Higher Education Quality Council of Ontario

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Measuring Essential Skills of Postsecondary Students: Final Report of the Essential Adult Skills Initiative

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Abbreviations

EASI: Essential Adult Skills Initiative
EASI is an assessment project led by HEQCO in partnership with 19 Ontario colleges and universities and one out-of-province institution. The college pilot launched in fall 2016, while the university pilot got underway in fall 2017.

ESO: Education and Skills Online
The ESO is an assessment of adult literacy, numeracy and problem-solving skills. It is the commercial version of PIAAC and is administered by ETS on behalf of the OECD, participating countries and the European Union. ESO results are comparable to PIAAC data and can be benchmarked against the national and international PIAAC results of participating countries.

ETS: Educational Testing Service
ETS is a private American non-profit specializing in educational measurement and research. ETS administers the ESO assessment on behalf of the OECD, participating countries and the European Union. Specifically, ETS manages the ESO's test portal and online assessment platform.

HEQCO: Higher Education Quality Council of Ontario
Established in 2005, HEQCO is a Crown agency at arm's length from the Government of Ontario. HEQCO has a mandate to conduct research and provide evidence-based policy advice on the Ontario postsecondary system.

OECD: Organization for Economic Co-operation and Development
The OECD is an intergovernmental economic agency with 35 member countries, "dedicated to promoting policies that improve the economic and social well-being of people around the world." The OECD led the development of the ESO assessment and its sister, the PIAAC, with the support of the Council of Ministers of Education, Canada and the European Commission, among other international bodies.

PIAAC: Programme for the International Assessment of Adult Competencies
PIAAC was developed and validated by the OECD for audiences aged 16 to 65. The ESO is the commercial version of PIAAC and the results of both tests are comparable. PIAAC has been administered in over 40 countries, including Canada, since 2011. In Canada PIAAC is administered by Statistics Canada on behalf of the Council of Ministers of Education, Canada and Employment and Social Development Canada, with the next data collection cycle set to begin in 2021.

EASI Partner Institutions

Algonquin College
Ottawa

Centennial College
Toronto

Conestoga College
Kitchener

Fanshawe College
London

Fleming College
Peterborough

George Brown College
Toronto

Humber College
Toronto

Sault College
Sault Ste. Marie

Seneca College
Toronto

Sheridan College
Oakville

St. Lawrence College
Kingston

Algoma University
Sault Ste. Marie

Brescia University College at Western University
London

Brock University
St. Catharines

McMaster University
Hamilton

Nipissing University
North Bay

Queen's University
Kingston

University of Guelph
Guelph

York University
Toronto

Quest University Canada
Squamish, B.C.

1. Introduction

Change is inevitable, even in times of certainty. While it can be difficult to predict labour market trends and shifts, we know specific skills can help one navigate those changes and engage fully in the world around them. We invest heavily in our educational institutions to help students develop those skills.

It will come as no surprise that postsecondary students expect their education to hone their abilities and enhance their job prospects. Similarly, employers expect postsecondary graduates to possess the skills needed to make positive, productive contributions to their organizations. In the coming decades, Canadian workers will need a transferable set of skills if they are to succeed in their careers, and if the country is to be economically competitive and attract the industries and jobs that are a hallmark of a modern, knowledge-based economy.

The K-12 system in every province has long emphasized basic skills like literacy, numeracy and problem solving; these skills are assessed at regular intervals by Canada's participation in international tests, such as the Programme for International Student Assessment (PISA). Canada has also participated in international assessments that test similar skills in adults, like the Programme for the International Assessment of Adult Competencies (PIAAC).

Innumerable industry surveys have demonstrated that the greatest concern of employers and students is not the content that Canadians acquire in their postsecondary programs, but rather an apparent shortcoming in a set of cognitive and behavioural skills necessary for success in volatile, changing and unpredictable job markets (Business Council of Canada, 2018). The most-cited skills needed for job success are, at a cognitive level, an adequate level of literacy and numeracy, problem solving and critical thinking; and at a behavioural level, effective communication skills, resourcefulness and adaptability. From an accountability perspective, a public-policy perspective and most importantly a learning-gain perspective, skills are now synonymous with quality in postsecondary education.

However, we do not know whether these concerns are justified, or whether postsecondary programs are doing an adequate job of fostering these cognitive and behavioural skills. Why? Because we do not measure them in a consistent way. Postsecondary education to a large extent still teaches, evaluates and credentials information and content. Statements about the employment-related skills of graduates from academic institutions are largely based on inference, opinion, gut feelings or aspirations.

There is no substitute for the direct measurement of job-related skills to answer important questions about the skills gap, to determine the effectiveness of our investments in programs designed to reduce this gap, and most importantly to determine the most effective ways of teaching these desired skills and competencies to a variety of students.

While measurement can take many forms, large-scale skills assessments can be particularly effective in helping us understand students' learning gain at the system and institutional levels. In testing students' skills when they enter postsecondary and again when they leave, we can get a pretty good idea of whether their education contributed to an increase in their skill level.

The Essential Adult Skills Initiative (EASI) is an ambitious, large-scale research project undertaken by HEQCO and 20 postsecondary partners, with funding provided by the federal and provincial governments. EASI was designed to measure the literacy, numeracy and problem-solving skills of incoming and graduating college and university students, and to evaluate the feasibility of administering assessments on a large scale in Ontario's postsecondary sector. In this respect, EASI represents an important first step toward the measurement of **learning gain** — the degree to which students' skills change over the course of their program of study — across multiple postsecondary institutions.

2. Methodology

EASI's central research questions are as follows:

1. Is the Education and Skills Online assessment a suitable measure of postsecondary students' literacy, numeracy and problem-solving skills?
2. Are there observable differences between incoming and graduating students' literacy, numeracy and problem-solving skills?
3. What are the practical implications of implementing a project like EASI in a postsecondary institution? How feasible is it to scale up this project to a provincial or national level?

The following section describes the design and methods of the EASI college and university pilots, including the process used to implement and manage EASI testing windows on participating campuses. The section concludes with a brief review of the caveats that should be taken into account when interpreting the EASI results.

2.1 Design

The EASI pilots were cross-sectional and voluntary, testing first- and final-year students from the same programs in a single academic year. This design allowed for aggregate-level comparisons of student skill levels at the start and conclusion of their postsecondary careers. During the data analysis phase, assessment results were linked to de-identified administrative variables provided by the institution to contextualize the EASI data set.

The EASI college pilot took place in the 2016–17 academic year. First-year college students were tested in the fall 2016 semester and final-year college students in the winter 2017 semester.[1] The EASI university pilot took place in the fall 2017 semester, with first- and final-year university students tested simultaneously. Each testing window was scheduled for early in the semester so as not to conflict with students' end-of-term assignments and examinations. Institutions selected start dates that suited their academic calendars. To maximize student participation, testing windows remained open for four to six weeks.

Table 1 provides a high-level view of the design of EASI's college and university pilots. Many of the items in this table, such as sampling, are expanded on later in this section. The table also reflects slight variations in study design between institutions, as well as adjustments made to the study design between each round of testing. In each instance, these adjustments were made with the goal of securing student and institutional participation, and were approved by the relevant institutional Research Ethics Boards before being put into practice.

1 One college wished to test both the first- and final-year cohorts in fall 2016, so the winter 2017 testing windows included 10 Ontario colleges.

Table 1: Research design summary, EASI college and university pilots

	EASI College Pilot, Fall 2016–Winter 2017		EASI University Pilot, Fall 2017
	First-year students	*Final-year students*	*First- & Final-year students*
No. of Institutions	11	11	8[2]
Design	Cross-sectional, testing first- and final-year students in selected programs in the same academic year		
Assessment	Education and Skills Online		
Participation	Voluntary		
Setting	Participants take the test online, on their own time		
Testing Launch	Late Sept. to early Oct. 2016 (rolling)	Late Jan. to early Feb. 2017 (rolling)[3]	Late Sept. to early Oct. 2017 (rolling)
Testing Length	Testing windows last from four to six weeks		
Recruitment	Email invitation and weekly email reminder messages to all eligible participants Additional recruitment strategies varied by institution		
Participant Incentives — Individual	Personalized ESO score report $10 Amazon.ca gift card[4]	Personalized ESO score report $20 Amazon.ca gift card Access to Paddle[5]	Personalized ESO score report $20 gift card to Amazon.ca Access to Paddle
Participant Incentives — Lottery	Entry into draw for 1 x $500 and 5 x $100 Amazon.ca gift cards, per institution, per cohort		
Data Linkage	Individual-level linkage of ESO results, EASI registration data and institutional administrative data, e.g., entry category, domestic/international student status, program of study		

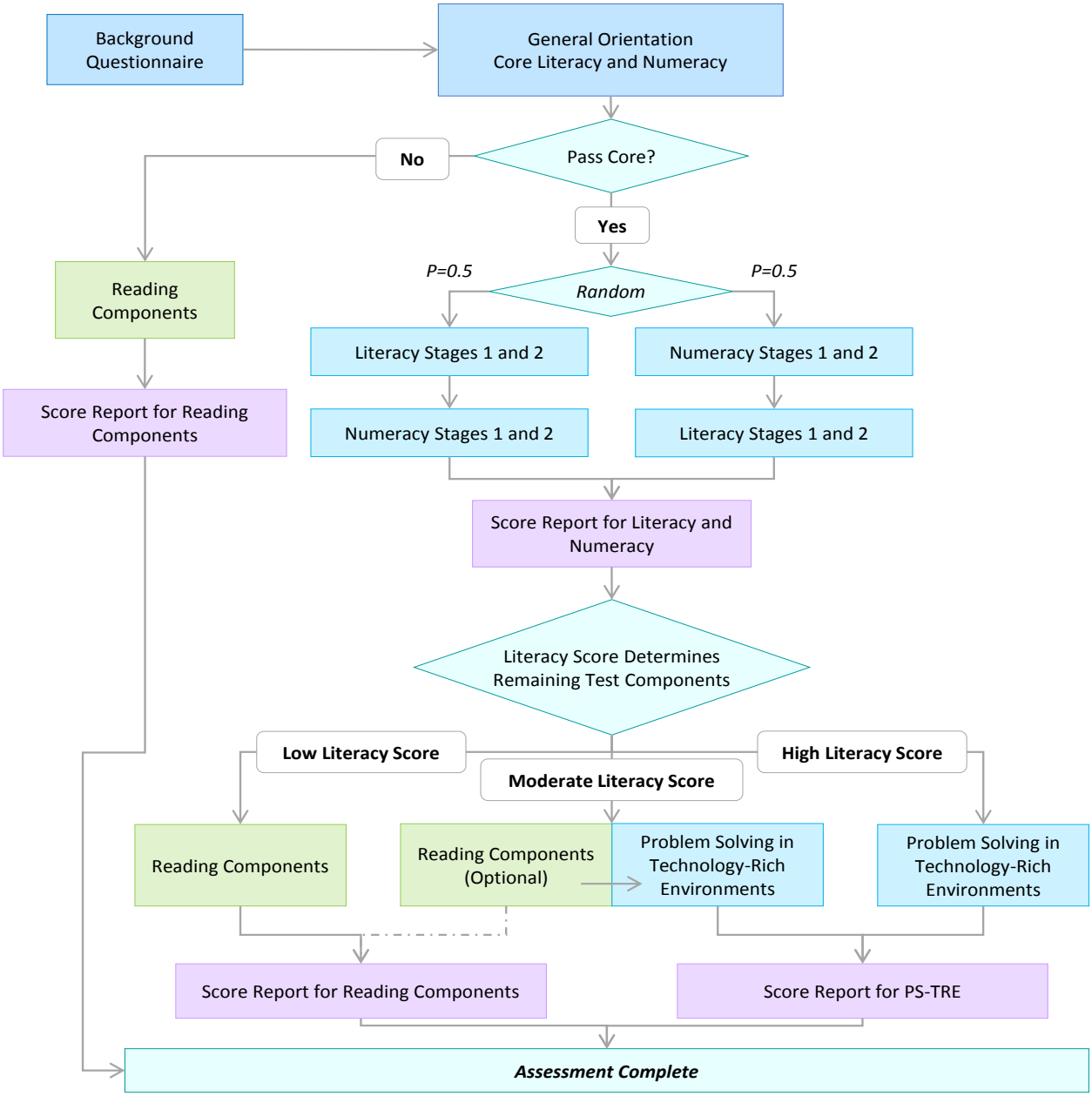
2 While Quest University participated in EASI, this table only reflects the eight Ontario universities that participated in the pilot. This is because Quest's program-delivery methods differ substantially from those commonly employed in Ontario's public postsecondary institutions. For the same reason, Quest University is also excluded from the university results presented in the *Performance* section of this report.

