Labrador respectively. The percentages between Ontario and Newfoundland and Labrador are very similar. The percentages for both provinces are higher than the international average in most cases. About three quarters of the students in both Ontario and Newfoundland and Labrador use a computer because they are more interested in the technology compared to an average of 63 per cent across all countries.

Table 2.3 Percentages of students agreeing with statements related to their interest and enjoyment in using computers[10]

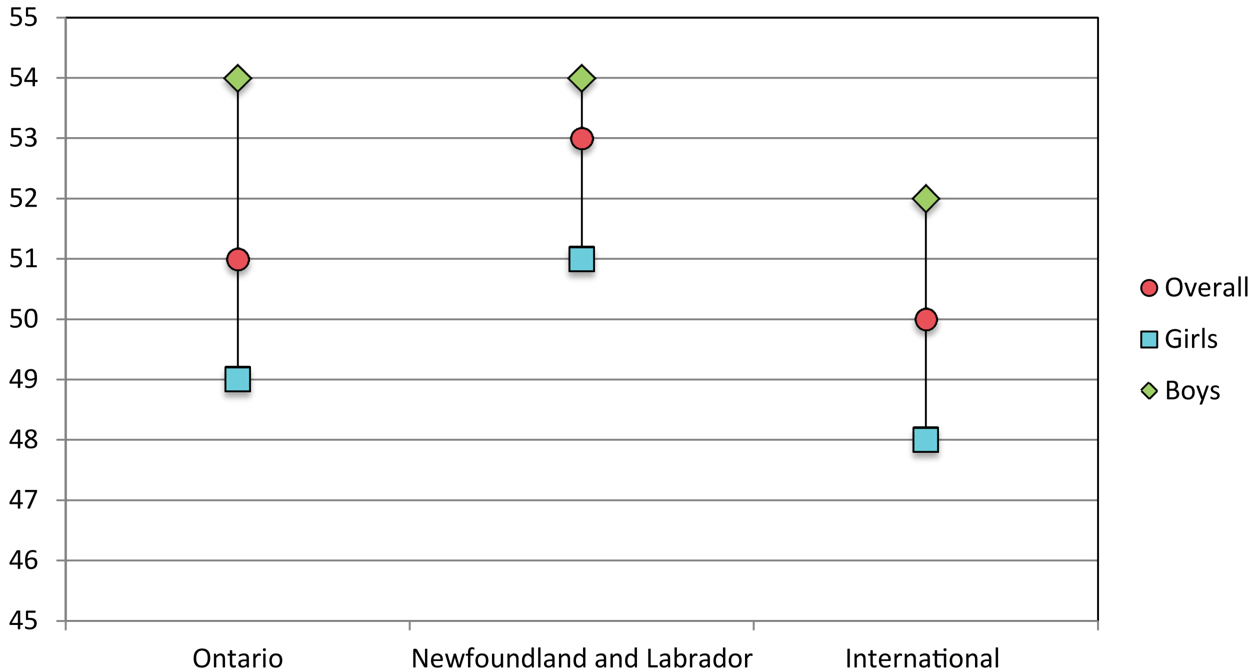
Statements	ON (%)	NL (%)	International (%)
It is very important to me to work with a computer.	90	91	89
I think using a computer is fun.	96	95	91
It is more fun to do my work using a computer than without a computer.	85	88	83
I use a computer because I am very interested in the technology.	72	76	63
I like learning how to do new things using a computer.	93	93	91
I often look for new ways to do things using a computer.	77	79	78
I enjoy using the Internet to find out information.	93	93	92

These statements have been aggregated to form the scale of "Students' Interest and Enjoyment in Using Computers." Chart 2.4 gives the overall average scale scores and the averages by gender for that scale for both provinces compared to the international average. The results indicate that students in both provinces have a higher level of interest and enjoyment in using computers than the international average. Students in Newfoundland and Labrador (average scale score of 53) are more interested and enjoy using computers slightly more than students in Ontario (average scale score of 51). Boys also have a more favourable attitude toward computers than girls in both provinces, with a difference of five scale points in Ontario and three scale points in Newfoundland and Labrador. This gender difference is consistent across all participating countries and confirms findings from Knezek and colleagues (2005)

[10] The percentages represent the proportion of students who agreed or strongly agreed with the statements.

who concluded that girls start showing less enjoyment toward computers compared to boys starting in Grade 6.

CHART 2.4 Average scale score of Students' Interest and Enjoyment in Using Computers overall and by gender



The relation between students' interest and enjoyment in using computers and the average CIL achievement scores is shown in Table 2.4. There is a positive association between students' interest and enjoyment in using ICT and their CIL achievement scores. The difference between the bottom quarter and the top quarter of interest and enjoyment is 19 points for Ontario while it is 7 points for Newfoundland and Labrador. Although there is a pattern where students who enjoy more and are more interested in using computers perform better on the assessment, the difference in the scores between students in the bottom and top quarter is not significant in Newfoundland and Labrador.

TABLE 2.4 Index of students' interest and enjoyment in using ICT and achievement on the CIL scale

	Bottom quarter		Second quarter		Third quarter		Top quarter	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
NL	523	7.0	524	5.8	538	5.4	530	6.3
ON	538	4.9	548	3.6	552	4.3	557	3.8
INT	490	1.3	500	1.2	507	1.2	507	1.1

Students' confidence in using computers

A recent report by the European Commission found that students are more confident in their "digital competences when they have high access to/use of ICT at home and at school" (European Commission, 2013, p. 15). The ICILS 2013 Student Questionnaire also gathered information on the students' confidence in using computers. Students were asked how well they thought they could do various computer-based tasks. In each case, students had to indicate their level of confidence in performing a number of ICT-related tasks.

For both provinces in comparison to the international average, Table 2.5 shows the percentage of students who indicated they knew how to do each task. Overall, the percentages are very similar across provinces and compared to the international average. The ease in performing certain tasks varied with more confidence in "searching for information on the Internet" and less confidence in "creating a computer program or macro." Students in both provinces are more confident in knowing how to do the task except for "Edit digital photographs or other graphic images," "Use a spreadsheet to do calculations, store data, or plot a graph," and "Use software to find and get rid of viruses" than students among participating countries.

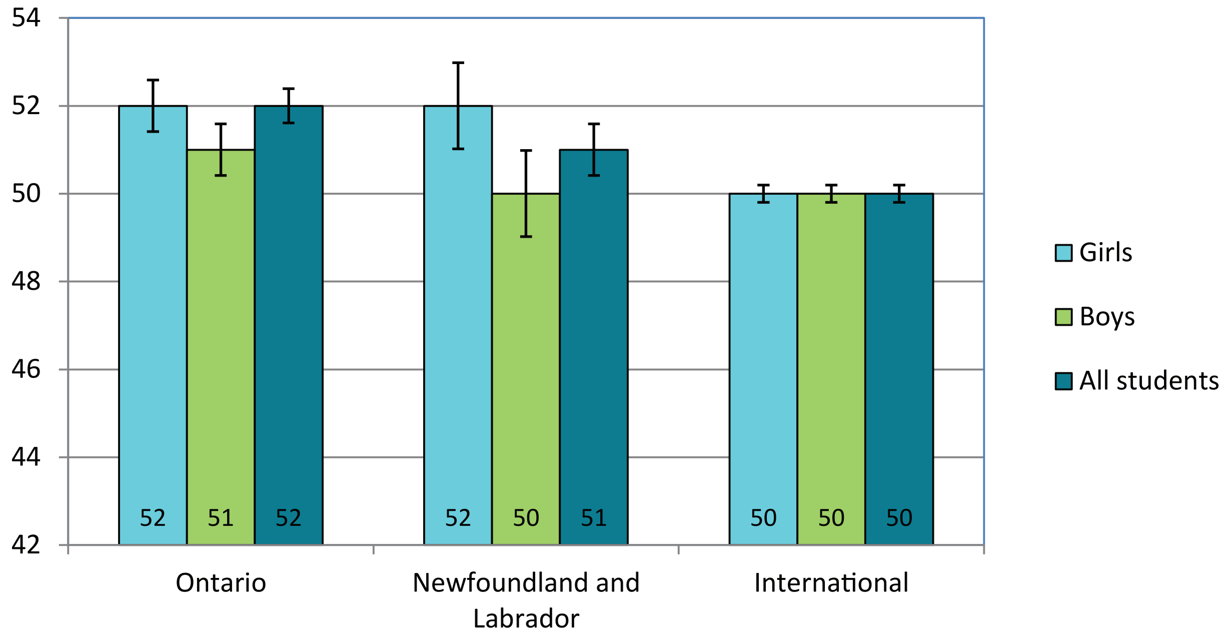
TABLE 2.5 Percentages of students' confidence in using computers

Statements	ON (%)	NL (%)	International (%)
Search for and find information you need on the Internet.	93	91	89
Search for and find a file on your computer.	88	88	87
Create or edit documents.	86	84	81
Upload text, images, or video to an on-line profile.	85	84	77
Edit digital photographs or other graphic images.	70	71	73
Create a multimedia presentation.	74	70	64
Change the settings on computer to improve the way it operates or to fix problems.	63	65	57
Use a spreadsheet to do calculations, store data, or plot a graph.	45	35	54
Use software to find and get rid of viruses.	36	41	47
Build or edit a Web page.	34	41	38
Set up a computer network.	35	39	35
Create a database.	29	30	30
Create a computer program or macro.	21	26	21

Two scales were formed from these items: Basic ICT Skills Self-Efficacy based on six items and Advanced ICT Skills Self-Efficacy based on seven items. Chart 2.5 and Chart 2.6 show the average scale scores overall and by gender for both of these scales.

When it comes to the Basic ICT Skills Self-Efficacy scale, the results show that students in Ontario and Newfoundland and Labrador (average scale scores of 52 and 51 respectively) are more confident in doing basic computer tasks compared to the international average. While girls are slightly more confident than boys in Ontario and Newfoundland and Labrador, the difference is not significant. This pattern is apparent in most participating countries.

CHART 2.5 Average scale score of Basic ICT Skills Self-Efficacy overall and by gender



In contrast, when examining the results for the Advanced ICT Skills Self-Efficacy scale, students in Ontario and Newfoundland and Labrador both obtained an average scale score of 49, and are slightly less confident in doing advanced computer tasks when compared to the international average. In both provinces, boys are more confident than girls with a difference of four scale points for Ontario and three scale points for Newfoundland and Labrador. The difference in the scale score points, favouring boys, is consistent in all other participating countries.

CHART 2.6 Average scale score of Advanced ICT Skills Self-Efficacy overall and by gender

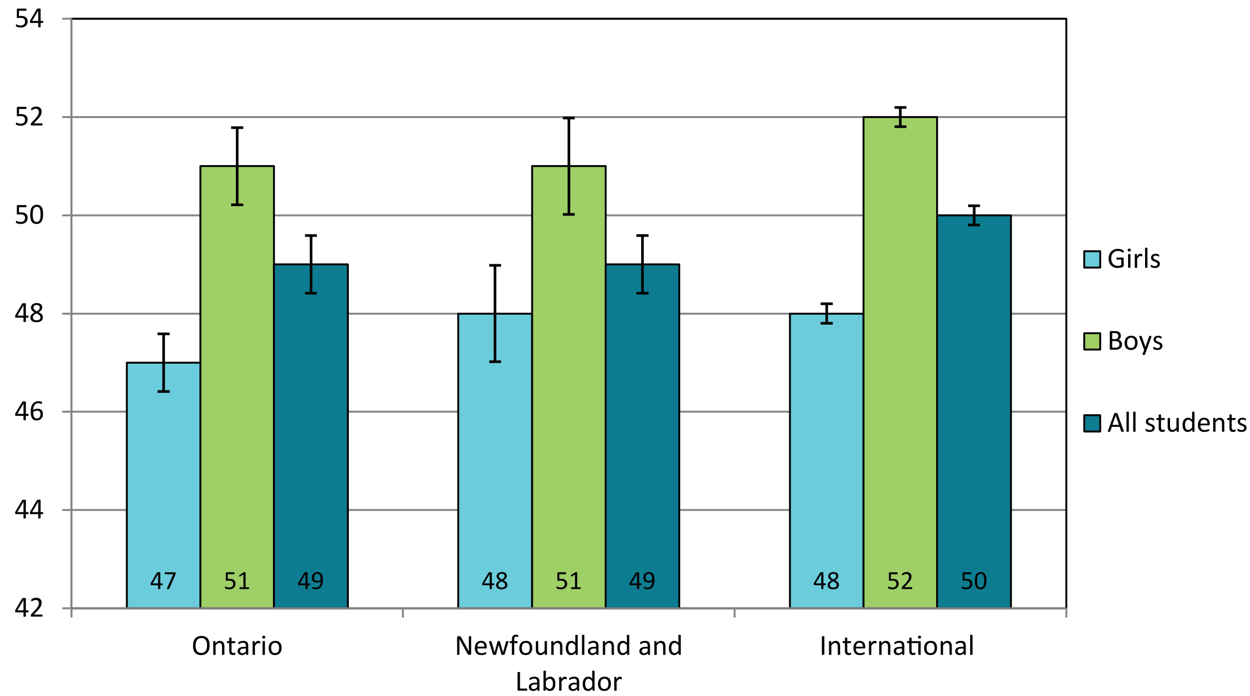
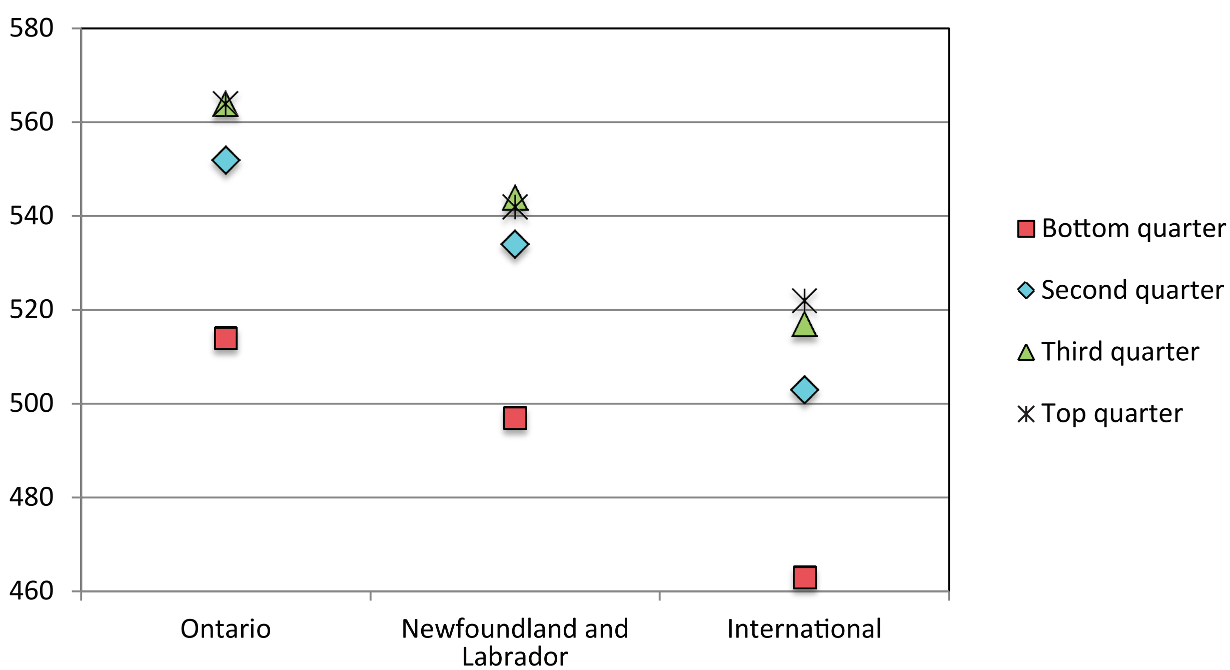


Chart 2.7 shows the relationship between Basic ICT Skills Self-Efficacy and student achievement. The results indicate a positive relationship between Basic ICT Skills Self-Efficacy and students' achievement scores in CIL. For Ontario and Newfoundland and Labrador respectively there is a difference of 50 and 45 points between the bottom and top quarter, compared to 60 points internationally. In other words, there is a larger difference in student achievement between students with low self-efficacy and others at both provincial and international levels.