3 One institution chose to test its first- and final-year students simultaneously in fall 2016.

4 One college paid out of pocket to increase the value of the individual incentive for first-year students from $10 to $20. Following the success of this strategy, HEQCO raised the individual incentive to $20 for all final-year college students tested in winter 2017. HEQCO amended EASI's initial research ethics application to reflect both this change and the optional addition of Paddle to the incentive package. The change was approved by each college's Research Ethics Board prior to the start of the winter 2017 testing window.

5 Paddle is a Canadian online career-exploration platform; three colleges and seven universities included Paddle in their incentive packages.

Figure 1: Structure of Education and Skills Online



Source: Adapted from "Figure 1: Education & Skills Online bundled package workflow" in *Education and Skills Online Technical Documentation*, OECD (2015), p. 8.

2.2 Choice of Assessment Tool

EASI's primary data collection tool is the Education and Skills Online (ESO) assessment.[6] The ESO is the commercial version of the Organization for Economic Co-operation and Development's (OECD) Programme for the International Assessment of Adult Competencies (PIAAC). Like the PIAAC, this instrument is delivered in over 40 countries. Both the ESO and PIAAC were validated for populations between the ages of 16 and 65. The ESO is administered on behalf of the OECD and its partners, including the Council of Ministers of Education, Canada, by the Educational Testing Service (ETS). The test has been adapted for Canadian audiences in both official languages.

Like the PIAAC, the ESO consists of three major components: Literacy and Numeracy (the Core Assessment), Problem Solving in Technology-Rich Environments (PS-TRE) and a background questionnaire. It also includes a brief remedial section (the Reading Components subtest) for test-takers who score low on the Core Assessment. The ESO is an adaptive assessment tool, so questions become progressively easier or more difficult depending on the test-taker's performance. Because of the test's adaptive nature, the number of questions differs for each test-taker. Figure 1 displays the structure of the ESO.

There are several reasons why HEQCO selected the ESO for EASI, which we summarize here.

Quality and comparability: The ESO underwent a rigorous development and validation process, which is described in the *Technical Documentation* (OECD, 2015). This process included: updating existing PIAAC items and the development of new items based on the PIAAC framework; the review of test items by members of PIAAC's Literacy and Numeracy Expert Groups; the adaptation and translation of the ESO for each of the participating countries; an extensive field test that included a large Canadian sample; and further revisions to the assessment based upon statistical analysis of the field-test results. In the end, roughly half of the ESO's respective literacy and numeracy items were newly developed, while the remaining half were drawn from PIAAC. All of the ESO's PS-TRE and Reading Components items were drawn directly from PIAAC's item pool (OECD, 2015, pp. 10-11). This means that the ESO data collected by EASI can be compared to the provincial, national and international PIAAC results.

User-friendliness: The ESO is simple for both test-takers and investigators to navigate. Its intuitive user interface is complemented by the high-quality technical infrastructure provided by Educational Testing Service. Based on ETS's record of managing high-volume online and computer-based assessments like the Graduate Record Examinations, HEQCO was confident that the ESO would be a consistent, secure and well-functioning tool. The fact that test-takers receive their personal score reports immediately upon completion of each test component added another layer of user-friendliness to the ESO, as did the ESO administrator portal, which allowed HEQCO to access ESO data in real time.

The ESO's user-friendliness is further enhanced by the level of control that test-takers are able to exercise over their test-taking experience. The ESO is delivered online and can be administered without proctors,

6 Education and Skills Online is a product of the OECD. Its development has been supported by the European Commission and, in Canada, the Council of Ministers of Education, Canada. It is administered by ETS.

which allows for some flexibility in terms of where and when students take the test. Though the ESO typically requires 90–120 minutes to complete, students may log off and on as needed should they require a break. These features in particular contributed to the feasibility of the EASI testing windows.

Subject matter and design: The ESO's adaptive nature sets it apart from many other assessments of adult skills currently available, with test items increasing or decreasing in difficulty according to the test-taker's performance. This makes it unsuitable for screening test-takers needing remedial support and other developmental education purposes, though it does include a remedial section (the Reading Components subtest) for test-takers who score very low on the first part of the Core Assessment.

Rather than focusing simply on the mastery of the mechanics of vocabulary or arithmetic operations, it assesses the real-world application of literacy, numeracy and problem solving in technology-rich environments. That is, the ESO provides a snapshot of how effectively test-takers use essential skills to navigate and engage with the world around them (OECD, 2016).

Figure 2: PIAAC and ESO definitions of literacy, numeracy and PS-TRE [7]

Literacy:
"Understanding, evaluating, using and engaging with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential."

Numeracy:
"The ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life."

Problem solving in technology-rich environments (PS-TRE):
"Using digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks."

Source: Adapted from OECD (2012), pp. 20, 34, 47.

Figure 2 displays the ESO's definitions of its three focal competencies: literacy, numeracy and problem solving in technology-rich environments. In the literacy component, test-takers engage with a variety of digital texts and documents that one encounters in everyday life — letters and emails, advertisements, news media, blog posts and online comments, technical instructions and so on. Numeracy items mirror common real-life applications, such as comparing retail discounts, interpreting and extracting information from charts

7 The definitions offer only a high-level view of the complex frameworks PIAAC uses to describe and measure these multifaceted competencies. The complete frameworks can be found in OECD (2012).

and graphs, and calculating drug dosages based on body weight. The problem-solving component assesses how well test-takers are able to navigate online environments to complete common tasks, such as using sorting tools to extract data from a spreadsheet, extracting relevant information from a multi-page website, and evaluating the quality and reliability of web search results.[8]

EASI is the first time the ESO has been used in a postsecondary context in Canada. For this reason, EASI includes the question of the ESO's feasibility for postsecondary applications as a central research question. Our findings on the matter are reviewed in the *Conclusion* of this report.

2.3 Sampling

Since our research questions include the feasibility of large-scale assessment programs in PSE and the validity of the ESO for these purposes, we chose to draw from as large a sample pool as possible and avoided controls that might have limited the number of eligible participants. To this end, the inclusion criteria for EASI's college and university pilots were deliberately broad and targeted to the program level. These criteria are summarized in Table 2.

Table 2: Inclusion and exclusion criteria, EASI college and university pilots

EASI College Pilot	EASI University Pilot
Inclusion Criteria	
- Enrolled full-time in first or final year of program - Program culminates in Ontario College Diploma (2 yrs.) or Ontario College Advanced Diploma (3 yrs.)*	- Enrolled full-time in first or final year of program - Program culminates in Ontario Undergraduate Degree (3 or 4 yrs.)
Exclusion Criteria	
- Enrolled in a year other than first or final year of program - Enrolled part-time - Program culminates in Ontario College Certificate or Ontario College Graduate Certificate (1 yr.) - Program is not credentialed - Program is offered jointly with another institution	- Enrolled in a year other than first or final year of program - Enrolled part-time - Enrolled in graduate or professional program - Program is not credentialed - Program is offered jointly with another institution

** Some colleges elected to include Ontario College Applied Degree programs (4 years) in the EASI sample.*

HEQCO encouraged our institutional partners to include programs from as wide a variety of disciplines as possible, so long as those programs met the inclusion criteria. Institutions were able to choose which programs of study they wished to include in the sample pool. Each institution provided a list to HEQCO of the specific programs to be included. In keeping with our goal of achieving strong response rates rather than

8 For more information on the types of tasks test-takers encounter, see Section 3.

representativeness, we did not enforce any quotas on the number of students from a given discipline who could participate in EASI.