CHART 2.7 Index of Basic ICT Skills Self-Efficacy and achievement on the CIL scale



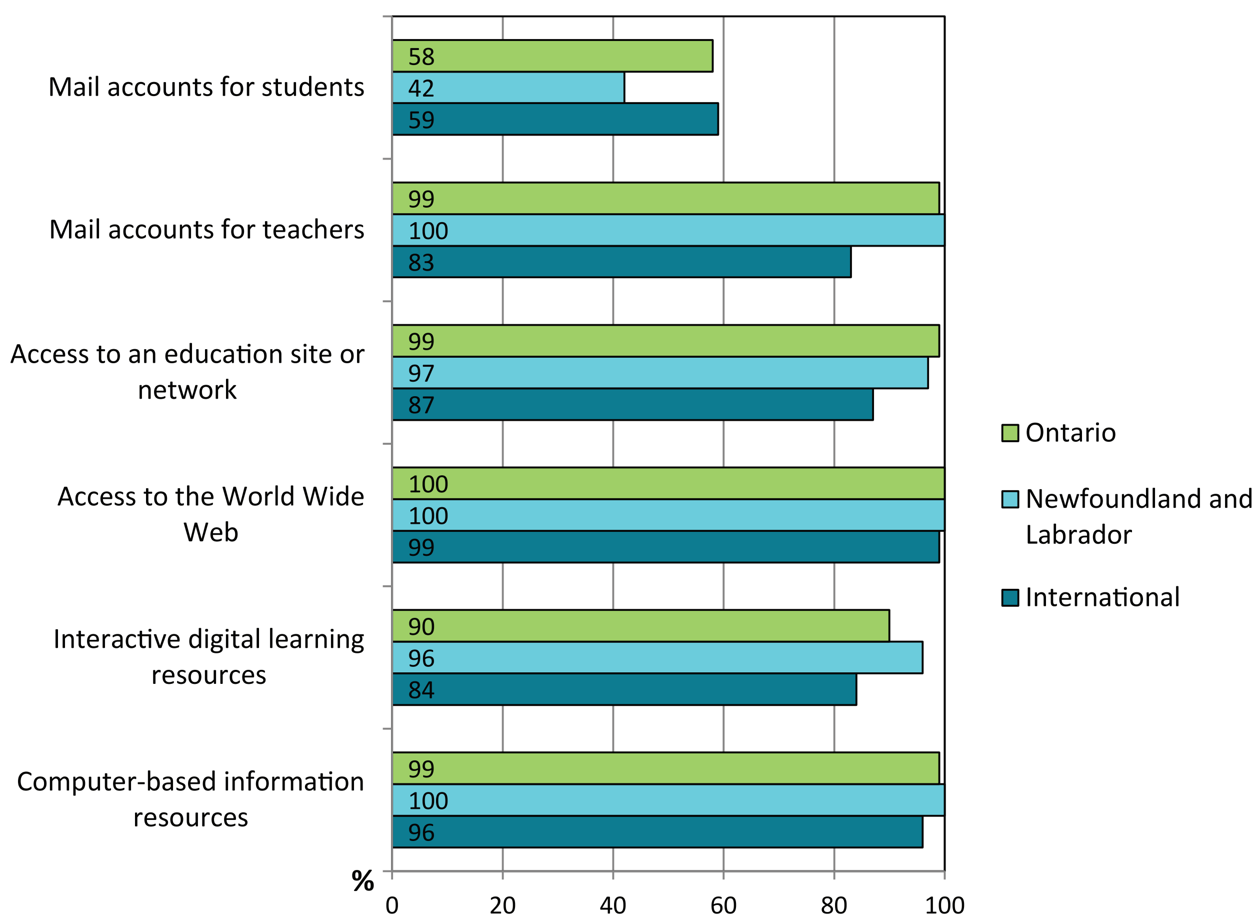
School policies and practices for ICT use

Students have more and more access to computers or other interactive technologies in schools. According to recent research, school heads and teachers consider insufficient ICT equipment (e.g., interactive whiteboard, laptops) as the major obstacle to ICT use in schools (European Commission, 2013). And while the IEA's Second Information Technology in Education Study (SITES-M1) noted a large increase in the uptake of ICT in schools compared to earlier data, it identified large differences in ICT infrastructure across countries (Pelgrum & Anderson, 2001).

Availability of technology resources for teaching and/or learning

The availability of technology resources in schools does not necessarily imply that these technologies are available and sufficiently accessible to students or teachers (Law, Pelgrum, & Plomp, 2008). As part of the ICILS assessment, the ICT-coordinator in each participating school was asked to indicate whether or not various technology resources were available for teaching and/or learning. As Chart 2.8 shows, most students are in schools where computer-based information resources, interactive digital learning resources, access to the World Wide Web, access to an education site or network maintained by an education system, and e-mail accounts for teachers are available for teaching and/or learning. However, the percentages were lower for the students' mail accounts. It was reported that close to 60 per cent of students in Ontario and participating countries attend schools where student mail accounts are available for teaching and/or learning compared to 42 per cent in Newfoundland and Labrador.

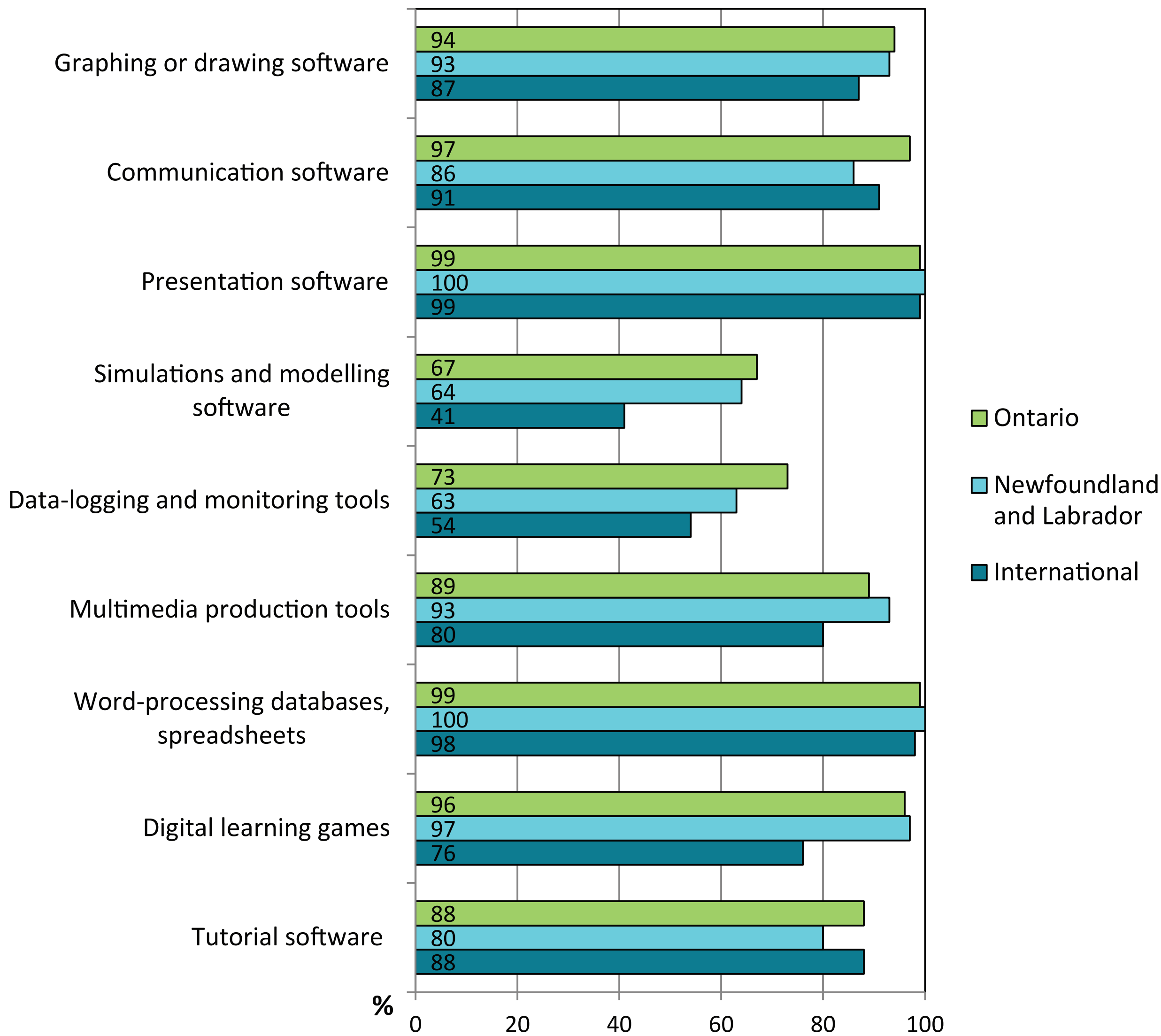
CHART 2.8 Proportion of students at schools with available technology resources for teaching and/or learning



Availability of software resources for teaching and/or learning

The ICT-coordinator also reported on the availability of software resources for teaching and/or learning (see Chart 2.9). According to the results, almost all students in Ontario and Newfoundland and Labrador attend schools where digital learning games are available compared to the ICILS average where this is the case for about three quarters of students. In Ontario and Newfoundland and Labrador, respectively 89 per cent and 93 per cent of students study at schools where multimedia production tools, such as media capture and editing and Web production, are available compared to an international average of 80 per cent. Data-logging and monitoring tools are available for 73 per cent of students in Ontario, 63 per cent of students in Newfoundland and Labrador, and 54 per cent of students among ICILS countries. What is more, 67 per cent of students in Ontario and 64 per cent in Newfoundland and Labrador go to schools where simulations and modelling software are available compared to the ICILS average of 41 per cent.

CHART 2.9 Proportion of students at schools with available software resources for teaching and/or learning



ICT use for teaching and/or learning hindered by different obstacles

ICT coordinators were also asked about the extent that ICT use for teaching and/or learning was hindered by different obstacles. Table 2.6 shows the proportion of students at schools where the ICT use for teaching and learning was hindered a lot or to some extent. In Ontario, more than half of the students are enrolled in schools with insufficient Internet bandwidth or speed compared to an average of 35 per cent in Newfoundland and Labrador and an ICILS average of 45 per cent. In Ontario, 66 per cent and in Newfoundland and Labrador, 55 per cent of students attend schools where there are not enough computers for instruction compared to 52 per cent of students in other countries. In both provinces, about 30 per cent of students attend schools where there is not enough computer software compared to 47 per cent of students in ICILS countries. In the opinion of ICT coordinators, the lack of ICT skills among teachers is the biggest issue in Ontario. The results show that 80 per cent of students attend schools where there is a lack of ICT skills among teachers, which is the highest percentage among all participating countries. In Newfoundland and Labrador and in other participating countries, an average of 63 per cent of students work with teachers lacking ICT skills. The teachers' lack of preparation time for lessons and professional learning resources are the biggest challenges in Newfoundland and Labrador. Approximately 80 per cent of students there go to schools where teachers do not have enough time to prepare lessons compared to about 60 per cent in Ontario and 63 per cent internationally. Approximately 60 per cent of students in Ontario and internationally are in schools where there is a lack of effective professional learning resources for teachers while this is the case for 77 per cent of students in Newfoundland and Labrador, which is the second highest percentage among all participating countries. Seventy per cent of schools in Newfoundland and Labrador lack qualified technical personnel to support the use of ICT compared to 54 per cent of schools in Ontario, and 53 per cent of participating schools internationally, on average.