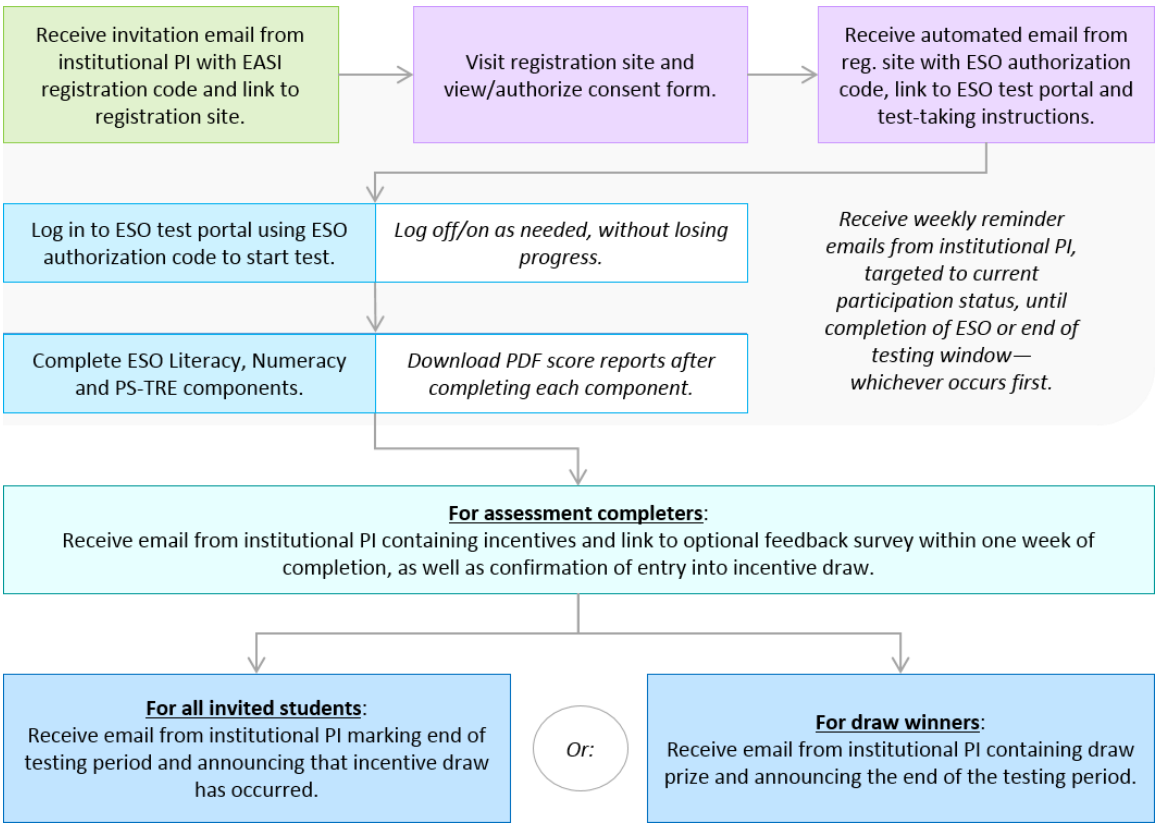
2.4 Implementation

Our implementation process was shaped by three core principles. First, our process should be flexible enough to adapt to each institution's unique culture and resources. Second, we should minimize demands on the time of our institutional EASI teams. The process, which was tested and tweaked during the fall 2016 testing windows, equipped us to handle any issues that might arise during testing. To this end, we created a registration website and a suite of materials, including email templates, data management files and how-to guides, which each institution used to run EASI. Members of HEQCO's EASI team also conducted on-site visits at each institution to ensure that the institutional teams were comfortable with the protocol and materials before testing got underway, and maintained regular phone and email communication throughout the testing period.

The third principle shaping our implementation process was student privacy. HEQCO at no time had access to student identities, so the institutional teams played an active part in the day-to-day administration of the testing windows. HEQCO handled data tracking and reporting, while the institutional EASI teams communicated with participants, delivered incentives and sent reminders. The system hinged on the unique codes assigned to each invited student, which were known as EASI registration codes. The registration codes served as proxies for identity, and facilitated data linkage between HEQCO and the institutional teams without requiring personal information to be shared outside of the institution.

Students used the EASI registration codes to authorize the participant consent form, claim an ESO authorization code, take the ESO and receive their rewards for participating — all without HEQCO ever knowing their identity, and without their home institution knowing their test results until after the testing window had closed. This process was facilitated by the EASI registration website, which hosted participant consent forms for each institution and assigned ESO authorization codes to each consenting student. Figure 3 displays the EASI process from the perspective of a participating student.

Figure 3: EASI from the student's perspective



Participant Incentives

Participation in EASI was voluntary. To encourage participation, each participant received an Amazon.ca electronic gift card upon completion of the ESO and was entered into a grand prize draw. The fall 2016, winter 2017 and fall 2017 testing windows each had slightly different individual incentive packages, described below.

Two elements of the incentive package were consistent across all three testing periods. First, participants received non-monetary incentives in the form of their personalized ESO score reports. These reports became available for download immediately upon completion of each ESO component. Second, participants who completed the ESO were automatically entered into the grand prize draws, which were held at the end of each institution's testing window. HEQCO conducted two draws — one for each cohort — at each institution. The prize pool for each separate draw consisted of one grand prize of a $500 Amazon.ca electronic gift card and five secondary prizes of $100 Amazon.ca gift cards. Though the fall 2016, winter 2017 and fall 2017 pilots each used different combinations of individual incentives to optimize student response rates, the individual score reports and grand prize draws remained in place throughout.

Fall 2016: Each participant received a $10 Amazon.ca gift card within two business days of completing the ESO. One institution paid out of pocket to increase the value of the individual incentives from $10 to $20 and had a comparatively high response rate.

Winter 2017: Given the relatively good response rate of the institution that used $20 incentives in fall 2016, we made the decision to increase the $10 Amazon.ca gift cards to $20 for the winter 2017 pilot. We also gave institutions the option to include free access to Paddle, an online career-exploration platform, for all participants who completed the ESO. Three institutions chose to include Paddle access among their individual incentives.

Fall 2017: The success of the winter 2017 incentive structure encouraged us to use it again for the fall 2017 university pilot. Each student received a $20 Amazon.ca e-gift card upon completion of the ESO and, at seven of the participating institutions, free access to Paddle.

Recruitment Strategies

Both the monetary and non-monetary participant incentives featured prominently in EASI's promotional materials and communications to students. Institutions were expected to promote EASI to staff, faculty and students on campus, and were encouraged to use whatever media they felt was most suited to their institutional culture. Institutions developed a variety of strategies to suit the particular character of each college and university, including:

- Presentations to the deans' council and other faculty groups
- "Head's-up" emails to eligible students just prior to the start of the study from program chairs or deans
- Infographics and posters advertising EASI to faculty and eligible students
- In-class messaging by a member of the institution's EASI team
- Announcements on the learning management system
- Working with faculty to run EASI in tutorials as an optional activity
- Making computer lab space available for students without access to a computer at home

HEQCO did not evaluate the recruitment strategies, but the general consensus seems to be that these activities put institutional EASI teams in touch with eligible students who might have been otherwise unaware of the opportunity to participate. That being said, the most commonly used strategy, which was in some cases the only promotional strategy used at a given institution, was the weekly reminder email.

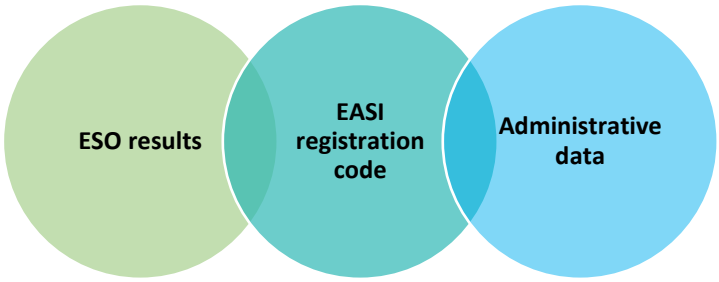
EASI participants received weekly reminder emails during the testing windows targeted to their progress in the study. For instance, students who had consented to participate but had not yet started the ESO received an email containing a direct link to the test portal and test-taking instructions. Meanwhile, students who had completed the literacy and numeracy components of the ESO but had yet to complete the PS-TRE section received an email informing them that they were nearly done the assessment. As we will see in our presentation of the results, reminder emails played an important part in encouraging students to complete the ESO.

Data Collection and Analysis

EASI testing windows remained opened for four to six weeks. Students could join EASI at any point during their institution's testing window and could log on or off the ESO test portal at will.

Data from the EASI registration site and the ESO test portal was available to HEQCO in real time. HEQCO linked these two data sets using the EASI registration codes to determine which students needed to receive incentives and to target reminder messages. Once the testing windows closed, institutions provided limited administrative variables for each consenting participant, such as entry category and program of study. HEQCO used the EASI registration codes to link this data back to the EASI registration site data and ESO test results to assemble the broader EASI data set. Figure 4 displays the central role of the EASI registration code in these linkages.

Figure 4: EASI data linkages



All data analyses were conducted using STATA 15. Descriptive statistics were used to analyze overall trends in data, assess for distribution of scores and participant characteristics. As part of our assessment for feasibility, we assessed for skewness, kurtosis and normality of distribution of test scores using Shapiro-Francia tests. Levene's test was used to assess the homogeneity of variances in the data. Given the cross-sectional design of the EASI pilots and the differences in the ways in which each institution administered testing, we have refrained from exploring the statistical significance of the results in any great detail.

Differences in Institutional Implementation

As mentioned in the preceding sections, HEQCO encouraged institutions to use their discretion in determining which programs to include in the sample pool, and to use recruitment methods that best suited their institutional culture. As the EASI pilots were designed to optimize recruitment, HEQCO also allowed institutions some flexibility in how testing was administered.

For some institutions, this flexibility applied to the reminder email schedule. Some institutions sent as few as three reminders, while others sent as many as six. A few other institutions skipped a week of reminders during the testing period to avoid conflicting with other institutional surveys.

The number of reminders issued corresponded to the length of the testing window at each institution. As described earlier in this section, institutions were able to select a start date for the testing period that suited their institutional calendar. Institutions typically chose start dates close to the beginning of the semester, but some started later in the term for various administrative reasons. Though most institutions elected to use an open-ended testing window — closing testing once participation appeared to drop off, usually around the six-week mark — several institutions opted for short, defined testing windows of three to four weeks.

Flexibility was also extended to the delivery of testing itself. At the majority of institutions, students took the test independently: in response to the invitation email, on their own time and in a location of their choosing. One institution worked with instructors from a given faculty to administer testing in tutorial settings. Students received assistance in logging on to the assessment and were able to complete the ESO on their own time if they did not manage to do so in class.

EASI's flexibility with regard to test administration encouraged institutional and student participation. However, the differences in how each institution administered testing necessarily affects the quality of the aggregate sample, as well as the types of analyses we were able to conduct. These caveats will be discussed in greater detail in section 2.5.

2.5 Limitations

Before we turn our attention to the results of EASI's college and university pilots, we must first review some parameters of this study. These limitations primarily relate to sample selection issues and affect both the types of analysis we can conduct on the EASI data set as well as the types of conclusions we can draw. These limitations are described below.

First, it is important to remember that *by design*, the EASI sample is neither random nor representative. EASI participants were not randomly selected, and as EASI was a voluntary study, we cannot rule out the possibility of self-selection and non-response bias in the sample. HEQCO worked with our partner institutions to recruit as many students as possible from a wide array of disciplines, but institutions were able exercise their discretion in choosing which programs to include in the EASI sample pool.

Second, HEQCO allowed colleges and universities to tweak the design and delivery of EASI to best suit their campus culture. These tweaks, which took the form of different recruitment strategies, reminder email schedules, the start and end dates of the testing windows and, in one case, the delivery of testing in a tutorial setting, were made with a view to attracting as many participants as possible while creating a smooth experience for both students and staff. That being said, the differences in how students were recruited and tested at different institutions — and in some cases, the differences in how students in different cohorts were recruited and tested at the same institution — present further possibilities for bias in the sample.

HEQCO's decision to prioritize sampling strategies that optimize participation was necessarily accompanied by the possibility of sample bias. Both the EASI college and university pilots obtained good response rates for voluntary studies — especially considering the length of the ESO. Though the sample is small, a sufficient number of students provided usable test results for HEQCO to respond to the "feasibility" research question. Because of the sampling methodology, we did not conduct any detailed analysis of test results — for instance, any direct comparisons of the results of college and university students, or any analysis of the relationships between results and sample characteristics like gender, program or high school GPA.

3. Scoring the ESO

This section describes how the ESO's three main components are scored and presents considerations for interpreting the scores and proficiency levels.

3.1 Scales

When test-takers complete each major component of the ESO, they receive a raw numerical score rounded to the nearest 10 points. The raw scores correspond to a series of proficiency levels, which describe task difficulty and contextualize the test-taker's range of skills.

The ESO's literacy and numeracy components are scored on the same scale (Figure 5). Because the scores at the extreme ends of the scale are less precise, no test-taker will receive a score below 150 or above 400. The proficiency levels for literacy and numeracy range from "Below Level 1" to "Level 4/5."

Figure 5: ESO literacy and numeracy scale, with corresponding score ranges and proficiency levels

0–175	176–225	226–275	276–325	326–500
Below Level 1	**Level 1**	**Level 2**	**Level 3**	**Level 4/5**
No scores provided below 150				*No scores provided above 400*

Source: Adapted from OECD (2015), pp. 64, 69.

The PS-TRE component is scored on its own scale (Figure 6). As with the ESO's literacy and numeracy scale, the extreme ends of the PS-TRE scale are not sensitive enough to provide a score below 150 or above 400. Note that the range of proficiency levels for PS-TRE is smaller than that of the literacy and numeracy components. PS-TRE proficiency levels range from "Below Level 1" to "Level 3."

Figure 6: ESO PS-TRE scale, with corresponding score ranges and proficiency levels

0–240	241–290	291–340	341–500
Below Level 1	**Level 1**	**Level 2**	**Level 3**
No scores provided below 150			*No scores provided above 400*

Source: Adapted from OECD (2015), p. 76.

3.2 Proficiency Levels

It is important to note that the proficiency-level descriptions do not capture the total test-taker's skill set. For example, a test-taker who receives an ESO literacy score at Level 2 may very well possess some of the skills needed to complete tasks at Level 3 or higher, both on the assessment and in everyday life. As the Council of Ministers of Education, Canada explains,

> If a respondent scores at a particular proficiency level, it does not mean that he or she cannot complete tasks at higher levels. It only means that even if he or she does successfully complete some tasks at a higher level, the probability of consistently doing so is low (CMEC, n.d., "About PIAAC").

In other words, the ESO and PIAAC proficiency levels indicate the complexity of the tasks that the test-taker can reliably and successfully solve (OECD, 2016).

Table 3 and Table 4 display the probability that a test-taker with a particular literacy or numeracy score will successfully complete tasks at a given proficiency level. The likelihood of a test-taker successfully completing a given task is directly related to the task's difficulty and the test-taker's raw score. The median EASI scores for first-year and final-year EASI students are shaded blue. For instance, a test-taker scoring near the median EASI literacy score for first-year university students (300) is at Level 3. This test-taker has a 68% chance of successfully completing a Level 3 literacy task, and a 29% chance of successfully completing a literacy task at Level 4.

Table 3: Probability of successfully completing ESO items at different difficulty levels: Literacy

Item difficulty	**Literacy Score**											
	150	*175*	*200*	*225*	*250*	*275*	*300*	*325*	*350*	*375*	*400*	*425*
Level 1	0.56	0.68	0.78	0.86	0.92	0.95	0.97	0.98	0.99	0.99	1.00	1.00
Level 2	0.08	0.15	0.27	0.44	0.63	0.80	0.90	0.95	0.98	0.99	0.99	1.00
Level 3	0.01	0.03	0.06	0.13	0.26	0.46	0.68	0.83	0.92	0.96	0.98	0.99
Level 4	0.01	0.01	0.02	0.05	0.09	0.16	0.29	0.47	0.65	0.80	0.90	0.95
** The median literacy scores for both cohorts of the EASI college and university pilots fall in the "300" range*												

Source: OECD. (2016). "Table 4.6 Probability of successfully completing items at different difficulty levels, by proficiency score: Literacy" (table). *The Survey of Adult Skills: Reader's Companion*, Second Edition, p. 72.

Table 4: Probability of successfully completing ESO items at different difficulty levels: Numeracy

Item difficulty	Numeracy Score											
	150	*175*	*200*	*225*	*250*	*275*	*300*	*325*	*350*	*375*	*400*	*425*
Level 1	0.47	0.60	0.72	0.82	0.89	0.93	0.96	0.98	0.99	0.99	1.00	1.00
Level 2	0.11	0.20	0.33	0.49	0.66	0.80	0.89	0.94	0.97	0.98	0.99	1.00
Level 3	0.02	0.04	0.08	0.15	0.26	0.43	0.63	0.80	0.90	0.95	0.98	0.99
Level 4	0.02	0.03	0.05	0.08	0.14	0.24	0.37	0.54	0.69	0.80	0.88	0.93
** The median numeracy scores for both cohorts of the EASI college and university pilots fall in the "300" range*												

Source: OECD. (2016). "Table 4.7 Probability of successfully completing items at different difficulty levels, by proficiency score: Numeracy" (table). *The Survey of Adult Skills: Reader's Companion, Second Edition*, p. 72.

Understanding the Literacy Proficiency Levels

The ESO scoring mechanism captures literacy's "multidimensional" nature by including a wide array of literacy difficulty factors. These factors range from the technical (e.g., the complexity of the vocabulary and grammar of the task text, or the presence of reader "signals" to aid comprehension) to the more nebulous (e.g., the text may reference unfamiliar, abstract or hypothetical concepts). HEQCO has found that literacy tasks at Level 3 and above tend to require increasingly complex, abstract thinking of the test-taker, while tasks at Level 2 and below involve content and activities that are more literal.

Though the ESO literacy and numeracy scales run from Below Level 1 to Level 4/5, the tables below focus on Levels 2, 3 and 4/5 as the bulk of EASI participants scored in those ranges. Table 5 presents several examples of the types of literacy tasks that test-takers scoring at Levels 2, 3 and 4/5 can successfully and consistently complete. These examples were taken verbatim from the OECD's proficiency level descriptions for literacy.

Please note:

- The proficiency levels are cumulative (e.g., individuals scoring in the Level 3 range are capable of the competencies described for Levels 3 and below).
- The proficiency levels do not capture the full range of a test-taker's skill set. Rather, the proficiency levels describe the level at which a test-taker is strongest or most consistently successful.

Table 5: ESO literacy proficiency levels: Examples of Levels 2, 3 and 4/5

	Test-takers scoring in this level are likely able to…
Level 2	- Submit a vote for or against a new workplace dress code on an employer's web page.
	- Identify information in a camera store's single web page that explains how this year's photo contest rules differ from those in previous years.
	- Name two reasons stated in an employee newsletter for an increase in company sales.
Level 3	- Find out whether a utility company accepts the same type of payment if paid by mail or online using information from a monthly billing statement.
	- Use a music store's web page to compare and contrast several reviews to determine which song to download based on the price and the type of music you like.
	- Search several web pages of a national health organization for evidence supporting the claim that exercise can lead to greater work productivity.
Level 4/5	- Evaluate posts in a discussion forum on health remedies by comparing the information they provide against that in a website from a well-known medical centre.
	- Use several links in a city's transportation web page to locate information about special fares or services on holidays.
	- Determine which claims in a newspaper article about the benefits of sleep are supported by information and graphs in two long research articles.

Source: Adapted from OECD (2015), pp. 65-68.

Table 6 summarizes the ESO proficiency level descriptions for literacy Levels 2, 3 and 4/5. These summaries are based on the descriptions provided in the ESO's technical documentation (OECD, 2015). PIAAC's conceptual framework and reader's companion also served as references (OECD 2012; 2016).

Table 6: ESO literacy proficiency levels: Summary of Levels 2, 3 and 4/5

Level 2	Level 3	Level 4/5
- Can handle tasks with few steps and no more than two different information sources.	- Can handle tasks with multiple steps and multiple information sources.	- Can handle tasks with multiple steps and multiple information sources.
- Requires information to be communicated in plain language.	- Can handle moderately complex vocabulary and grammar.	- Can handle advanced vocabulary and grammar.
- Requires clearly stated instructions and obvious positioning of important information.	- Can handle long or dense text passages, where important information is not immediately obvious.	- Can handle multiple long, dense text passages, where important information is not immediately obvious.
- Can handle very small amount of competing information.	- Can identify and filter out most competing or irrelevant information.	- Can identify and filter out high volumes of competing or irrelevant information.
- Requires obvious clues to make sense of text.	- May require a few obvious clues to make sense of text.	- Does not require obvious clues to make sense of text.
- Can paraphrase, summarize or make connections within a single text, and compare/contrast two texts when criteria are provided.	- Can "read between the lines" to identify, compare and evaluate common themes, motives, arguments/opinions and conclusions within and across texts.	- Can "read between the lines" very well, within and across multiple complex texts; e.g., analyzing and evaluating arguments/opinions and conflicting information, and integrating/synthesizing information.
- Can determine whether or not a source is reliable when clear criteria are provided.	- Can determine and apply criteria to evaluate the reliability of a source.	- Can determine and apply criteria to evaluate which source (of several) is most reliable.
- Can handle literal information and concepts, but may be less reliable with abstract or hypothetical information.	- Can handle some complex abstract or hypothetical information within a text, but may be less reliable working across multiple texts of this type.	- Can handle complex, abstract or hypothetical information within and across multiple complex texts.
Level 2 includes all Level 1 competencies.	*Level 3 includes all Level 2 competencies.*	*Level 4/5 includes all Level 2 and 3 competencies.*

Source: Adapted from OECD (2012; 2015, pp.62-68; 2016).

Understanding the Numeracy Proficiency Levels

For the ESO, proficiency in numeracy depends on both mathematical skills as well as the extent to which an individual can integrate those skills with their "broader reasoning, problem-solving skills and literacy skills" to successfully respond to numeracy-related problems in real-life situations (OECD 2012, p. 38). Tasks at the higher end of the proficiency scale are more likely to involve formal mathematical and statistical concepts. HEQCO has also found that numeracy tasks at Level 3 and above tend to require test-takers to determine, apply and evaluate the appropriate method for solving a problem — especially when the relevant mathematical information is not immediately apparent, whether due to the complexity of the accompanying text, the ways in which numerical information is presented or the presence of competing information. For this reason, test-takers generally need decent literacy and problem-solving skills in order to correctly solve numeracy tasks at Levels 3 and 4/5 (OECD 2012; 2015; 2016).

As in the preceding section, the tables below focus on Levels 2, 3 and 4/5 since the bulk of EASI participants scored in those ranges. Table 7 presents several examples of the types of numeracy tasks that test-takers scoring at those levels can consistently solve. These examples were taken verbatim from the OECD's proficiency level descriptions for numeracy. Once again, please note that the proficiency levels are cumulative and describe the level at which a test-taker is most consistently successful.