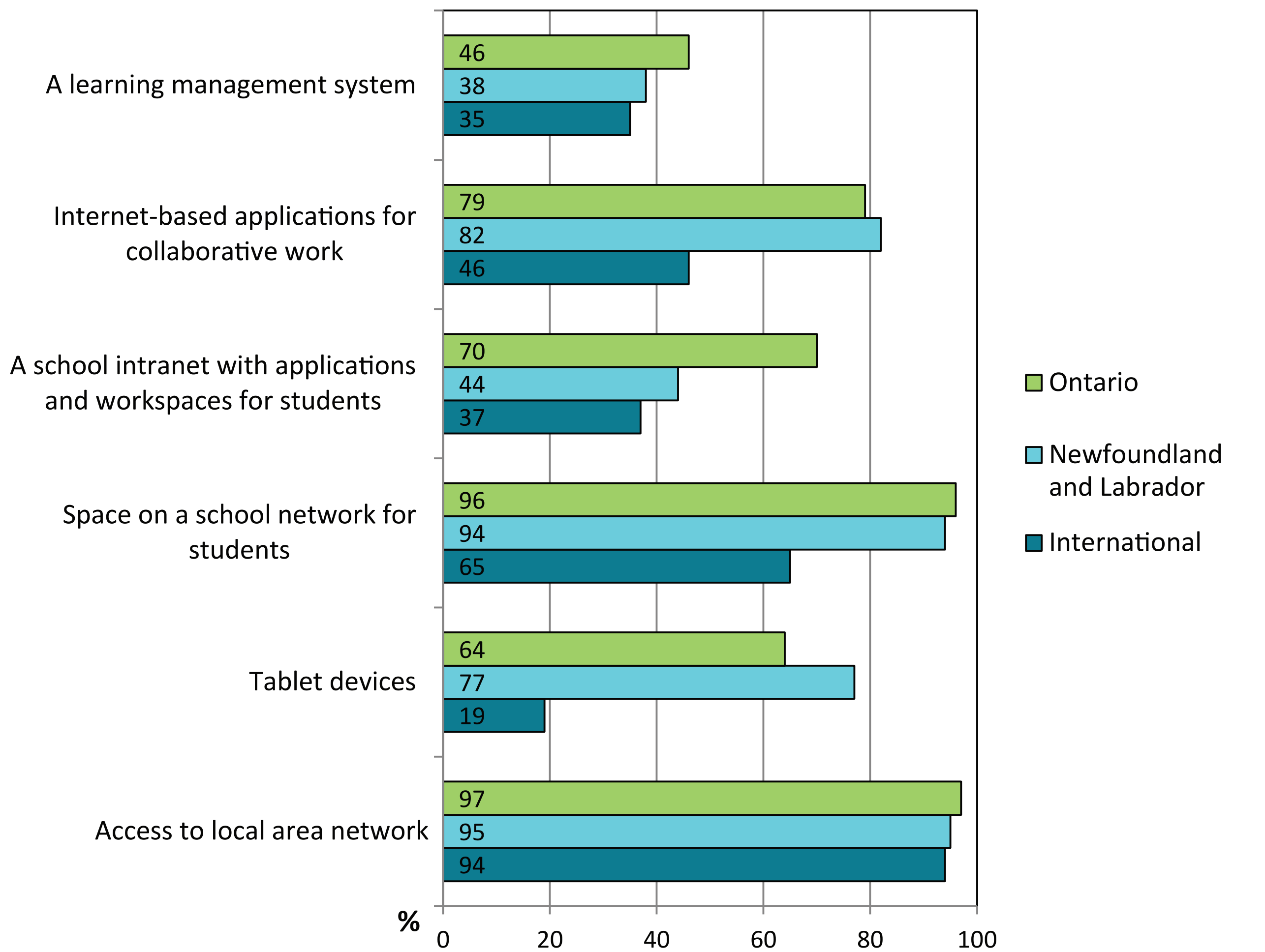
Table 2.6 Proportion of students enrolled in schools where ICT use for teaching and learning is hindered by different obstacles

	ON (%)	NL (%)	International (%)
Too few computers connected to the Internet	29	41	33
Insufficient Internet bandwidth or speed	52	35	45
Not enough computers for instruction	66	55	52
Lack of sufficient powerful computers	59	39	55
Not enough computer software	30	29	47
Lack of ICT skills among teachers	80	63	63
Insufficient time for teachers to prepare lessons	59	79	63
Lack of effective professional learning resources for teachers	58	77	60
Lack of an effective on-line learning support platform	48	69	58
Lack of incentives for teachers to integrate ICT use in their teaching	64	67	60
Lack of qualified technical personnel to support the use of ICT	54	70	53

Availability of computer resources for teaching and/or learning

Chart 2.10 shows the proportion of students attending schools with computer resources available for teaching and/or learning, according to the ICT coordinators. The results show that 64 per cent of students in Ontario and and 77 per cent in Newfoundland and Labrador respectively are enrolled in schools where tablet devices (e.g., iPads and androids) are available compared to the ICILS average of only 19 per cent. Students in both provinces have more access to tablets than students in any other country, except Australia (64%). About 95 per cent of students in Ontario and Newfoundland and Labrador are enrolled in schools that have space on a school network for students to store their work compared to 65 per cent of students in ICILS countries. In Ontario, 70 per cent of students have access to a school intranet with applications and workspaces whereas this is the case for 44 per cent of students in Newfoundland and Labrador and 37 per cent in other countries. When it comes to Internet-based applications for collaborative work such as Google Docs, about 80 per cent of students in both provinces have access to this computer resource compared to the ICILS average of 46 per cent.

CHART 2.10 Proportion of students at schools with available computer resources for teaching and/or learning



School procedures for various aspects of ICT use

School principals were asked whether or not their school, or the school system they are a part of, has procedures in place regarding various aspects of ICT use. According to the results in Table 2.7, close to a third of the schools in both Ontario and Newfoundland and Labrador (29% and 36% respectively) restrict the number of hours students are allowed to sit at a computer compared to more than half of the ICILS participating countries (52%). More than 80 per cent of the schools in both provinces have procedures regarding playing games on school computers while the international average is 68 per cent. Close to half of the schools among participating countries give the local community (parents/guardians and/or others) more access to school computers and/or laptops than Ontario (41%) and Newfoundland and Labrador (25%) do. More than two-thirds of the schools in Ontario provide students with their own laptop computers and/or other mobile learning devices for use at school and at home compared to more than a third of schools among ICILS participating countries (35%) and less than a third in Newfoundland and Labrador (29%). The data also show that almost all schools in both provinces and internationally are implementing procedures to prevent unauthorized access to systems or access to inappropriate material.

Table 2.7 Proportion of students in schools with procedures regarding various aspects of ICT

	ON (%)	NL (%)	International (%)
Setting up security measures to prevent unauthorized system access or entry	97	99	94
Restricting the number of hours students are allowed to sit at a computer	29	36	52
Offering student access to school computers outside class hours (but during school hours)	68	73	80
Granting student access to school computers outside school hours	41	52	52
Honouring intellectual property rights (e.g., software copyrights)	95	84	89
Prohibiting access to inappropriate material (e.g., pornography, violence)	100	100	97
Playing games on school computers	82	87	68
Giving the local community (parents/guardians and/or others) access to school computers and/or Internet	41	25	47
Providing students with their own laptop computers and/or other mobile learning devices for use at school and at home	69	29	35

School priority on facilitating the use of ICT in teaching and learning

In the School Questionnaire, principals were asked to rate the priority of a number of proposed procedures to facilitate the use of ICT in teaching and learning. Table 2.8 presents the proportion of students in schools that indicated the proposed procedures were a high or a medium priority. Establishing or enhancing an on-line learning support platform is a priority for 68 per cent of the students in Ontario and 88 per cent in Newfoundland and Labrador compared to 79 per cent among ICILS participating countries. The increase of bandwidth for Internet access is a priority for 77 per cent of schools in Ontario compared to 92 per cent of schools in Newfoundland and Labrador and 89 per cent of schools among participating countries. The majority of students in ICILS participating countries (86%) attend schools that provide teachers with incentives to integrate ICT use in their teaching compared to 67 per cent of students in schools in Ontario and 71 per cent in Newfoundland and Labrador. About 80 per cent of students in Newfoundland and Labrador and in the ICILS participating countries go to schools that give more time to teachers to prepare lessons in which ICT is used, compared to 55 per cent of students in Ontario.

TABLE 2.8 Proportion of students at schools with ways to facilitate the use of ICT in teaching and learning

	ON (%)	NL (%)	International (%)
Increasing the number of computers per student in the school	90	97	88
Increasing the number of computers connected to the Internet	84	91	89
Increasing the bandwidth of Internet access	77	92	89
Increasing the range of digital learning resources	93	96	93
Establishing or enhancing an on-line learning support platform	68	88	79
Providing for participation in professional development on pedagogical ICT use	86	95	91
Increasing the availability of qualified technical personnel to support the use of ICT	76	84	84
Providing teachers with incentives to integrate ICT use in their teaching	67	71	86
Providing more time for teachers to prepare lessons in which ICT is used	55	80	78
Increasing the professional learning resources for teachers in the use of ICT	84	95	91

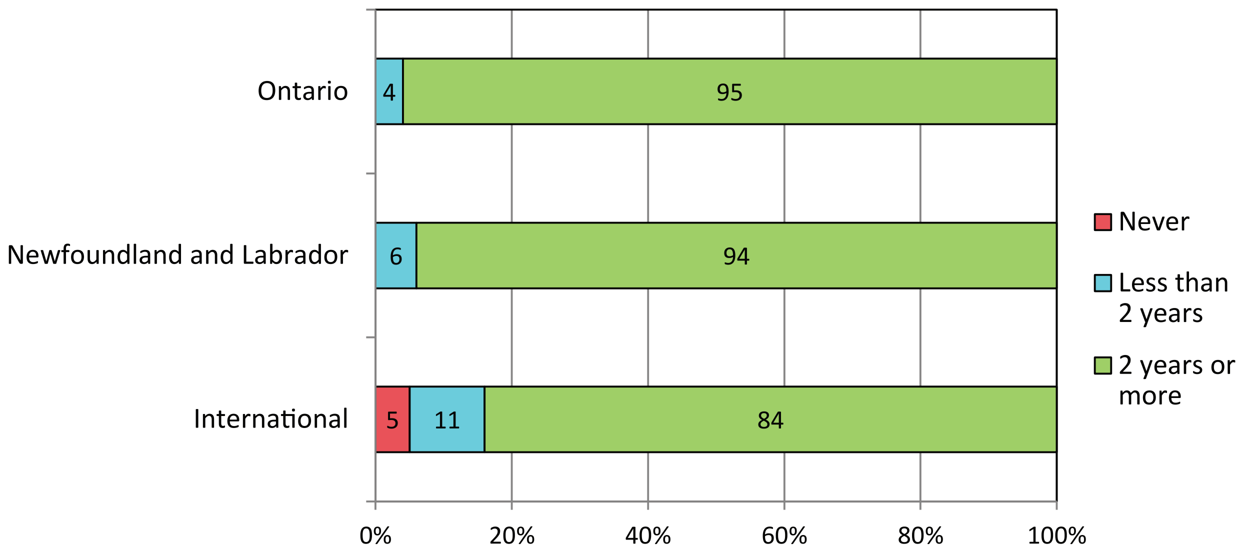
Teachers' perspectives, attitudes, and confidence in ICT use

Over the years, teachers in many countries have introduced ICT in various subject areas. The use of ICT in teaching and learning has become common practice. A number of education systems have adopted policies to support schools' and teachers' pedagogical use of ICT (Plomp, Anderson, Law, & Quale, 2009; Bakia, Murphy, Anderson, & Trinidad, 2011). Teachers' pedagogical beliefs play a central role in the adoption of ICT. It takes time and resources for teachers to become knowledgeable about technology and confident enough to use it effectively in the classroom (OECD, 2001).

Teachers' computer experience

Teachers were asked to report the number of years they have been using computers for teaching purposes.[11] The results were reported based on the following three categories: never, less than two years, and two years or more. According to the results in Chart 2.11, about 95 per cent of teachers in both provinces have been using computers in their teaching for two years or more compared to an international average of 84 per cent of teachers across ICILS countries. When compared to the international average, all teachers in both provinces have at least some experience using computers for teaching.

CHART 2.11 Proportion of teachers' computer experience used for teaching



Teachers' perspectives on ICT in their schools

In the Teacher Questionnaire, teachers were asked to indicate their level of agreement with statements related to ICT use in their teaching. The responses of teachers who "strongly agreed" and "agreed" were combined and are shown in Table 2.9. In Ontario, 20 per cent and in Newfoundland and Labrador, 13 per cent of teachers do not consider ICT a priority for use in their teaching compared to almost half of the teachers in other countries. In both provinces, 60 per cent or more agree there is not enough time for teachers to prepare lessons that incorporate ICT compared to an international average of 57 per cent. About two thirds of teachers in both provinces say that there is insufficient provision for them to develop expertise in ICT while 39 per cent of teachers across other countries agree with this statement. Almost 60 per cent of teachers in both provinces, compared to 45 per cent internationally, reported that there is not sufficient technical support to maintain ICT resources. In Ontario, about half of the teachers think that their school does not have sufficient ICT equipment, that it has limited Internet connectivity, and that the computer equipment is out of date while the proportions are lower in Newfoundland and Labrador and internationally.

[11] Since Ontario did not meet the sampling requirements for teachers, their data are reported but must be interpreted with caution.

TABLE 2.9 **Proportion of teachers who say that use of ICT for teaching at their school is hindered by different obstacles**

	ON (%)	NL (%)	International (%)
ICT is not considered a priority for use in teaching.	20	13	46
My school does not have sufficient ICT equipment (e.g., computers).	56	35	42
My school does not have access to digital learning resources (e.g., learning objects).	31	22	22
My school has limited connectivity to Internet (e.g., slow or unstable speed).	49	35	40
The computer equipment in our school is out of date.	49	29	38
There is not sufficient time to prepare lessons that incorporate ICT.	60	68	57
There is not sufficient provision for me to develop expertise in ICT.	62	66	39
There is not sufficient technical support to maintain ICT resources.	57	59	45

Teachers' attitudes about ICT in teaching and learning at school

Teachers' attitudes toward computers can have an impact on the successful use of computers and digital technologies in teaching and learning. Depending on whether these attitudes are positive or negative, they can affect how teachers respond to using technologies in the classroom (Sabzian & Gilakjani, 2013). In ICILS 2013, teachers were asked to indicate their level of agreement with statements related to their attitudes about ICT use in teaching and learning at school.