Table 7: ESO numeracy proficiency levels: Examples of Levels 2, 3 and 4/5

	Test-takers scoring in this level are likely able to…
Level 2	- Figure out the price of a shirt that will be discounted by 25%.
	- Determine the price of a single bottle of water when given the cost of an entire case of bottles.
	- Determine how many months in a year had sales above the mean sales for the year from a table of monthly sales.
Level 3	- Identify which predicted monthly gasoline price was most accurate based on line graphs of predicted and actual gasoline prices for a year.
	- Determine the amount of concentrated lemonade flavouring and water needed to make a large container of lemonade that is in the same ratio of flavouring to water as a smaller amount of lemonade.
	- Read a complex graph, comparing the amount of salt, sugar and fat in a typical diet for men versus a typical diet for women, to determine the amount of sugar consumed by men.
Level 4/5	- Convert the number of students enrolled in a university each year into percentages, and then compute the change in the percentage of students enrolled each year.
	- Determine how much medicine to give to a child when the dosage is based on the child's body weight.
	- Calculate profit from a table containing lists of income and expense sources.

Source: Adapted from OECD (2015), pp. 69-73.

Table 8 summarizes the ESO proficiency level descriptions for numeracy Levels 2, 3 and 4/5. These summaries are based on the descriptions provided in the ESO's technical documentation (OECD, 2015). PIAAC's conceptual framework and reader's companion also served as references (OECD 2012; 2016).

Table 8: ESO numeracy proficiency levels: Summary of Levels 2, 3 and 4/5

Level 2	Level 3	Level 4/5
- Can handle tasks where mathematical information is delivered in everyday contexts.	- Can handle tasks where mathematical information is delivered in new or unfamiliar contexts.	- Can handle tasks where mathematical information is delivered in abstract contexts, such as academic texts.
- Can handle limited competing information so long as relevant information is clearly stated.	- Can handle moderate amounts of competing or complex information.	- Can handle competing and complex information, including advanced mathematical and statistical ideas.
- Can handle basic tasks involving two or more steps.	- Can handle tasks requiring several steps.	- Can handle tasks requiring several steps.
- Can respond to a task using a given problem-solving or mathematical strategy when the strategy is clearly stated in the task question.	- Can identify and apply the necessary problem-solving and mathematical strategies to solve a given task, with few prompts.	- Can evaluate and explain choice of problem-solving or mathematical strategies and draw conclusions about arguments and solutions.
Associated math skills: - Calculations with whole numbers and common decimals, percentages and fractions; simple measurement and spatial representation; estimation; and interpretation of relatively simple data and statistics in texts, tables and graphs.	***Associated math skills:*** - Application of number sense and spatial sense; recognizing and working with mathematical relationships, patterns, and proportions expressed in verbal or numerical form; and interpretation and basic analysis of data and statistics in texts, tables and graphs.	***Associated math skills:*** - Analysis and complex reasoning about quantities and data; statistics and probability; spatial relationships; rates of change; proportions; and formulas.
Level 2 includes all Level 1 competencies.	*Level 3 includes all Level 2 competencies.*	*Level 4/5 includes all Level 2 and 3 competencies.*

Source: Adapted from OECD (2012; 2015, pp. 69-73; 2016).

Understanding the PS-TRE Proficiency Levels

The ESO's problem solving in technology-rich environments (PS-TRE) component measures how well one uses different types of technology and how well one understands and uses information in different environments in order to solve problems. In this component, a problem is "any situation where one does not already have a good idea about how to achieve a goal" (OECD 2015, p. 75).

The PS-TRE component uses a different scale than the literacy and numeracy components. This scale runs from Below Level 1 to Level 3. Table 9 presents several examples of the types of PS-TRE tasks that test-takers scoring at Levels 1, 2 and 3 can consistently solve. These examples were taken verbatim from the OECD's proficiency level descriptions for PS-TRE. Once again, please note that the proficiency levels are cumulative and describe the level at which a test-taker is most consistently successful.

Table 9: ESO PS-TRE proficiency levels: Examples of Levels 1, 2 and 3

	Test-takers scoring in this level are likely able to…
Level 1	- Open, read, and respond to email using an unfamiliar email program.
	- Locate specific information on the homepage of a website that a friend has recommended.
	- Set up a system of folders that allow files or emails to be organized and easily retrieved.
Level 2	- Find an email message or file that has been "lost" somewhere on a computer hard drive.
	- Use a sorting tool to make it easier to locate sales numbers for a specific product in a company spreadsheet.
	- Conduct a web search to find out how to solve a problem with other software, such as how to view a column that won't display properly in a spreadsheet.
Level 3	- Evaluate a number of web search results to determine which has the most relevant and reliable information. Part of this process includes evaluating and refining a search to determine if additional or different types of websites should be considered.
	- Use a software program that they have never seen before with limited or unclear direction. Success may be based on a user's general experience with technology or information may be gathered by consulting other online resources including websites or user blogs.
	- Select from among a number of choices the best software to use for a particular task.

Source: Adapted from OECD (2015), pp. 77-79.

Table 10 summarizes the ESO proficiency level descriptions for PS-TRE Levels 2, 3 and 4/5. These summaries were taken verbatim from the ESO's technical documentation (OECD 2015, Table 7.1, p. 76).

Table 10: ESO PS-TRE proficiency levels: Summary of Levels 1, 2 and 3

Level 1	Level 2	Level 3
- Few steps, single operators	- Multiple steps, multiple operators	- Multiple steps, multiple operators
Technology features: - Generic applications - Little or no navigation required - Relevant information is directly available - Use of facilitating tools not required	***Technology features:*** - Both generic and novel applications (e.g., web-based services) - Some navigation required to acquire information or perform actions - Use of tools facilitates operations	***Technology features:*** - Generic and novel applications - Some navigation required to acquire information or perform actions - Use of tools required to efficiently solve the problem
Cognitive processes: - Reach a given goal - Apply explicit criteria - Minimal monitoring demands - Simple relevance match - Categorical reasoning - No integrate or transformation	***Cognitive processes:*** - Goal may need to be defined - Apply explicit criteria - Generally higher monitoring demands - Generally involves resolving impasses - Some evaluation of relevance - Some integrate or transformation - Inferential reasoning	***Cognitive processes:*** - Goal may need to be defined - Establish and apply criteria - Generally high monitoring - High inferential reasoning and integration - Evaluate relevance and reliability - Generally involves resolving impasses
Level 1 includes all Below Level 1 competencies.	*Level 2 includes all Level 1 competencies.*	*Level 3 includes all Level 2 competencies.*

Source: OECD (2015). "Table 7.1: Technology, task, and cognitive characteristics of problems at each of three main levels of proficiency" (table). *Education and Skills Online Technical Documentation (updated October 2016)*, p. 76.

3.3 PIAAC 2012 Comparators

HEQCO recommends using Statistics Canada's 2015 report, *Skills in Canada: First Results from the Programme for the International Assessment of Adult Competencies (PIAAC)* (Statistics Canada, 2015), when comparing EASI results to the Canadian data from PIAAC 2012. Comparator groups were identified by age and highest completed level of education.

Table 11 displays the suitable comparator groups for each EASI cohort. Since each cohort has a median age between 18 and 22, the most fitting PIAAC comparators by age are 16–24 year-olds. Comparator groups are further distinguished by level of completed education. Note that the same comparator group is used for first-year students at both colleges and universities, since these students are just beginning their postsecondary studies.

Table 11: PIAAC comparator groups for EASI college and university students

EASI Cohort	Median Age	PIAAC 2012 Comparator Group
First-year college students	21	16–24 year-olds whose highest level of completed education is a ***high school diploma***
Final-year college students	22	16–24 year-olds whose highest level of completed education is ***postsecondary education — below bachelor's degree***
First-year university students	18	16–24 year-olds whose highest level of completed education is a ***high school diploma***
Final-year university students	22	16–24 year-olds whose highest level of completed education is ***postsecondary education — bachelor's degree or higher***

Please note that the only PIAAC results that Statistics Canada portrays by age group *and* highest completed level of education are the average scores and the 5th, 25th, 75th and 95th percentile for literacy and numeracy. These results are reported in *Annex D* of the *Skills in Canada* series (Statistics Canada & CMEC, 2013). Statistics Canada does provide the distributions of literacy and numeracy performance by proficiency level, but this data is not arranged by highest level of completed education or age group.

PS-TRE results, by contrast, are displayed as distributions of performance by proficiency level, and include a distribution of PS-TRE performance by proficiency level, age group and highest completed level of education. Statistics Canada does not, however, display the average scores or percentiles for PS-TRE. Statistics Canada also does not provide the number of participants for each group or figure.

4. EASI Pilot Results

This section provides a general overview of the results from the EASI college and university pilots. Specifically, we present data related to participation, ESO assessment results and feedback survey responses for first- and final-year students from EASI's 11 Ontario college partners and 8 Ontario university partners. Data for participants from Quest University, whose program delivery methods differ substantially from those commonly employed in Ontario's public postsecondary institutions, is excluded.

HEQCO classifies test-takers who have completed at least the ESO Literacy and Numeracy components as having provided **usable data**. These students have completed enough of the ESO to have received both raw numeric scores. Only students who provided usable data were included in the analyses and figures in this section.

4.1 Participation

Figure 7 reviews student participation in the EASI college pilot. Nearly 90% of EASI college students who provided usable data completed the entire ESO. These students (n=2483) were evenly divided between the first- and final-year cohorts. Lastly, 63% of college students who completed the ESO required at least one reminder email to prompt them.