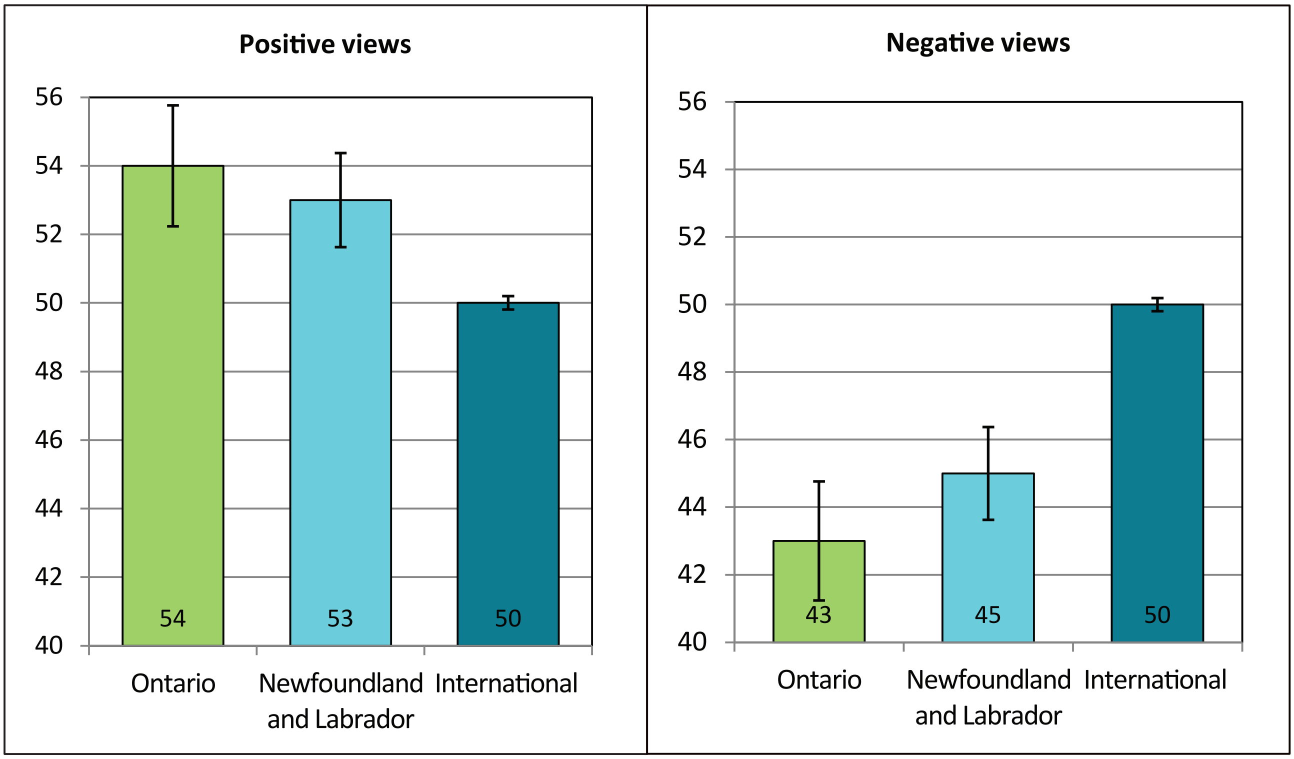
As Table 2.10 shows, almost 30 per cent of teachers in Ontario and 40 per cent of teachers in Newfoundland and Labrador believe that the use of ICT will result in poorer writing skills among students compared to an average of 67 per cent of teachers in other countries. In both provinces, 20 per cent of teachers agree that ICT would impede concept formation, which they believe would be better achieved with real objects rather than computer images, compared to an international average of 40 per cent. About a third of teachers in both provinces agree that the use of ICT would encourage students to copy material from published Internet sources compared to almost half of the teachers across countries who think this. The majority of teachers in both provinces feel that students using ICT would develop a greater interest in learning compared to an average of 79 per cent of teachers across participating countries in ICILS. About one third of teachers in both provinces agree that ICT would limit the amount of personal communication among students compared to an international average of almost 60 per cent. More than 80 per cent of teachers in Ontario and Newfoundland and Labrador think the use of ICT in teaching and learning would improve students' academic performance compared to 68 per cent internationally. Only 11 and 14 per cent of teachers in Ontario and Newfoundland and Labrador respectively reported that ICT use would distract students from learning compared to almost a quarter internationally.

Table 2.10 Proportion of teachers' attitudes toward the use of ICT in teaching and learning at school

	ON (%)	NL (%)	International (%)
Gives students better access to sources of information	98	98	96
Results in poorer writing skills among students	29	39	67
Helps students to consolidate and process information more effectively	92	91	91
Only introduces organizational problems for schools	12	13	17
Helps students learn to collaborate with other students	82	85	78
Impedes concept formation which is better done with real objects than with computer images	20	20	40
Enables students to communicate more effectively with others	71	75	68
Only encourages copying material from published Internet sources	33	38	49
Helps students develop greater interest in learning	95	94	79
Helps students work at a level appropriate to their learning needs	88	86	80
Limits the amount of personal communication among students	35	34	58
Helps students develop skills in planning and self-regulation of their work	76	73	65
Results in poorer calculation and estimation skills among students	33	30	48
Improves academic performance of students	82	81	68
Only distracts students from learning	11	14	24

The positively worded items formed the first scale "Positive views on using ICT in teaching and learning" and the negatively worded items formed the second scale "Negative views on using ICT in teaching and learning" (see Chart 2.12). In Ontario and Newfoundland and Labrador, the average scale score for the first scale "Positive views on using ICT in teaching and learning" is respectively four and three scale points higher than the international average. This suggests that teachers in both provinces have a more positive opinion about the value of using ICT for teaching and learning than teachers among the ICILS participating countries. As for the second scale "Negative views on using ICT in teaching and learning," the average for Ontario and Newfoundland and Labrador is respectively seven and five scale points lower than the international average. Thus, teachers in ICILS participating countries have a more negative view on the value of using ICT for teaching and learning than teachers in both provinces.

CHART 2.12 Average scale score of "Positive views on using ICT in teaching and learning" and "Negative views on using ICT in teaching and learning"



Teachers' confidence in performing ICT tasks

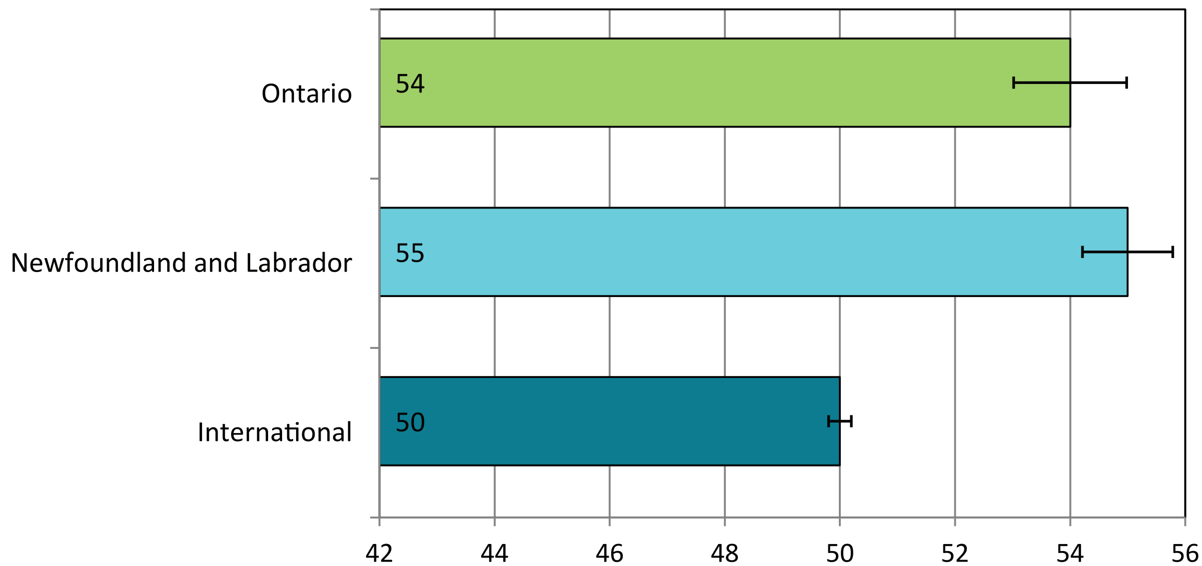
The Teacher Questionnaire also collected information on the teachers' level of confidence in performing different ICT tasks which are listed in Table 2.11. The percentages of teachers in Ontario and Newfoundland and Labrador who know how to do these tasks were higher for all tasks listed except for "using a spreadsheet program for keeping records or analyzing data" and "preparing lessons that involve the use of ICT by students" where the percentages were about the same as the international average.

Table 2.11 Proportion of teachers' confidence about different computer tasks

	ON (%)	NL (%)	International (%)
Producing a letter using a word-processing program	99	99	89
E-mailing a file as an attachment	98	98	89
Storing your digital photos on a computer	90	92	82
Filing digital documents in folders and subfolders	88	92	84
Monitoring students' progress	77	89	65
Using a spreadsheet program for keeping records or analyzing data	60	56	59
Contributing to a discussion forum/user group on the Internet	64	71	58
Producing presentations with simple animation functions	87	86	76
Using the Internet for on-line purchases and payments	96	96	77
Preparing lessons that involve the use of ICT by students	72	72	73
Finding useful teaching resources on the Internet	97	98	92
Assessing student learning	80	85	71
Collaborating with others using shared resources	64	69	44
Installing software	75	75	47

The items related to teachers' confidence in using various ICT tasks formed one scale named "Teachers' ICT Self-Efficacy" (see Chart 2.13). The average scale score for Ontario and Newfoundland and Labrador is four and five scale points higher respectively than the international average. Teachers in both provinces have greater confidence in performing different ICT tasks compared to teachers in other participating countries. The average scale score for both provinces was higher than all participating countries except for Australia where the average scale score was higher than Ontario and the same as Newfoundland and Labrador.

Chart 2.13 Average scale score of teachers' ICT Skills Self-Efficacy



3 Canada's Approach to CIL

Although only Ontario and Newfoundland and Labrador participated in ICILS 2013, 11 of Canada's 13 jurisdictions responded to the National Context Survey.[12] This survey aimed to investigate the approaches to CIL education in schools across Canadian jurisdictions. British Columbia, Alberta, Saskatchewan, Ontario, Quebec, New Brunswick French, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, Yukon, and the Northwest Territories responded to the survey.

Given that there is no national ministry of education in Canada, ministries and departments of education in each participating jurisdiction responded to the survey based on what is being done in their respective province or territory. This chapter examines the similarities and differences in the provision of CIL education across Canadian jurisdictions.

Overview of the education system

In Canada, there are 13 different education systems representing Canada's 10 provinces and three territories. There is no centralized national ministry of education and the responsibility for education rests with each jurisdiction. In other words, education policies in Canada are developed and implemented by departments or ministries of education in each provincial or territorial jurisdiction, which also oversee the curriculum and have the authority to develop and administer provincial or territorial assessments (CMEC, n.d.).

The vast majority of educational services in Canada are delivered locally through district school boards or boards of education. Depending on the jurisdiction, schools can be private or public, provide English-language, French-language, or French-immersion programs, separate schools (Roman Catholic or Protestant) or charter schools. Although band schools, for First Nations students, are the responsibility of the federal government, a number of First Nations students are also integrated into schools that are overseen by a specific jurisdiction (CMEC, n.d.).

The age range for compulsory education in Canada varies across jurisdictions. Children usually start school at the age of five or six and schooling is compulsory for a total of 10 to 13 years. In British Columbia, compulsory education begins at the age of five for a total of 11 years. In Nova Scotia, children start school at the age of five for 10 years. In New Brunswick French, school starts at the age of five for 13 years. In Yukon, children start school when they are five or six for a total of 12 to 13 years. In Alberta and Northwest Territories, school commences at the age of six for a total of 10 years. In Saskatchewan, Ontario, and Newfoundland and Labrador school starts at the age of six for a total of 12 years. In Quebec and Prince Edward Island, children start school at the age of six for a total of 11 years.

Educational levels are grouped and named differently both across and within jurisdictions. Generally, there are two main levels: primary or elementary and secondary or high school. When applying the United Nations Educational, Scientific, and Cultural Organization's (UNESCO) International Standard Classification of Education (ISCED) levels to the Canadian context, there are a number of jurisdictional differences.[13] Within each jurisdiction, the categorization of grades into levels may change depending on

[12] In this chapter, the term *jurisdiction* refers to both provinces and territories.
[13] For more on UNESCO's ISCED levels see UNESCO, 2011.

the district school board or board of education, the language of the school system, and the region (rural or urban schools).

Education at the primary level (ISCED 1), which is the equivalent of Grades 1 to 6 in Canada, may include more than one level in certain jurisdictions. For example, in Saskatchewan and in some schools in Nova Scotia, elementary school comprises Grades 1 to 5 and Grade 6 is part of a middle level, which includes Grades 6 to 9. In Ontario, elementary school usually covers Grades 1 to 8 and secondary education is made up of Grades 9 to 12. Ontario offers full-day Kindergarten for four- and five-year-old children; while it is not mandatory, over 90 per cent of eligible children are enrolled. In New Brunswick French, elementary schools span from Kindergarten to Grade 8 and secondary schools cover Grade 9 to Grade 12.

Related to the question of education at the primary level, jurisdictions were also asked to comment on the ways in which education is provided at this level for students with special needs. The majority of jurisdictions reported that students with special needs are, to the extent possible, fully integrated into their schools' main programs. However, how these students are integrated varies. For instance, in Ontario, principals ensure that a student's Individual Education Plan (IEP) is developed collaboratively and they oversee the special education team that monitors and reviews each student's IEP.

Education at the lower-secondary level (ISCED 2), which is the equivalent of Grade 7 (Secondary I in Quebec) and Grade 8 (Secondary II in Quebec), can also include more than one level and at these grades schools continue to offer general education programs with courses in the arts, languages, and sciences rather than vocational or technical education. Some jurisdictions have middle schools where Grades 7, 8, and 9, are taught (i.e., Saskatchewan and urban areas in Newfoundland and Labrador). In Quebec, the division of grades is quite different from the rest of Canada: secondary school involves five years of study (Secondary I to V, which is roughly equivalent to Grades 7 to 11), divided into two "cycles." The first "cycle" includes Secondary I and II (Grade 7 and 8) and the second one combines Secondary III, IV, and V (Grades 9 to 11).

Education at the upper-secondary level (ISCED level 3), from Grade 9 (Secondary III in Quebec) to Grade 12 (first year of cégep in Quebec),[14] is generally equivalent to secondary school. In most jurisdictions, students still need to take general courses throughout secondary school but after Grade 10 they have an increasing number of options regarding their choice of courses. In a number of jurisdictions, secondary schools operate on a credit system or course-level system whereby students must complete a number of credits or courses to obtain a secondary-school diploma. Depending on the number of credits or level of courses students complete, they graduate into a certain stream that allows them to carry on and pursue a university, college, or vocational pathway (e.g., in Alberta, Ontario, Prince Edward Island, Newfoundland and Labrador, Northwest Territories). Students in Quebec graduate from secondary school in Grade 11 (Secondary V) and either enter the workforce with their secondary-school diploma or pursue their education in a general and vocational college (cégep) where they study for two further years to prepare for university or enter a three-year vocational program. After successfully completing Grades 9 or 10 (Secondary III or IV) for specific training programs, students can participate in vocational training in order to practise an occupation, which would lead to a diploma of vocational studies. Students who obtain such a diploma can also further specialize. The majority of the students in the target grade (Grade 8/Secondary II) were enrolled in public schools rather than private or other schools. That being said, in Quebec 20 per cent of students from the youth sector at the secondary

[14] Collège d'enseignement général et professionnel/general and vocational college (cégep).

level were enrolled in private schools while this was the case for 11 per cent of students in British Columbia, 6.5 per cent in Alberta, and 5 per cent in Ontario. In New Brunswick French, Prince Edward Island, Newfoundland and Labrador, Northwest Territories, and Yukon 1 per cent of students or less are in private schools.

Across jurisdictions, the autonomy of schools with students in the target grade (Grade 8/Secondary II) varies widely when it comes to issues such as school governance, acquisition/purchase of ICT equipment and software, opportunities for staff to participate in in-service education in ICT use, ICT curriculum planning and delivery, teacher recruitment, student assessment, and technical support for ICT. The majority of jurisdictions indicated that schools have at least some autonomy, if not complete autonomy, with respect to most of these items. Ontario's schools have some autonomy in all areas listed here except for school governance. Northwest Territories reported that schools have no autonomy in school governance, Prince Edward Island and Newfoundland and Labrador reported having no autonomy regarding ICT curriculum planning and delivery, and Prince Edward Island and New Brunswick French have no autonomy with technical support for ICT.

Plans and policies for using ICT in education

In almost all jurisdictions, there are plans and policies in place to support the use of ICT in education.[15] All of these plans and policies refer to improving student learning with specific mention of developing information literacy and ICT-based skills in critical thinking, collaboration, and communication. These documents also emphasize the need to increase access to on-line courses of study, for example, for rural students (except in Northwest Territories). In most jurisdictions, there is also mention of improving student learning in subject-matter/content (except British Columbia and New Brunswick French) and preparing students for using ICT in their future work (except Northwest Territories).

Jurisdictions were also asked if these plans and policies make reference to the provision, maintenance, accessibility, and support for ICT resources. All of the jurisdictions emphasized support for teachers' use of computer equipment and other ICT resources in their work as well as providing access to digital educational resources. Internet connectivity and the provision of computer equipment and other ICT resources as well as home access to school-based digital education resources were also referenced in the vast majority of documents. Maintaining computer equipment and other ICT resources as well as renewing, updating, and replacing computer equipment and other ICT resources were part of ICT policies and plans in most jurisdictions (except Alberta, New Brunswick French, and Northwest Territories).

Such plans and policies also identify a number of methods for supporting student learning in ICT. Specifically, the majority of jurisdictions reported in-service teacher education in the use of ICT, communicating with parents/guardians, and providing feedback to students. Methods that were less common across jurisdictions included the use of learning-management systems and pre-service teacher education in ICT use.

[15] There are also a number of plans and policies in place at the national level for band schools (First Nations schools), which are federally funded.

The main priorities and plans and policies for the use of ICT in education vary across jurisdictions. That being said, a number of priorities are similar across jurisdictions, in particular: 1) supporting educators and administrators through professional development in the use of ICT in education; 2) creating an environment for the use of ICT in education; 3) increasing available resources for ICT use in education; 4) decreasing inequalities that exist in ICT use; and 5) increasing access to on-line tools for families, educators, and students.

In the majority of jurisdictions, plans and/or policies for using ICT in education do not mention providing one-to-one student-to-computer ratio in schools. While this is the ultimate goal in a number of jurisdictions, it has not yet been reached and is particularly difficult to attain in smaller and more remote areas.[16] In other jurisdictions, either no targets are in place or the emphasis is on decreasing the ratio of students to computers.

There is formal support for the development of digital resources in the majority of jurisdictions. Nova Scotia has support for the development and creation of digital curriculum resources for the public school system. In Newfoundland and Labrador, the department of education requires digital resources with any new curriculum resource. Ontario makes ministry-licensed software available to school boards. In British Columbia, digital resources are developed locally.

Most jurisdictions make some provision and provide some support for teaching information literacy using ICT but the type of provision and support varies across jurisdictions. In Ontario, Quebec, and Northwest Territories, information literacy is generally taught across disciplines. In other words, it is integrated throughout the curriculum and teachers in all disciplines are encouraged to use ICT in their teaching. In Alberta, information literacy is part of the provincial standards and all students must learn to use ICT across disciplines. British Columbia, Prince Edward Island, Newfoundland and Labrador, and Yukon emphasize training teachers in information literacy through professional development workshops, expert committees, etc.

In a number of jurisdictions, there are ICT-related subjects, such as ICT Study or Computer Studies, offered as separate subjects to students. At the primary level (Grades 1 to 6), such subjects are offered in Yukon as noncompulsory subjects whereas in Alberta they are compulsory subjects. At the lower-secondary level (Grade 7 to 8/Secondary I and II), ICT-related subjects are not offered in British Columbia, Saskatchewan, Ontario, or Northwest Territories. In Nova Scotia, Prince Edward Island, and Yukon these subjects are offered as noncompulsory subjects. Meanwhile, in Alberta, New Brunswick French, and Newfoundland and Labrador they are compulsory subjects. At the upper-secondary level (Grade 9 to 12/Secondary III, IV, and V), courses in this area are offered in all jurisdictions as a noncompulsory subject with the exception of Alberta where they are compulsory.

In the majority of jurisdictions, there are no requirements regarding the assessment and monitoring of ICT and computer skills of students at the target grade (Grade 8/Secondary II). In Alberta, New Brunswick French, and Newfoundland and Labrador, assessments exist but they are implemented at the school level and there is no overarching mechanism in place to assess ICT at the jurisdictional level. In Quebec, an assessment of students' ICT cross-curricular skills can be done by teachers at the school level.

[16] A number of countries that answered the National Context Survey also reported that a 1:1 computing policy existed but that in practice this policy has not been implemented. See Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014.

ICT and student learning at lower-secondary level – from Grade 7 (Secondary I) to Grade 8 (Secondary II)-ISCED 2

Regarding what schools are doing with ICT and student learning at the lower-secondary level, jurisdictions were asked to respond to questions relating to: 1) the extent that education authorities support ICT use for collaboration among teachers and students within schools and across different schools, with experts/authorities and learning partners outside of schools, and with students or teachers in other countries; 2) whether ministries or departments of education used, or supported the use of, ICT for the provision of diagnostic, formative, and summative assessments, national or jurisdictional monitoring programs, and digital work products; and 3) the extent that student ICT use in extended project work is supported by education authorities.

All jurisdictions reported that, to some extent, education authorities supported ICT use for collaboration at school with experts and authorities outside of schools. The vast majority of jurisdictions indicated that collaboration was supported to some extent among teachers and students across different schools, with learning experts outside of schools, and with students or teachers in other countries. Most jurisdictions also responded that there was supported collaboration to some extent among students across different schools. There was support to a large extent or to some extent in all jurisdictions among teachers and among teachers and students within the same school. Finally, there was supported collaboration to a large extent or to some extent in almost all jurisdictions among students within the school.

In the majority of jurisdictions, then, collaboration is a priority, at least to some extent. In their comments, jurisdictions emphasized the importance of educating teachers through Web seminars, professional development workshops, and on-line community as well as including students in collaboration efforts.

When asked whether or not ministries or departments of education used or supported the use of ICT for various types of assessments, jurisdictions had various responses. Diagnostic assessments are supported in Ontario, New Brunswick French, Nova Scotia, and Yukon. Formative assessments receive support in Alberta, Ontario, New Brunswick French, Nova Scotia, and Yukon, while British Columbia, Alberta, Ontario, Quebec, New Brunswick French, Nova Scotia, and Yukon support summative assessments. Finally, there is support for national or jurisdictional monitoring programs in Alberta, Ontario, Quebec, Nova Scotia, Newfoundland and Labrador, and Yukon. Meanwhile, digital work products (e.g., e-portfolios) are supported in Ontario, New Brunswick French, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, and Yukon.

While the use of and support for ICT in these types of student assessments varied among jurisdictions, a number of changes are taking place that favour ICT provision in this area. In Alberta, for example, provincial assessments are in transition from paper-based to computer-based assessments. Similarly, Quebec is exploring different ways of administering its assessments by computer. In Ontario, the Education Quality and Accountability Office (EQAO), which administers provincial assessments and documents their results, offers interactive electronic tools to administrators in schools boards and schools to assist with further analysis. Ontario is also planning to transition from paper- to computer-based assessments, beginning with the Ontario Secondary School Literacy Test (OSSLT) in 2016.

In the vast majority of jurisdictions, student use of ICT in extended project work is supported by education authorities to some extent. Support from education authorities varied from one jurisdiction to another but included funds for pilot projects (Ontario), skills competitions (Prince Edward Island), ICT-supported fairs (Northwest Territories), and access to resources such as laptops or the Internet (New Brunswick French), to name a few.

ICT and teacher development

The survey also asked jurisdictions about the extent to which there is teacher development related to the use of ICT. In particular, jurisdictions were asked how ministries or departments of education develop teacher capacity to use ICT in various areas as well as the extent to which there is support for teacher access and participation in ICT-based professional development activities.

When asked about how ministries or departments of education support and/or require the development of teachers' technical capacity to use ICT, use of ICT in pedagogy, collaboration and communication using ICT, and the use of ICT for student assessment, none of the jurisdictions reported such teacher registration requirements. Instead, teacher capacity in these areas was developed in either pre-service teacher education or in-service teacher education or training or in both. This is consistent with what is taking place in the other countries surveyed with the exception of Australia and Turkey where each of these aspects are required for teacher registration (Fraillon et al., 2014).

In British Columbia, Alberta, Prince Edward Island, Newfoundland and Labrador, technical capacity to use ICT, ICT use in pedagogy, and collaboration and communication using ICT are part of both pre-service teacher education and in-service teacher education or training while these aspects form part of in-service teacher education or training in Ontario, New Brunswick French, Nova Scotia, Northwest Territories, and Yukon. The use of ICT for student assessment is part of pre-service education and in-service teacher education or training in British Columbia and of in-service teacher education or training in Alberta, Ontario, New Brunswick French, Nova Scotia, Newfoundland and Labrador, Northwest Territories, and Yukon. These regions provide teacher development in a variety of ways including teacher-training programs offered through different faculties of education at a number of universities, summer programs, mentoring programs, video tutorials, job-embedded professional development, e-coaches, and the implementation of information systems such as PowerSchool, to name a few.

Regarding the extent to which ministries or departments of education support teacher access to and participation in ICT-based professional development for the a) improvement of ICT/technical skills; b) improvement of content knowledge; c) improvement of teaching skills; d) development of digital resources; and e) integration of ICT into teaching and learning activities, most jurisdictions responded that this was done to some extent. In Yukon, improvement of ICT/technical skills, content knowledge, teaching skills, and development of digital resources were supported to a large extent. Similarly, improvement of content knowledge and teaching skills were supported to a large extent in Nova Scotia. Integration of ICT into teaching and learning activities was supported to a large extent in Alberta and Nova Scotia. Supported programs include: an interactive whiteboard initiative, professional learning community workshops, support for conferences, monthly Web conferences, and Webinars and on-line communities.

While Canadian jurisdictions are working toward providing teacher development for ICT, continuing to increase the availability of both pedagogical and technical support at the school level is important to increase teachers' use of ICT in the classroom (Law, Pelgrum, & Plomp, 2008, p. 276).

ICT-based learning and administrative management systems

With respect to ICT-based learning and administrative management systems, jurisdictions were asked two questions: 1) if ministries or departments of education in their jurisdiction use ICT-based data systems; and 2) if they provide training for teachers in ICT use for the analysis of achievement data.

All jurisdictions use ICT-based data systems for collecting, analyzing, and reporting student achievement data at various levels of aggregation. ICT-based data systems also provide links to examples of student work and teaching resources that are related to achievement data in Alberta, Ontario, New Brunswick French, Prince Edward Island, Newfoundland and Labrador, and Yukon while they provide tools for analysis of data about the school and its environment in British Columbia, Saskatchewan, Ontario, New Brunswick French, Nova Scotia, Prince Edward Island, and Yukon. For example, ministries or departments of education use a provincial student information system (British Columbia), WinSchool/PowerSchool and Students Achieve, which are two information systems about students (New Brunswick French, Northwest Territories, and Prince Edward Island), and the Ontario Student Information System (OnSIS) which is managed by the Education Statistics and Analysis Branch at the ministry (Ontario).

Ministries or departments of education provide training in the use of ICT for the analysis of achievement data to support interpreting data at school, class and/or student levels, linking data to instructional decisions, and using data to monitor student progress over time in the following jurisdictions: Ontario, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, and Yukon. In Saskatchewan, New Brunswick French, and Northwest Territories this option is currently being explored.

Conclusion

The results of the International Computer and Information Literacy Study (ICILS) — which investigates how young people know, understand, and use information and communication technology (ICT) — demonstrate that students in Ontario and Newfoundland and Labrador performed well compared to students in other participating countries. No participating country performed significantly better than Ontario while five countries and Ontario performed significantly better than Newfoundland and Labrador. The CIL scale included four levels of proficiency. While most students in Ontario and Newfoundland and Labrador performed at level 2, the percentages of students achieving the highest levels were higher than the average percentage of students across all participating countries. Girls in both provinces performed significantly better than boys on the ICILS test, which was consistent with results in almost all participating countries. The difference in the results between students in a majority language group versus a minority language group was studied in Ontario only. Generally, students enrolled in an English-language school system performed better than students enrolled in a French-language school system. The results also show a difference in the CIL average scores between students who had at least one parent born in Canada and those with both/only parent(s) born abroad.

The study also collected contextual information through student, school, ICT-Coordinator, and teacher questionnaires. The students' individual and home characteristics, as well as their attitudes, confidence, and use of computers were investigated. The results show that parents' occupation, an indicator of socioeconomic status, is related to the students' performance. Overall, students in Ontario and Newfoundland and Labrador whose parents are in a high occupational category perform better than students whose parents are in the low categories. The relationship between home literacy resources and CIL achievement was also examined. Consistent with a number of other studies, this study found that the number of books in a student's household is a strong predictor of student performance in CIL. The more books students have access to at home, the better they performed on the ICILS test.