Figure 7: Student participation highlights: First- and final-year college students

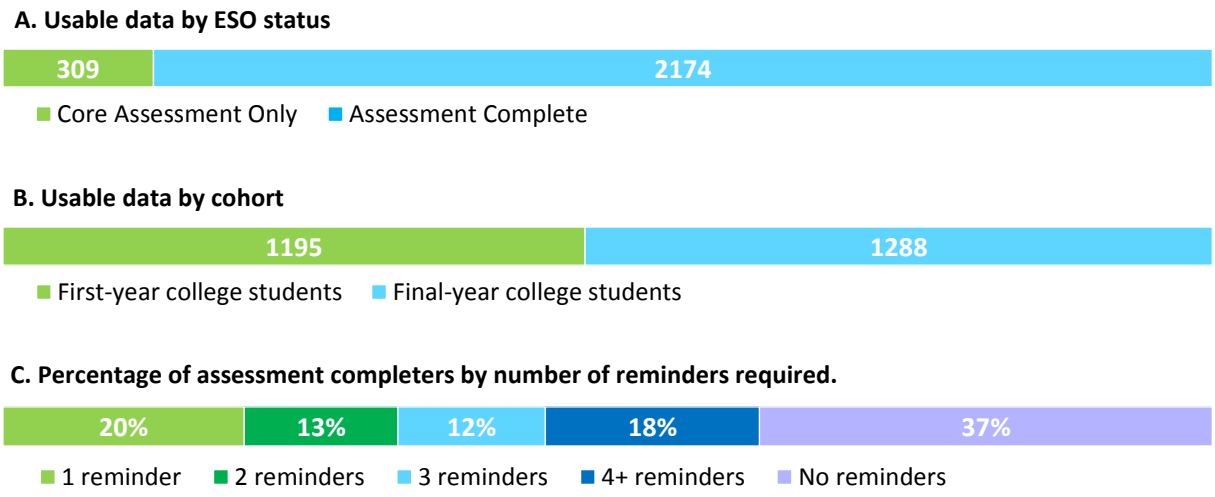
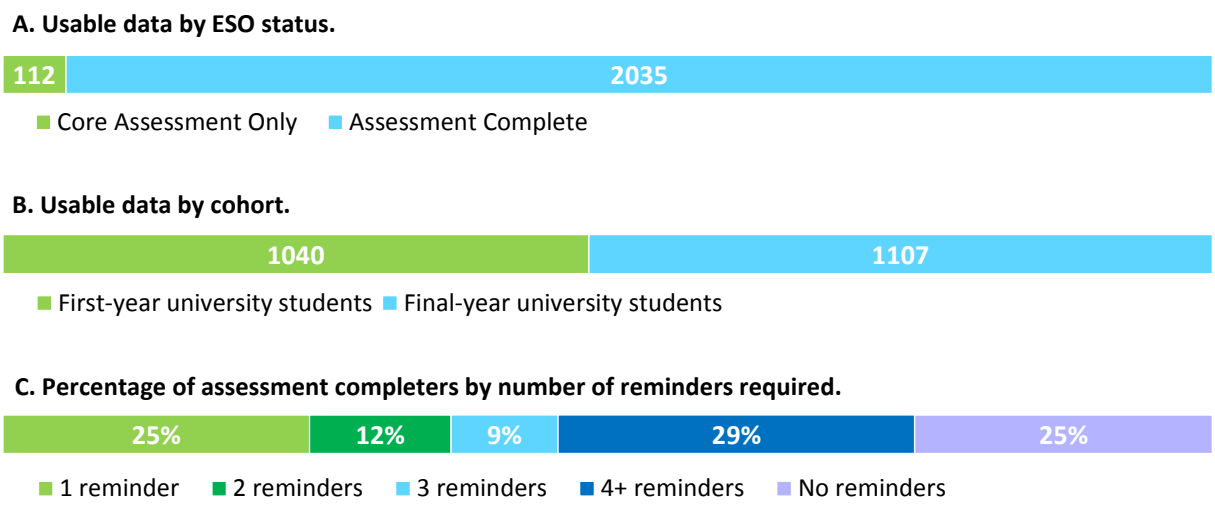


Figure 8 displays the corresponding data from the EASI university pilot, which closely mirrored the participation trends of the college pilot. Nearly 95% of EASI university students who provided usable data completed the entire ESO. These students (n=2147) were evenly divided between the first- and final-year cohorts. Finally, 75% of university students who completed the ESO required at least one reminder email.

Figure 8: Student participation highlights: First- and final-year university students



Time Spent on Assessment

HEQCO analyzed the time each student spent on the assessment in order to determine whether the average test-taking time reported by ETS (90–120 minutes) was accurate for the EASI sample.

The ESO does not record the actual length of time test-takers spend on the assessment, though it records the timestamps for when they start and complete each test component. HEQCO used the timestamps to establish how long test-takers spent on each component and on the test as a whole. Only students who had completed the entire assessment within 24 hours of starting it and who had literacy scores greater than 250 (in other words, those who completed the three major components) were included in the analysis. Students with literacy scores below 250 were excluded from the analysis of time spent on the assessment because they either would not have had the option of progressing to the PS-TRE component (if they scored below 200) or would have had the option of completing the Reading Components subtest and PS-TRE (if they scored at or above 200 and below 250), which would have lengthened their test time.

Total times do not include the time elapsed between completing one component and starting the next. HEQCO also created upper and lower thresholds to weed out students who may have been "clicking through" rather than taking the test seriously, as well as those who may have left the test open in a browser window while taking breaks. Test-takers with assessment times within these parameters were included in the mean and median time calculations.

Table 12: Mean and median time spent on the ESO: First-and final-year college and university students

	First-year students	Final-year students
Assessment completers with literacy scores over 250 (n)	1692	1934
% who took a break of 10 minutes or less between completing Core Assessment and starting PS-TRE	83%	84%
% completed within 24 hours of starting the ESO	68%	68%
% completed ESO within 24 hours of starting, with literacy scores > 250 and within time thresholds*	55% (n=923)	56% (n=1087)
Mean time spent on ESO*	***1:30***	***1:30***
Median time spent on ESO*	***1:23***	***1:24***

** Lower time threshold = time < (0.6*median); upper time threshold = time > (third quartile + (1.5*interquartile range)).*
*** Mean and median calculations based on students who met the proxy criteria: completion within 24 hours of starting the ESO, literacy scores greater than 250 and total time within the time thresholds.*

Table 12 displays the results of the analysis of student time spent on the ESO. Since few differences were observed between college and university students, they are displayed together. More than 80% of first- and final-year students took a 10 minute break or less between completing the Core Assessment and starting the PS-TRE component. About two-thirds of first- and final-year students completed the ESO within 24 hours of starting it. Slightly more than half of students completed the test within the time thresholds identified by HEQCO, indicating that they likely did not speed through the assessment or take excessive breaks. The mean and median time spent on the ESO by both first- and final-year students aligns with the average test-taking time of 90 minutes described in the ESO technical report (OECD, 2015).

HEQCO did not observe a relationship between time spent on the assessment and performance on the assessment. There was also no indication that students who achieved higher scores spent any longer on the assessment than students who scored at the lower ends of the scale. This tracks with the ESO's adaptive design: The test-taker's responses to the initial orientation questions for literacy and numeracy are used to estimate the level of difficulty of the first few questions a test-taker encounters in the literacy and numeracy components, so test-takers with stronger literacy skills do not have to spend time on tasks that are far below their skill level.

4.2 Sample Characteristics

EASI College Sample

In all, 1195 first-year and 1288 final-year students from 11 Ontario colleges provided usable assessment results. These counts include students who completed either the entire assessment (1006 first-year and 1168 final-year students) or, at the very least, the literacy and numeracy components (189 first-year and 120 final-year students). Four first-year and nine final-year students completed the assessment but did not pass the General Orientation for literacy and numeracy. These students did not receive scores for the ESO literacy and numeracy components. They are included in Table 13 and the proficiency level distribution charts, but are excluded from all mean and median scores.

Table 13: Overview of EASI sample characteristics: First- and final-year college students

Variable	First-year students	Final-year students
Background Questionnaire		
Number of students with usable data	1195	1288
Median age	21	22
% Female	48%	50%
% Born in Canada	68%	66%
% English as first language	69%	70%
% Employed	41%	54%
Administrative Data		
% Indirect entry*	65%	48%
% International	14%	15%
% Enrolled in Diploma (2 yr.)	63%	65%
% Enrolled in Advanced Diploma (3 yr.)	33%	30%
% Enrolled in Applied Degree (4 yr.)	4%	5%

** Indirect entry students were not enrolled in an Ontario high school at the time of application to PSE*

Table 13 draws on a combination of institutional administrative data and responses to the background questionnaire portion of the Education and Skills Online assessment: The median age of first-year college students was 21 years old and the median age of final-year students was 22; there was little difference between cohorts for gender, English as a first language, being born in Canada or holding international status; 41% of first-year students reported having some form of employment, in comparison with 54% of final-year students.

EASI University Sample

In all, 1040 first-year and 1107 final-year students from eight Ontario universities provided usable assessment results. These counts include students who completed either the entire assessment (983 first-year and 1052 final-year students) or, at the very least, the literacy and numeracy components (57 first-year and 55 final-year students). Eleven first-year and two final-year students completed the assessment but did not pass the General Orientation for literacy and numeracy. These students did not receive scores for the ESO literacy and numeracy components. They are included in Table 14 and the proficiency level distribution charts, but are excluded from all mean and median scores.

Table 14: Overview of EASI sample characteristics: First- and final-year university students

Variable	First-year students	Final-year students
Background Questionnaire		
Number of students with usable data	1040	1107
Median age	18	21
% Female	66%	66%
% Born in Canada	73%	76%
% English as first language	72%	73%
% Employed	26%	47%
Administrative Data		
% Indirect entry	10%	13%
% International	5%	4%

** Indirect entry students were not enrolled in an Ontario high school at the time of application to PSE*

Table 14 draws on a combination of institutional administrative data and responses to the background questionnaire portion of the Education and Skills Online assessment: The median age of first-year university students was 18 years old and the median age of final-year students was 21; there was little difference between cohorts for gender, English as a first language, being born in Canada, holding international status or entering university indirectly; 26% of first-year students reported having some form of employment, in comparison with 47% of final-year students.

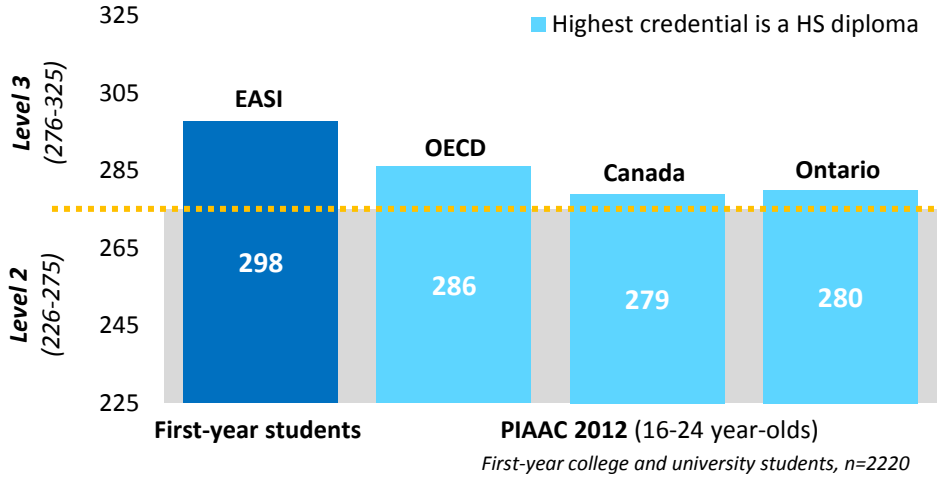
4.3 Performance

Aggregate Results

EASI literacy scores for first- and final-year college and university students were compared to PIAAC 2012 results for OECD countries, Canada and Ontario. First-year students recorded an average literacy score (298) higher than that of PIAAC 2012 respondents from OECD nations (286), Canada (279) and Ontario (280) (Figure 9). Final-year students recorded an average literacy score (303) higher than that of PIAAC 2012 respondents from OECD nations (290), Canada (286) and Ontario (287) whose highest completed level of education was postsecondary — below bachelor's level (Figure 10). Final-year

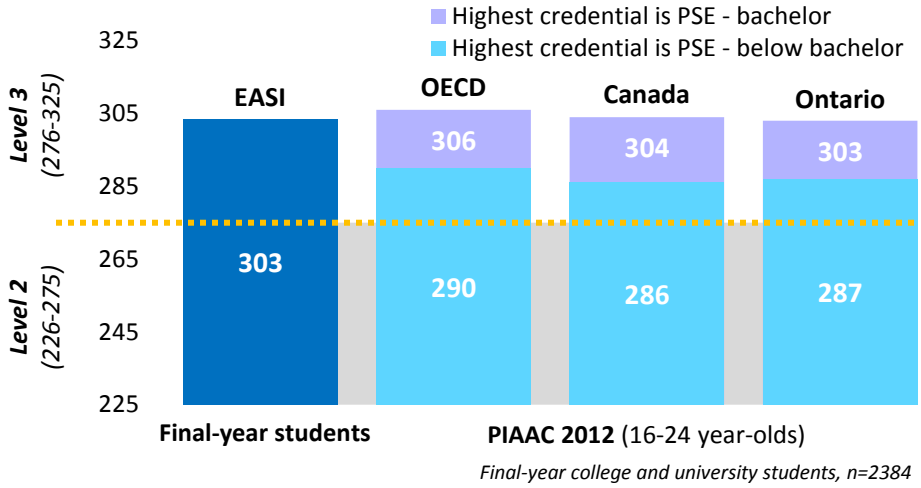
students' average literacy score was similar to PIAAC 2012 respondents from OECD nations (306), Canada (304) and Ontario (303), whose highest completed level of education was a bachelor's degree.