The ICILS results show a positive relationship between the number of years students have been using computers and their CIL scores. The study also examined the impact of students' level of interest and enjoyment using computers on the CIL scores. In Ontario, students who have a higher level of interest and enjoyment in using computers have higher CIL achievement scores compared to students who have less while the results show no significant difference for Newfoundland and Labrador. Generally, boys tend to have a more favourable attitude toward using computers than girls do. Results also reveal that students in both provinces are more confident in doing basic computer tasks and less confident when doing advanced computer tasks compared to the international average.

Various aspects related to school policies and practices for ICT use were examined. Most students were attending schools where technology, software, and computer resources were available for teaching and learning. The results show that a high percentage of students in both provinces are enrolled in schools where tablets are available compared to the international average. However, ICT use for teaching and learning was also hindered by different obstacles. For example, according to participating ICT-coordinators, more than half of the students attended schools where there were not enough computers for instruction, where teachers do not have enough time to prepare lessons, where there is a lack of effective professional learning resources for teachers, and where qualified technical personnel to support the use of ICT are lacking. Based on responses from ICT coordinators, schools in Ontario and

Newfoundland and Labrador have procedures in place regarding various aspects of ICT use, mostly setting up security measures to prevent unauthorized system access or entry, honouring intellectual property rights, and prohibiting access to inappropriate material. Schools in both provinces give priority to initiatives related to increasing the number of computers per student, the range of digital learning resources, and the professional learning resources for teachers in ICT use.

According to the results, the vast majority of teachers in Ontario and Newfoundland and Labrador have been using computers for teaching purposes for two years or more. Most teachers in both provinces consider ICT a priority in schools and feel that there is insufficient provision for the development of expertise in ICT, insufficient time to prepare lessons that incorporate ICT in their teaching, and insufficient technical support to maintain ICT resources. Interestingly, teachers' attitudes in both provinces had a more positive outlook regarding the value of using ICT for teaching and learning when compared to other countries. They feel the use of ICT in teaching and learning would improve students' academic performance and help them develop a greater interest in learning. Teachers in both provinces also have greater confidence in performing different ICT tasks compared to those in other countries. The percentage of teachers who know how to do various CIL-related tasks was higher in both provinces compared to other countries except for specific skills such as using a spreadsheet program for keeping records or analyzing data, and preparing lessons that involve the use of ICT.

The National Context Survey provided details on what jurisdictions across Canada are doing regarding ICT. Given that matters relating to education are decided at the provincial and territorial level in Canada, the responses were quite varied from one jurisdiction to another. Despite this variation, the responses to this survey demonstrate that ICT in education is, without a doubt, on the agenda of education ministries and departments throughout the country. Efforts are clearly being made to include ICT in education as is evident in the fact that almost all jurisdictions have developed and put in place plans and policies for supporting the use of ICT for teaching and learning. In the majority of jurisdictions, there is formal support for the development of digital resources and there is some provision made for teaching information literacy using ICT.

Developing a holistic approach to including ICT in education by implementing plans and policies that focus on ICT and student learning, teacher development, and improving ICT-based learning and management systems will certainly yield the best results in terms of improving ICT in education across the country. Although it is a necessary first step, simply providing students and teachers with computer and Internet access in schools is clearly insufficient for ICT use in learning and teaching (Law, Pelgrum, and Plomp, 2008, p. 275).

Since the 1980s, education systems around the world have been investing heavily in technology. In an economy driven by knowledge technology, it is crucial that people master the skills and competencies that will allow them to fully participate in the 21st century. The ways in which young people acquire, understand, and use ICT in the digital age is of critical importance given the ever-growing digitization of the world. Based on the ICILS study, students in Ontario and Newfoundland and Labrador are well prepared to meet such challenges.

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Appendix 1: ICILS 2013 Participation and Exclusion Rates

In ICILS 2013, as in other large-scale assessments, the quality of the information collected is essential to ensure the comparability of the results between participating countries. Countries are encouraged to have, to the extent possible, all selected schools and students participating in the study. Sampling procedures are thorough in order to maximize coverage of the target population.

That being said, exclusions in the target population are unavoidable and can occur for different reasons and at various stages of the sampling process. In Canada, ICILS 2013 was administered to Grade 8 students in only Ontario and Newfoundland and Labrador. The ICILS 2013 sample was based on a two-stage stratified random sample. First, schools with students enrolled in Grade 8 were randomly sampled systematically, with probabilities proportional to size. To meet international requirements, a minimum of 150 schools had to be selected in each country. In Ontario, 200 schools were sampled in order to produce reliable estimates for both the province and for the English- and French-language school systems. To obtain reliable results for Newfoundland and Labrador, all schools with Grade 8 students were selected because of the province's population size.

Second, students in the selected schools were sampled. Each selected school had to prepare a list of all Grade 8 students enrolled in the school. Twenty students from the list were randomly selected to participate in the study. If the school had less than 20 students, all of them were selected. The list contained all eligible Grade 8 students.

Although international studies such as ICILS attempt to maximize coverage of the target population within the sampled schools, student exclusions are inevitable. School officials were responsible for determining whether students were to be included or excluded from the ICILS assessment, based on strict international guidelines. School officials had to ensure that excluded students met one of the following criteria:

- *Students with special learning needs — physical impairment:* This category refers to students who have permanent physical impairments that did not allow them to perform in the ICILS testing situation.
- *Students with special learning needs — social, emotional, or intellectual impairment:* This category refers to students who have been formally identified by the principal, an educational psychologist, or similarly qualified professional as eligible for additional learning support because of social, emotional, or intellectual impairment. It should be noted that students with poor academic performance or disciplinary problems were not automatically excluded from the test nor were students with dyslexia or other learning disabilities of a similar nature.
- *Non-native language speakers:* This category refers to students who are unable to read or speak the language of the test and who would be unable to overcome the language barrier in the test situation. Students who had received less than one year of instruction in the language of the test were generally excluded from the test.

Table A1.1 presents the ICILS 2013 student and school exclusion rates. Please note that teacher exclusion rates could not be calculated due to lack of information regarding the number of teachers within the excluded schools. At the school level, approximately 8 per cent of the schools in Ontario and 23 per cent of the schools in Newfoundland and Labrador were excluded. In Newfoundland and Labrador, the proportion is higher, mostly due to the very small schools being excluded for operational reasons. The majority of these schools were excluded because of their size. Very small schools, with less than six students in Grade 8, were excluded from the sampling. At the student level, nearly 5 and 8 per cent of students in Ontario and Newfoundland and Labrador respectively were excluded prior to sampling and within the sample.

Table A1.1 ICILS 2013 school and student exclusion rates

Provinces	School-level exclusions	Student-level exclusions
Ontario	7.64%	4.98%
Newfoundland and Labrador	22.84%	7.61%

ICILS data quality standards require minimum participation rates for schools and students in order to minimize the potential for response bias. The participation rates required for each country were 85 per cent for both selected schools and students, or a weighted overall participation rate of 75 per cent. The coverage for the teacher sample was judged independently but the participation rate required was also 85 per cent. Tables A1.2, A1.3, and A1.4 show the sample sizes for schools, students, and teachers, as well as the response rates for both Ontario and Newfoundland and Labrador.

Table A1.2 School sample size and participation rates

Province	Number of sampled schools	Number of eligible schools	Number of schools that participated	School response rate before replacement (weighted)	School response rate after replacement (weighted)
Ontario	202	199	193	94.5%	96.7%
Newfoundland and Labrador	155	154	118	98.3%	98.3%

In Ontario, 202 schools were originally sampled; 199 were eligible for the study. In total, 193 Ontario schools participated in ICILS. Therefore, the weighted school response rate before replacement was 95 per cent and 97 per cent after replacement. In Newfoundland and Labrador, the number of sampled schools was 155 and the number of eligible schools was 154. A total of 118 schools participated in ICILS. The weighted school response rate for both before and after replacement was 98 per cent.

TABLE A1.3 Student sample size and participation rates

Province	Number of sampled students	Number of assessed students	Student participation rate (unweighted)	Student participation rate (weighted)
Ontario	3,653	3,377	92.4%	92.1%
Newfoundland and Labrador	1,769	1,556	88.0%	87.8%

The total number of sampled students in Ontario was 3,653 and 3,377 students were assessed. The unweighted and weighted student participation rate was 92 per cent. In Newfoundland and Labrador, 1,769 students were sampled and 1,556 of them were assessed. The rate for unweighted and weighted student participation was 88 per cent.

TABLE A1.4 Teacher sample size and participation rates

Province	Number of sampled teachers	Number of participating teachers	Teacher participation rate (unweighted)	Teacher participation rate (weighted)
Ontario	479	443	92.5%	92.9%
Newfoundland and Labrador	441	403	91.4%	92.6%

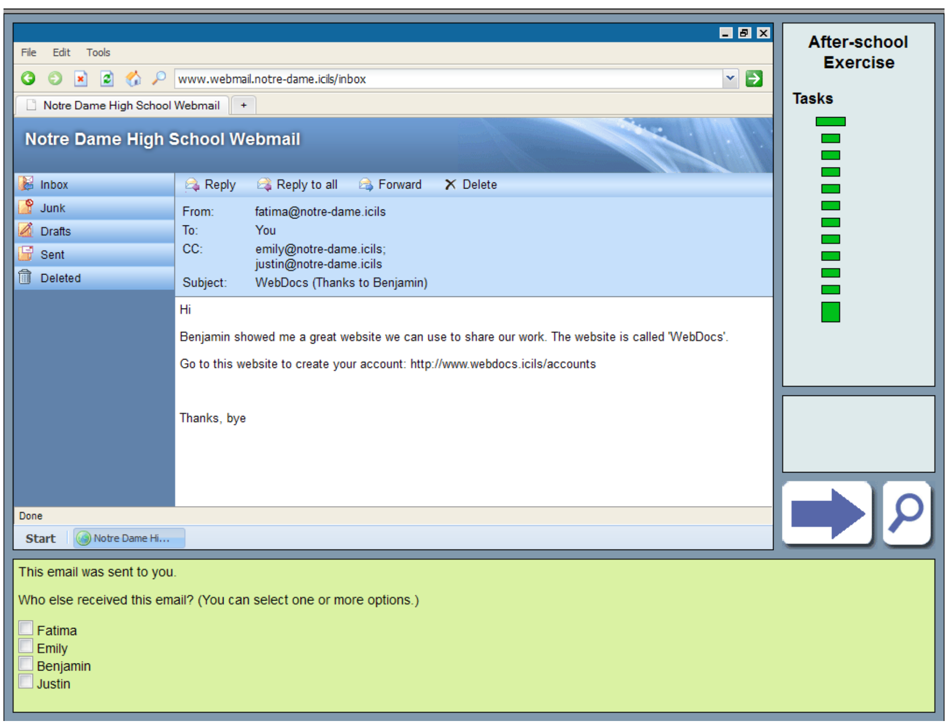
In Ontario, 479 teachers were sampled and 443 teachers completed the Teacher Questionnaire; in Newfoundland and Labrador, 441 teachers were sampled and 403 teachers responded to the questionnaire. The unweighted teacher participation rate for Ontario was 93 per cent while it was 92 per cent for Newfoundland and Labrador. When combined, the weighted teacher participation rate was 93 per cent for both provinces.

Appendix 2: ICILS 2013 Sample Questions

The module called "After-School Exercise" was administered to participating students and included a series of small tasks and one large task. This appendix presents some sample questions to provide the reader with a better understanding of the type and range of tasks that students were required to complete. For the small task examples, a screenshot of the actual question is presented, followed by information regarding the ICILS assessment framework strand and aspect, the CIL proficiency level, and the percentage of correct responses for Ontario and Newfoundland and Labrador and all other participating countries. The large task includes the screenshots of the instructions, the blank document to create the poster, and the Web site students need to refer to when creating the poster. A table showing the percentage of students who obtained full credit for each criterion assessed is also presented for Ontario and Newfoundland and Labrador and compared to the ICILS average. This table includes the CIL proficiency level, the criterion assessed, and its descriptor as well as the assessment framework aspect.

After-School Exercise: Question 1

FIGURE A2.1 Sample question 1 of the After-School Exercise module



ICILS Assessment Framework reference:

- Strand 2: Producing and exchanging information
- Aspect 2.3: Sharing information

CIL Proficiency Level: 1

Table A2.1 Percentage of correct responses for question 1 of the After-School Exercise module

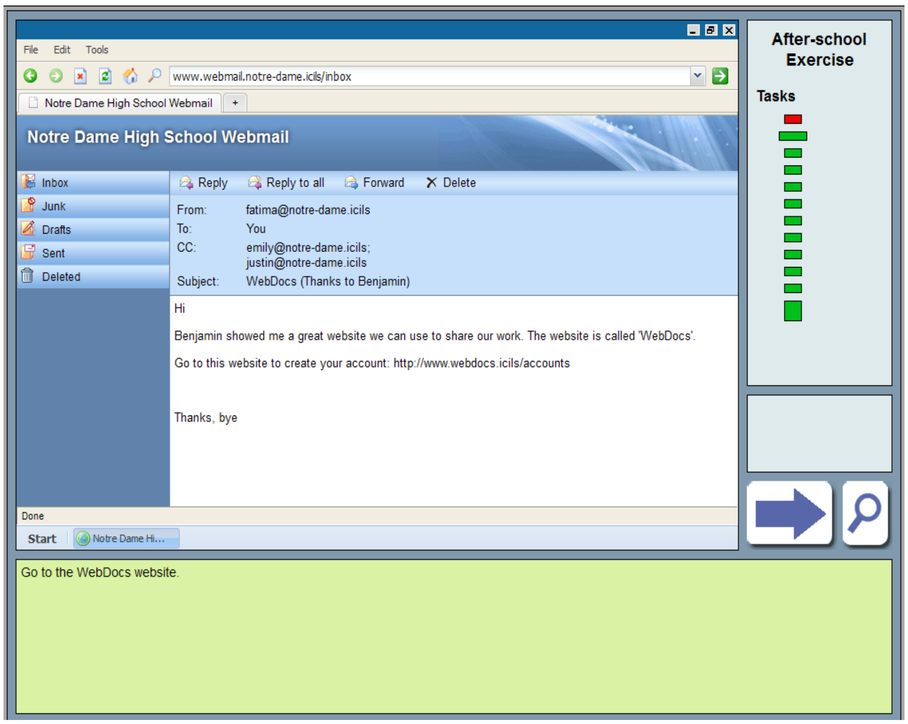
Item statistics		
Country/Province	**Percentage of correct responses**	**Standard error**
Australia	80	1.0
Chile	62	1.6
Croatia	68	1.5
Czech Republic	69	1.3
Germany	77	1.6
Korea	57	1.4
Lithuania	73	1.4
Newfoundland and Labrador	**80**	**2.1**
Norway (Grade 9)	85	1.1
Ontario	**79**	**1.4**
Poland	71	1.3
Russian Federation	74	1.4
Slovak Republic	70	1.3
Slovenia	69	1.5
Thailand	30	1.9
Turkey	35	1.9
International	**66**	**0.4**
Countries not meeting sampling requirements		
Argentina (Buenos Aires)	62	2.2
Denmark	78	1.6
Hong Kong (SAR)	69	1.7
Netherlands	83	1.4
Switzerland	80	2.0

This multiple-choice item illustrates level 1 on the CIL proficiency scale. Students could select one or more options when answering the question. They were asked to identify the recipients of the e-mail. This item assessed whether or not the students were familiar with the conventions used in an e-mail ("From," "To," and "CC" fields) and whether individuals listed in carbon copy (CC) also received the e-mail. The correct responses for this question were Emily and Justin.

This was an easy question and the percentage of correct responses for both Ontario (79%) and Newfoundland and Labrador (80%) was above the ICILS average (66%). Only Norway (Grade 9) had a higher percentage of correct responses (85%) than both provinces.

After-School Exercise: Question 2

FIGURE A2.2 Sample question 2 of the After-School Exercise module



ICILS Assessment Framework Reference:

- Strand 1: Collecting and managing information
- Aspect 1.1: Knowing about and understanding computer use

CIL Proficiency Level: 2

Table A2.2 Percentage of correct responses for sample question 2 of the After-School Exercise module

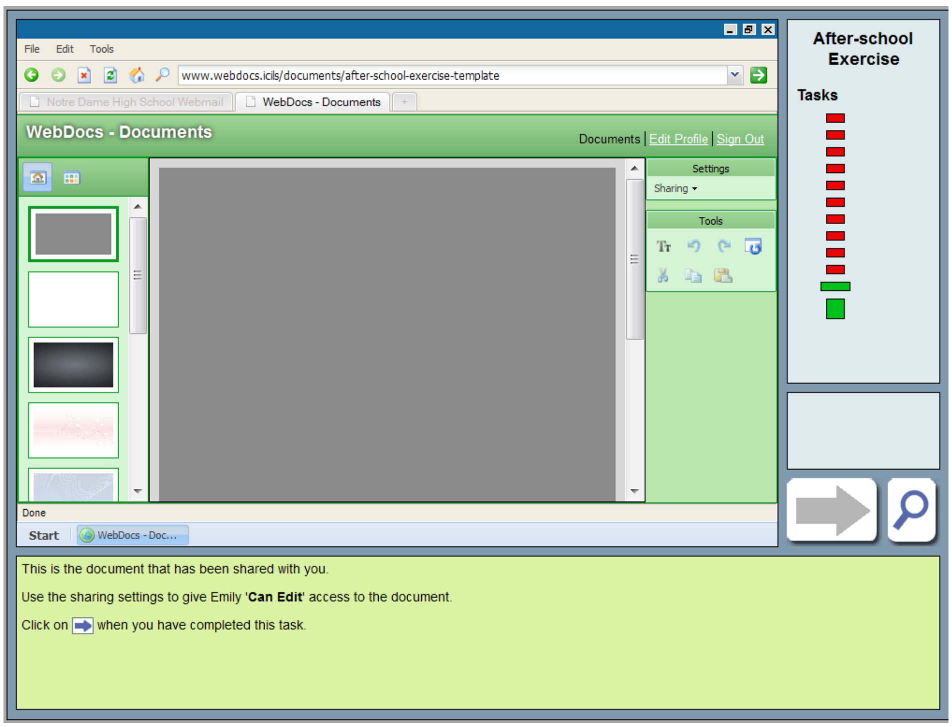
	Item statistics	
Country/Province	**Percentage of correct responses**	**Standard error**
Australia	66	1.1
Chile	44	1.5
Croatia	45	1.5
Czech Republic	54	1.7
Germany	50	1.4
Korea	63	1.2
Lithuania	64	1.8
Newfoundland and Labrador	**58**	**2.9**
Norway (Grade 9)	61	1.8
Ontario	**61**	**1.8**
Poland	55	1.3
Russian Federation	52	1.4
Slovak Republic	42	1.6
Slovenia	48	1.2
Thailand	21	1.7
Turkey	23	1.6
International	**49**	**0.4**
Countries not meeting sampling requirements		
Argentina (Buenos Aires)	44	3.0
Denmark	66	1.9
Hong Kong (SAR)	65	2.1
Netherlands	61	1.6
Switzerland	49	1.8

This question illustrates level 2 on the CIL proficiency scale. Students needed to access a Web site by navigating to a URL given as plain text. Because students could not just click on the hyperlink to access the site, this seemingly simple task was made more complex because they either had to copy and paste the link or type the text into the address bar of the Web browser and activate the search.

Almost 60 per cent of students in both Ontario and Newfoundland and Labrador had the correct response while almost half of all Grade 8 students selected the correct response. Three countries (Australia, Lithuania, and Korea) had a higher percentage than Ontario while the percentages for four countries (Australia, Lithuania, Korea, and Norway [Grade 9]) and Ontario were higher than Newfoundland and Labrador.

After-School Exercise: Question 3

FIGURE A2.3 Sample question 3 of the After-School Exercise module



ICILS Assessment Framework Reference:

- Strand 1: Collecting and managing information
- Aspect 1.1: Knowing about and understanding computer use

CIL Proficiency Level: 2

Table A2.3 Percentage of correct responses for sample question 3 of the After-School Exercise module

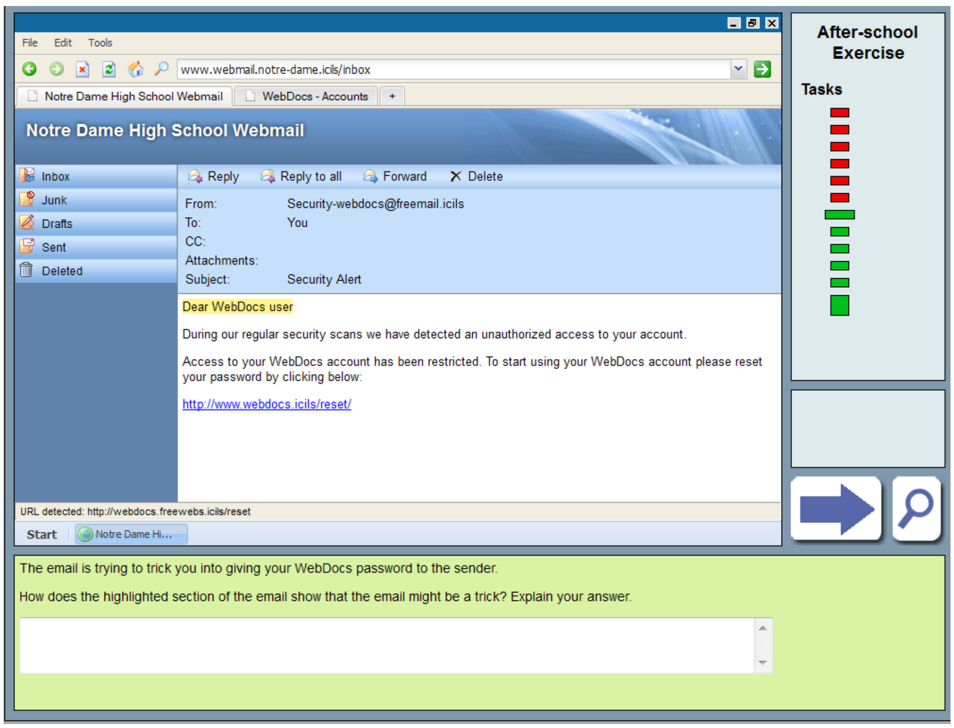
Item statistics		
Country/Province	**Percentage of correct responses**	**Standard error**
Australia	72	1.1
Chile	50	1.5
Croatia	60	1.6
Czech Republic	46	1.2
Germany	58	1.8
Korea	66	1.2
Lithuania	49	1.6
Newfoundland and Labrador	**67**	**1.7**
Norway (Grade 9)	74	1.2
Ontario	**71**	**1.9**
Poland	54	1.4
Russian Federation	68	1.5
Slovak Republic	62	1.8
Slovenia	57	1.8
Thailand	16	1.6
Turkey	30	1.8
International	**54**	**0.4**
Countries not meeting sampling requirements		
Argentina (Buenos Aires)	49	2.8
Denmark	72	1.9
Hong Kong (SAR)	50	2.0
Netherlands	58	1.8
Switzerland	63	2.2

This question refers to level 2 on the CIL proficiency scale. In this question students were asked to modify the sharing settings of a collaborative document and allocate "can edit" rights to another student working on the same project. Students had to navigate the Web site and access "sharing" located under the "settings" menu to allocate access to the required user.

About two-thirds of the students in Ontario (71%) and Newfoundland and Labrador (67%) obtained the correct response, which is higher than the ICILS average (54%). Only Australia and Norway (Grade 9) had higher percentages (72% and 74% respectively) than both provinces.

After-School Exercise: Question 4

FIGURE A2.4 Sample question 4 of the After-School Exercise module



ICILS Assessment Framework Reference:

- Strand 2: Producing and exchanging information
- Aspect 2.4: Using information safely and securely

CIL Proficiency Level: 3

TABLE A2.4 Percentage of correct responses for sample question 4 of the After-School Exercise module

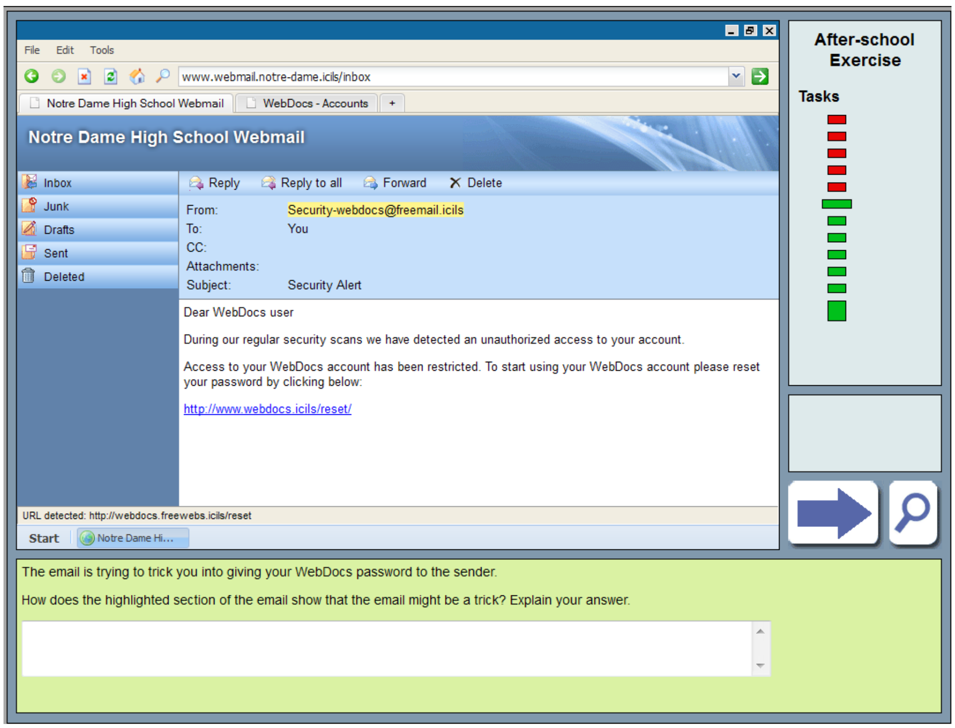
Item statistics		
Country/Province	**Percentage of correct responses**	**Standard error**
Australia	60	1.1
Chile	19	1.2
Croatia	14	1.2
Czech Republic	21	1.2
Germany	28	1.5
Korea	27	1.4
Lithuania	36	1.5
Newfoundland and Labrador	**56**	**2.7**
Norway (Grade 9)	30	1.4
Ontario	**53**	**1.9**
Poland	34	1.5
Russian Federation	33	1.8
Slovak Republic	23	1.5
Slovenia	16	1.0
Thailand	7	0.9
Turkey	4	0.7
International	**25**	**0.3**
Countries not meeting sampling requirements		
Argentina (Buenos Aires)	15	1.8
Denmark	34	1.9
Hong Kong (SAR)	24	2.2
Netherlands	42	1.8
Switzerland	37	2.5

This question illustrates level 3 on the CIL proficiency scale. In this open-response question, a section in the e-mail is highlighted and students have to indicate the reason the e-mail might be a trick. This item assessed whether or not students could identify whether an e-mail comes from an untrustworthy source based on specified characteristics.

This question was more difficult for most students across all countries since only a quarter responded correctly. In Ontario and Newfoundland and Labrador, more than half of the students (53% and 56% respectively) were able to indicate the e-mail might be a trick because the greeting is generic and the sender does not know the recipient. Students in Australia (60%) were the only ones who had a higher percentage than both provinces.

After-School Exercise: Question 5

FIGURE A2.5 Sample question 5 of the After-School Exercise module



ICILS Assessment Framework Reference:

- Strand 2: Producing and exchanging information
- Aspect 2.4: Using information safely and securely

CIL Proficiency Level: 4

Table A2.5 Percentage of correct responses for sample question 5 of the After-School Exercise module

Item statistics		
Country/Province	**Percentage of correct responses**	**Standard error**
Australia	19	1.0
Chile	17	1.1
Croatia	12	1.1
Czech Republic	27	1.3
Germany	7	1.0
Korea	21	1.1
Lithuania	28	1.4
Newfoundland and Labrador	**36**	**2.7**
Norway (Grade 9)	25	1.3
Ontario	**36**	**1.4**
Poland	14	0.8
Russian Federation	15	1.1
Slovak Republic	21	1.2
Slovenia	13	1.0
Thailand	5	1.0
Turkey	3	0.5
International	**16**	**0.3**
Countries not meeting sampling requirements		
Argentina (Buenos Aires)	16	2.7
Denmark	38	2.1
Hong Kong (SAR)	24	1.8
Netherlands	22	1.4
Switzerland	16	1.6

This is a level 4 question on the CIL proficiency scale. It highlights another section of the same e-mail that was used in the previous question. Once again, students were asked to indicate why the e-mail might be a trick. Students had to identify the mismatch between the purported sender and the e-mail address, which would suggest the e-mail might be suspicious.