Figure 9: Average literacy scores: First-year college and university students vs. PIAAC comparators[9]



First-year college and university students, n=2220

Figure 10: Average literacy scores: Final-year college and university students vs. PIAAC comparators



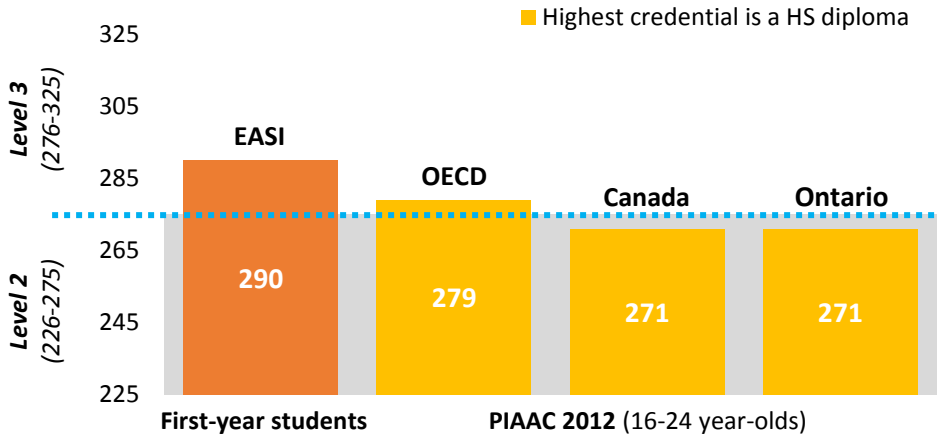
Final-year college and university students, n=2384

EASI numeracy scores for both first- and final-year college and university students were compared to PIAAC 2012 results for OECD countries, Canada and Ontario. First-year students recorded average numeracy scores (290) higher than those of their PIAAC 2012 comparators from OECD nations (279),

9 The PIAAC literacy results used in Figures 9-10, 19-20 and 29-30 were drawn from Statistics Canada & CMEC (2013), "Table D.5a Literacy — Average scores with 0.95 confidence interval and scores at 5th, 25th, 75th, and 95th percentiles of population aged 16 to 65, by highest level of completed education and age group, OECD average, Canada, provinces and territories, 2012" (table), Annex D, *Skills in Canada*, pp. 13-20.

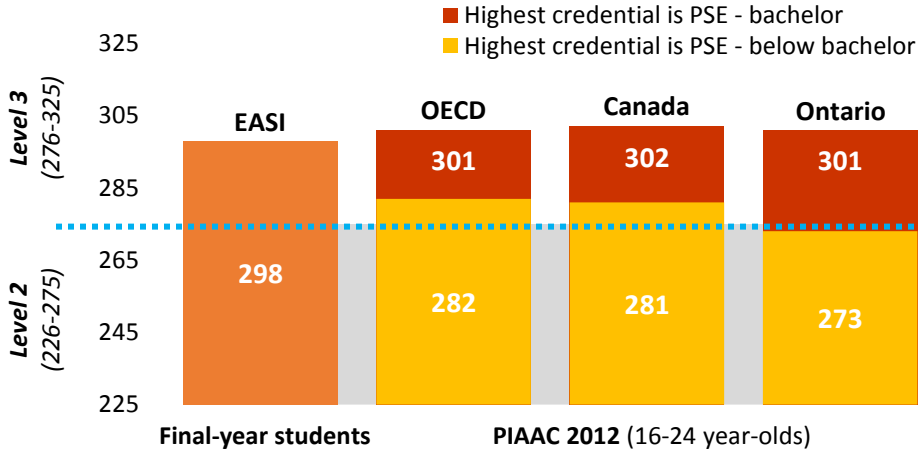
Canada (271) and Ontario (271) (Figure 11). Final-year students recorded average numeracy scores (298) higher than those of PIAAC 2012 respondents from OECD nations (282), Canada (281) and Ontario (273), whose highest completed level of education credential was postsecondary — below bachelor's level (Figure 12). The average numeracy scores of final-year students were similar to those of PIAAC 2012 respondents from OECD nations (301), Canada (302) and Ontario (301), whose highest completed level of education was a bachelor's degree.

Figure 11: Average numeracy scores: First-year college and university students vs. PIAAC comparators[10]



First-year college and university students, n=2220

Figure 12: Average numeracy scores: Final-year college and university students vs. PIAAC comparators



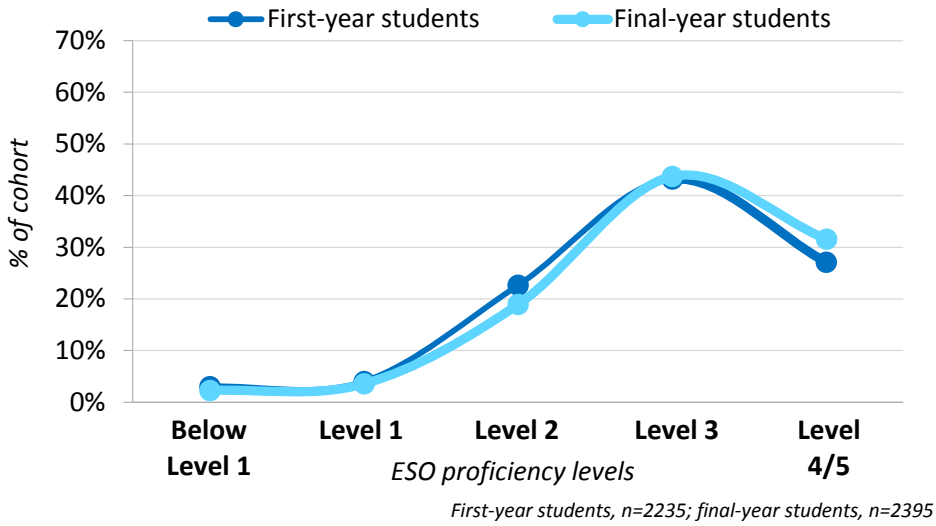
Final-year college and university students, n=2384

10 The PIAAC numeracy results used in Figures 11-12, 21-22 and 31-32 were drawn from Statistics Canada & CMEC (2013), "Table D.5b Numeracy — Average scores with 0.95 confidence interval and scores at 5th, 25th, 75th, and 95th percentiles of population aged 16 to 65, by highest level of completed education and age group, OECD average, Canada, provinces and territories, 2012" (table), Annex D, *Skills in Canada*, pp. 21-28.

PIAAC 2012 comparisons for the PS-TRE component are not available as Statistics Canada does not report average PS-TRE scores for PIAAC 2012.

The ESO provides proficiency levels that correspond to the numerical scales for each test component. When the literacy scores of college and university students were distributed by proficiency level, 70% of first-years and 75% of final-years were observed to have scored at or above Level 3 (Figure 13).

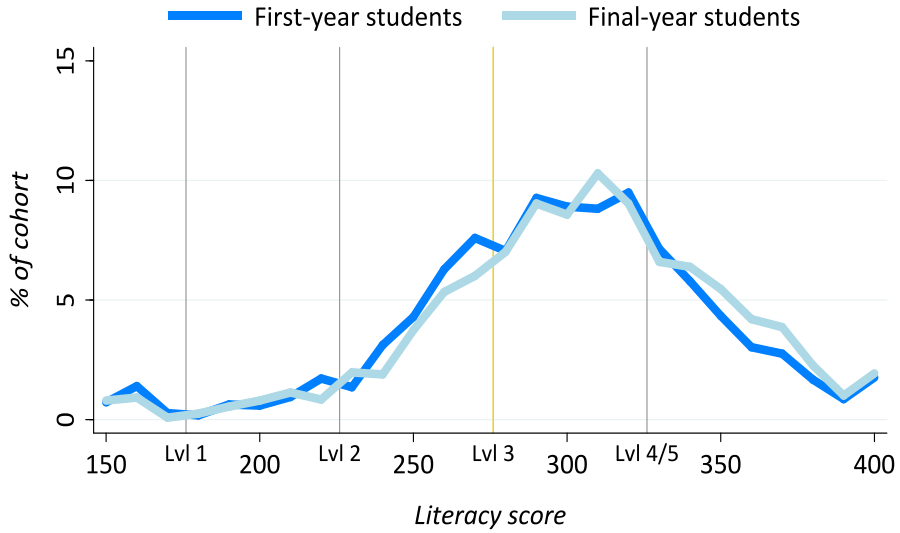
Figure 13: Literacy performance by cohort and proficiency level: College and university students



First-year students, n=2235; final-year students, n=2395

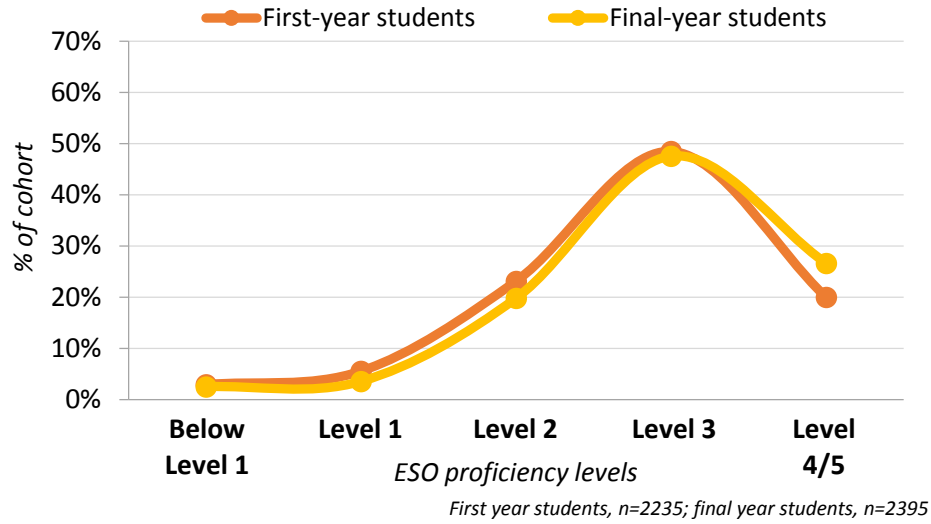
Figure 14 distributes the literacy performance of college and university students by cohort and numerical score. The vertical lines indicate the proficiency level cut-off points, with the gold-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 14: Literacy performance by cohort and score: College and university students



When the numeracy scores of college and university students were distributed by proficiency level, 69% of first-years and 74% of final-years were observed to have scored at or above Level 3 (Figure 15).