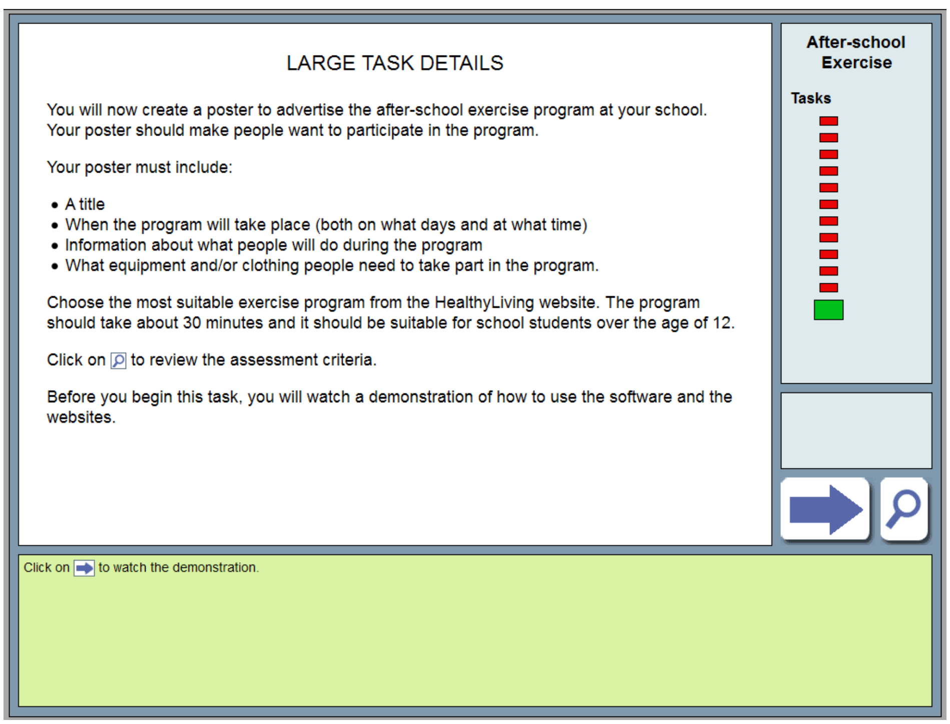
This question was difficult. Only 16 per cent of all Grade 8 students gave the correct response. More than a third of students in Ontario and Newfoundland and Labrador (36% in both provinces) were able to respond correctly to this question, and this percentage is higher than any other participating country.

After-School Exercise: Large task

At the end of each module, students were asked to complete a large task that took approximately 15 to 20 minutes. In the After-School Exercise module, students had to create a poster to promote an after-school exercise program based on one or more activities they selected from the Web site. The purpose of the task was to entice people to participate in the after-school program.

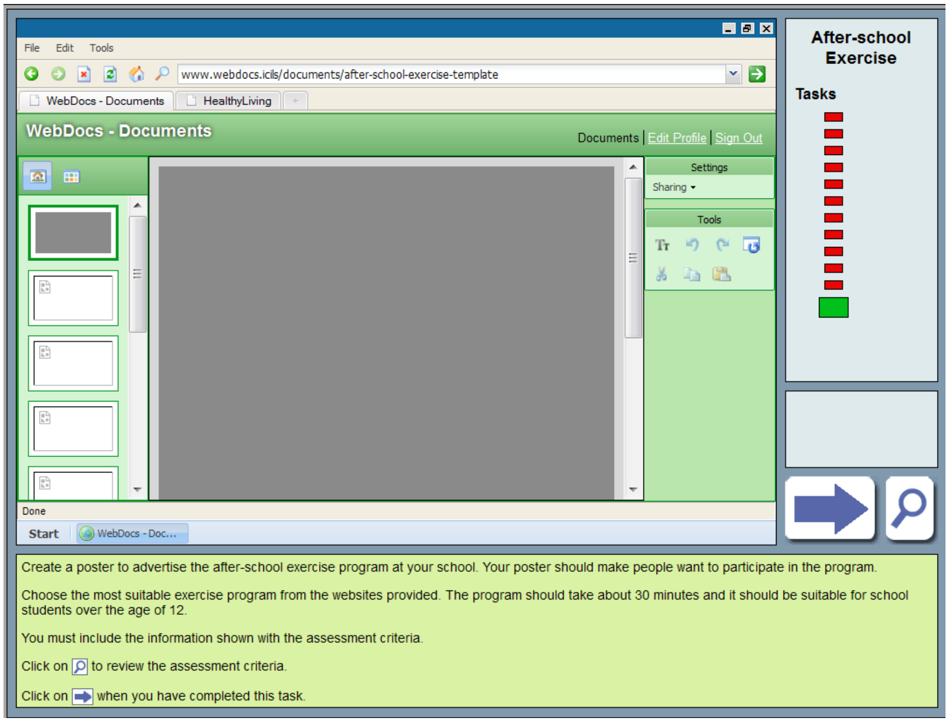
Before creating the poster, the task details were described to the students. Figure A2.6 shows the instructions given to students to complete the task. Students were told to select an activity from the Healthy Living Web site and create a poster including the following information: a title, when the program would take place, information about what people would do during the program, and what equipment and/or clothing people required to take part. Students were given access to a short video presentation that gave them a better understanding of the task and the main features of the software they could use to complete it.

FIGURE A2.6 Sample large task details of the After-School Exercise module



After reading the task details and viewing the video presentation, students could begin the large task. A blank document was presented to students, as shown in Figure A2.7. It included editing software, which was designed to match the conventions of Web-based document editors, so students could create the poster.

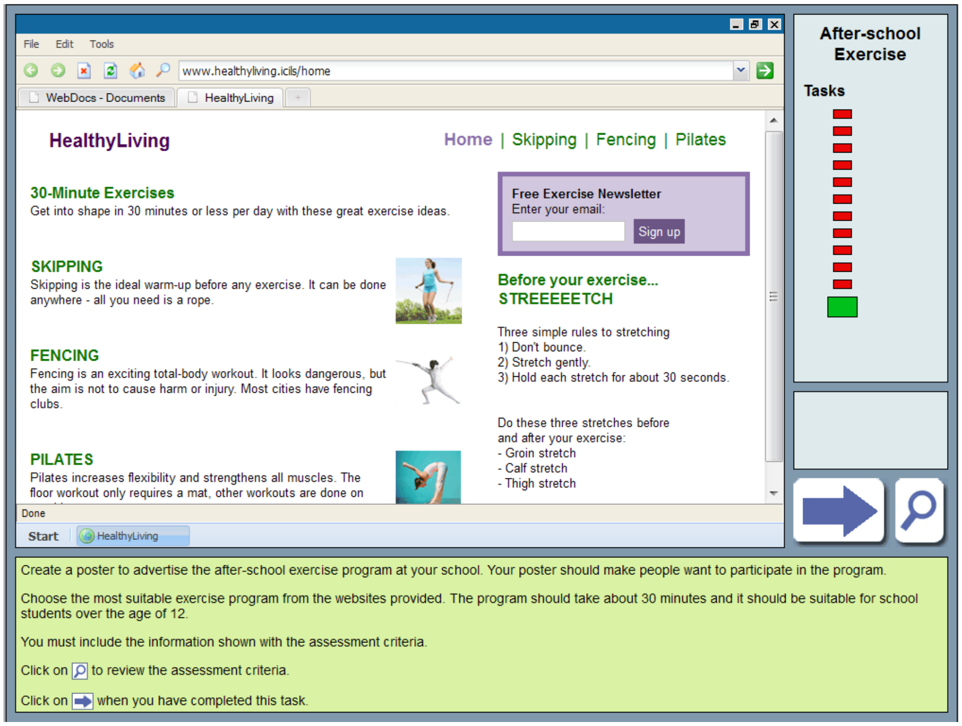
FIGURE A2.7 Sample working document of the After-School Exercise module



To access information on the Healthy Living Web site, clickable tabs were presented at the top of the screen, which allowed students to visit the Web site and return to the poster-making software.

Skipping, fencing, and Pilates were the three activities on the Healthy Living Web site the students could choose from. To obtain additional information, they had to refer to the Web site and click on the selected activity or activities (see Figure A2.8). Then they had to filter and select the most relevant information when creating the poster to promote the after-school program. Students could also copy and paste the text from the resources and include some images related to the activity or activities chosen. Once students completed the poster, they had to click on the "I've finished" button and the poster was saved as a final version.

FIGURE A2.8 Sample large task and Web site resource of the After-School Exercise module



The large tasks took longer to score than the small tasks, due to the number and complexity of the scoring criteria. For the After-School Exercise module, the poster was scored based on the following nine criteria: title design, image layout, text layout and formatting, colour contrast, colour consistency, information adaptation, information completeness, persuasiveness, and the use of a full page for the poster.

In large tasks, assessment criteria usually fall under two categories: technical proficiency and information management. In the technical proficiency category, for example, students could be assessed on whether or not they showed control of the text or image formatting or layout and/or the colours they used throughout the task. In the information management category, for example, students could be assessed on whether or not the information in the poster was adapted to suit the audience or if the information selected was relevant and would flow throughout the poster. Some criteria were dichotomous, where the scoring assigned could be either 0 (no credit) or 1 (full credit). Partial credit was allowed for some other criteria, where the scoring assigned could either be 0 (no credit), 1 (partial credit), or 2 (full credit).

Table A2.6 shows the overall percentage of students obtaining full credit for each criterion in Ontario and Newfoundland and Labrador in comparison to the ICILS average. The percentage of students is listed according to the criteria and follows the same order as the scoring guide.

Table A2.6 Percentage of students achieving full credit for each scoring criterion for the After-School Exercise large task[17]

Criterion	Descriptor	CIL Proficiency Level	Ontario* (%)	Newfoundland and Labrador* (%)	International* (%)	Assessment Framework Aspect
1. Title design	A relevant title has been added and the role of the title is clear in the poster.	2	67 (1.7)	61 (2.7)	48 (0.4)	2.1. Transforming information
2. Image layout	One or more images are well aligned with the other elements on the page and appropriately sized.	3	55 (2.1)	54 (2.2)	40 (0.4)	2.2. Creating information
3. Text layout and formatting	Formatting tools have been used successfully to support readers' understanding of the role of the different text elements.	4	27 (1.4)	27 (1.9)	15 (0.2)	2.2. Creating information
4. Colour text contrast	There is sufficient contrast to enable all text and images to be seen and read easily.	3	25 (1.3)	25 (2.4)	23 (0.3)	2.1. Transforming information
5. Colour consistency	The poster shows evidence of planning regarding the use of colour to denote the role of the text, background, and images in the poster.	1	86 (1.3)	84 (1.9)	80 (0.3)	2.3. Sharing information
6. Information adaptation	The relevant key points from the resources have been rephrased using students' own words.	4	8 (0.9)	5 (1.2)	7 (0.2)	2.3. Sharing information
7. Information completeness	All required information about the program has been included in the poster.	3	35 (1.8)	32 (1.7)	27 (0.3)	1.2. Accessing and evaluating information
8. Persuasiveness	Uses some emotive or persuasive language to make program appealing to readers.	3	46 (1.6)	41 (2.3)	26 (0.3)	2.1. Transforming information
9. Use of full page	Use of full page when creating poster.	2	57 (1.9)	53 (3.0)	46 (0.4)	2.1. Transforming information

* ( ) denotes standard error.

[17] See Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014.

The first criterion to be scored was the title's role in the poster. To obtain full credit, the student had to make the title clear, its position had to be prominent, and a different text format had to be used to differentiate the title from the main body text. Approximately two-thirds of students in Ontario and Newfoundland and Labrador (67% and 61% respectively) obtained full credit while this was the case for close to half of Grade 8 students among all participating countries.

The second criterion was image layout, where one or more images had to be well aligned with the other elements on the page and in a suitable size for students to get full credit. More than half of the students in Ontario and Newfoundland and Labrador obtained full credit (55% and 54% respectively) which was better than the ICILS average of 40 per cent.

Text layout and formatting was the third criterion to be scored. Students who received full credit successfully used the formatting tools to support readers' understanding of the role of the different text elements. There was a clear and consistent distinction between the main body and headings or subheadings and the position and alignment of the text boxes made it easy to follow the information visually. More than a quarter of students in Ontario and Newfoundland and Labrador obtained full credit (27% in both provinces) compared to 15 per cent of students across participating countries.

To obtain full credit for the fourth criterion, text contrast, students had to ensure that all text and images could be seen and read easily. A quarter of Grade 8 students in both Ontario and Newfoundland and Labrador received full credit for this criterion compared to an international average of 23 per cent.

Consistency in the colours used for the poster was the fifth criterion to be scored. To receive full credit, students had to demonstrate that they had planned what colours they were going to use for the poster by showing evidence of planning in the use of colours to denote the role of the text, background, and images in the poster. In Ontario and Newfoundland and Labrador, about 85 per cent of students obtained full credit compared to the ICILS average of 80 per cent.

To obtain full credit for the sixth criterion, information adaptation, students had to choose relevant key points from the resources and rephrase them in their own words. Only 8 per cent of students in Ontario and 5 per cent in Newfoundland and Labrador received full credit, which is close to the ICILS average of 7 per cent.

Information completeness was the seventh criterion to be scored. All three pieces of information regarding the after-school program (i.e., when the program took place, what participants will do during the program, and what equipment and/or clothing is needed to take part) had to be included in the poster to obtain the maximum points. In Ontario and Newfoundland and Labrador, 35 and 32 per cent of the students respectively obtained full credit compared to 27 per cent of Grade 8 students in participating countries.

For the eighth criterion (poster persuasiveness), students had to use persuasive or emotive language appropriate for the audience and purpose in order to motivate people to participate in the program. Among Grade 8 students in participating countries, just over a quarter of students received full credit while the percentages were higher in both Ontario and Newfoundland and Labrador, with 46 per cent and 41 per cent respectively.

The use of a full page for the poster was the last criterion to be scored. Students who added any text or images to the area of the poster that was viewed only by using the scrollbar obtained full credit. More than half of the students in Ontario (57%) and Newfoundland and Labrador (53%) received full credit compared to 46 per cent of Grade 8 students in participating countries.