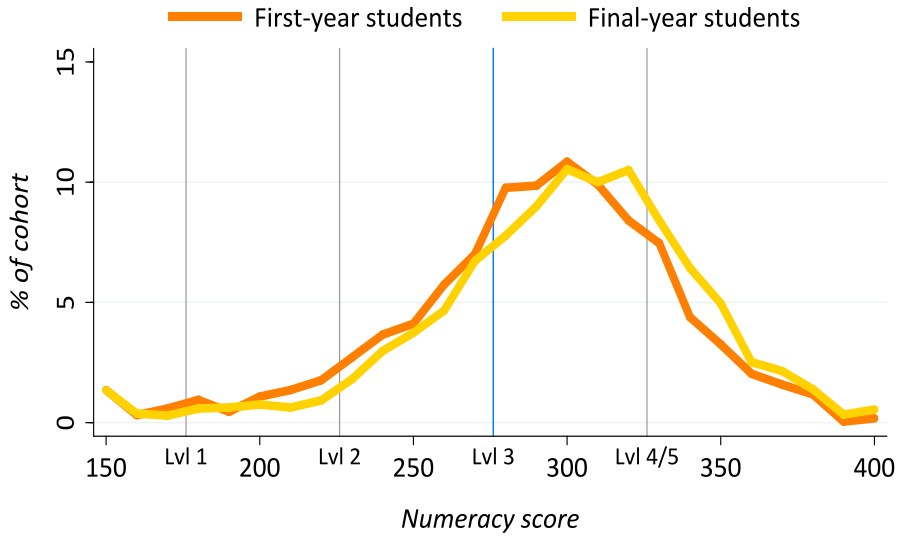
Figure 15: Numeracy performance by cohort and proficiency level: College and university students



First year students, n=2235; final year students, n=2395

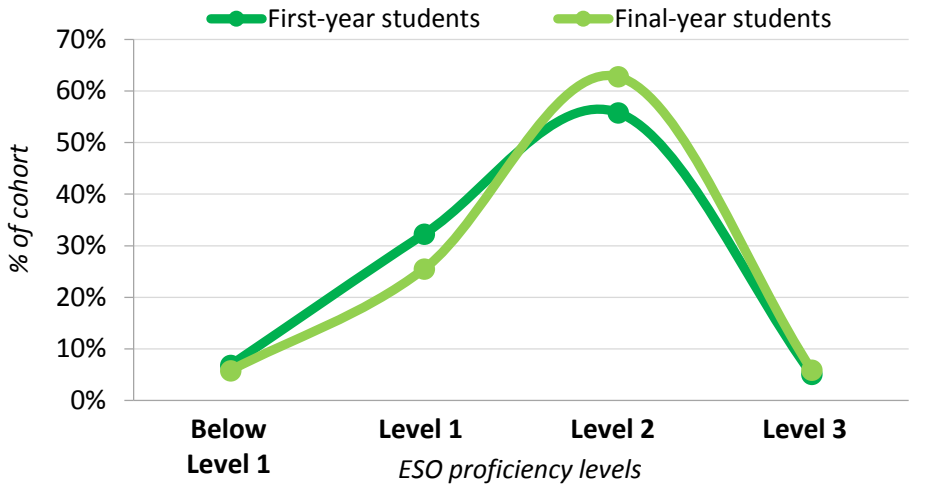
Figure 16 distributes the numeracy performance of college and university students by cohort and numerical score. The vertical lines indicate the proficiency level cut-off points, with the blue-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 16: Numeracy performance by cohort and score: College and university students



When the PS-TRE scores of college and university students were distributed by proficiency level, 61% of first-years and 69% of final-years were observed to have scored at or above Level 2 (Figure 17).

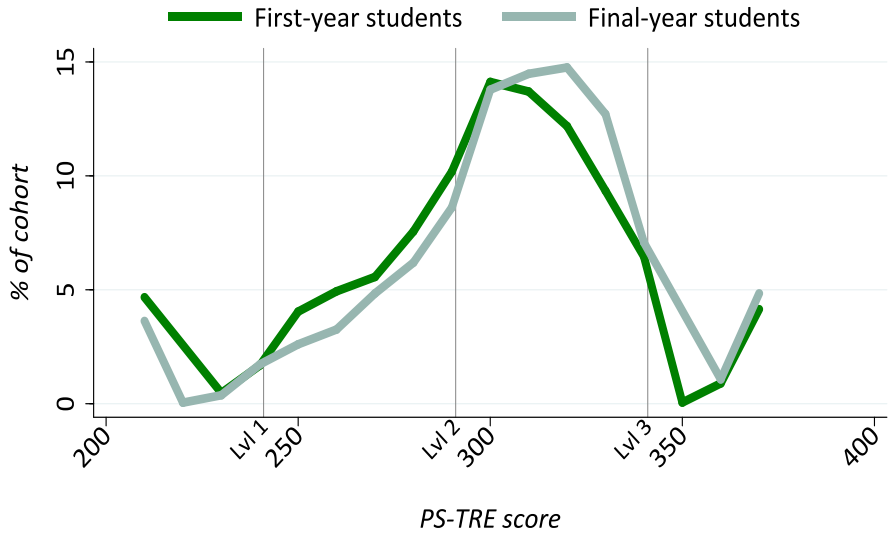
Figure 17: PS-TRE performance by cohort and proficiency level: College and university students



First-year students, n=1912; final-year students, n=2151

Figure 18 distributes the PS-TRE performance of college and university students by cohort and numerical score. The vertical lines indicate the proficiency level cut-off points.

Figure 18: PS-TRE performance by cohort and score: College and university students



College Results

EASI scores for first- and final-year college students were gathered and compared to PIAAC 2012 results for OECD nations, Canada and Ontario. First-year college students had an average literacy score of 295 (Figure 19) and final-year students had an average literacy score of 292 (Figure 20). First-year college students who participated in EASI recorded average literacy scores (295) higher than OECD nations (286), Canada (280) and Ontario (279) for PIAAC 2012. Final-year college students who participated in EASI recorded average literacy scores (292) that were similar to OECD nations (290), Canada (286) and Ontario (287) for PIAAC 2012.

Figure 19: Average literacy scores: First-year college students vs. PIAAC 2012 comparators

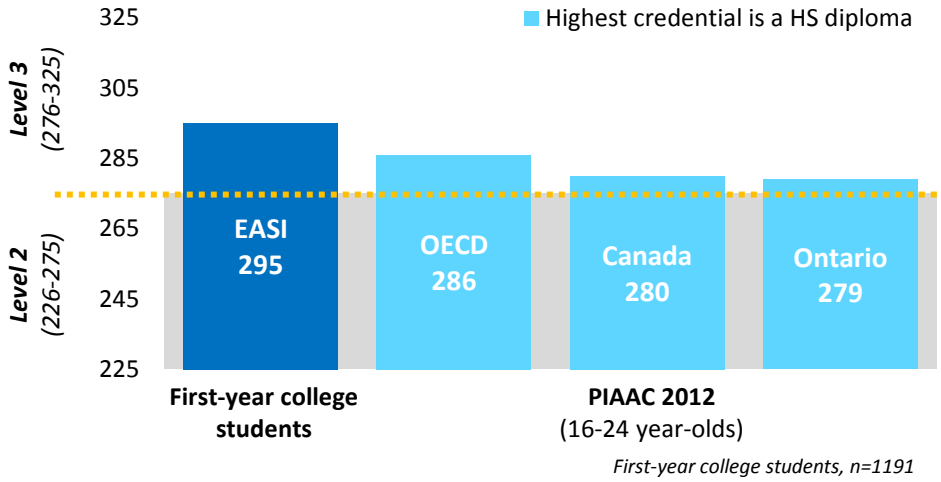
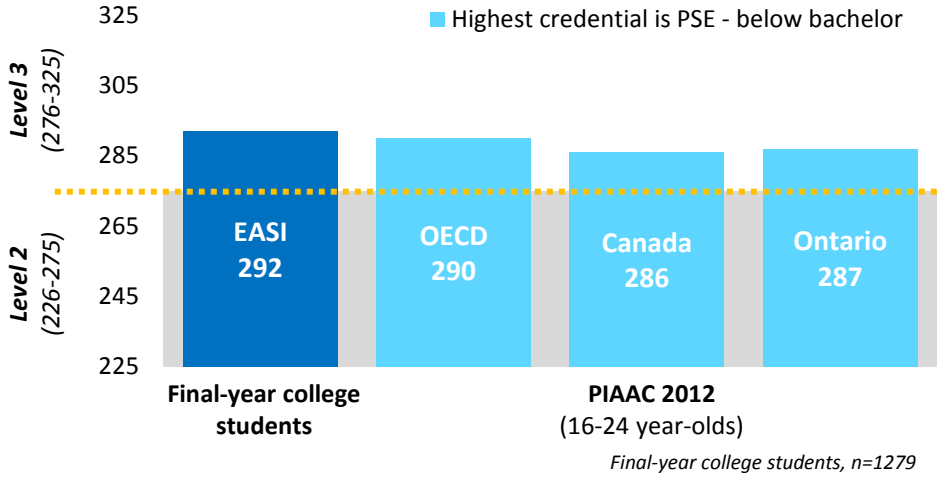


Figure 20: Average literacy scores: Final-year college students vs. PIAAC 2012 comparators



First-year college students had an average numeracy score of 286 (Figure 21) and final-year college students had an average numeracy score of 288 (Figure 22). First-year college students who participated in EASI recorded average numeracy scores higher than the average numeracy score for OECD nations (279), Canada (271) and Ontario (271) for PIAAC 2012. Final-year college students who participated in EASI recorded average numeracy scores that were higher than the average numeracy scores for OECD nations (282), Canada (273), and Ontario (281) for PIAAC 2012.

Figure 21: Average numeracy scores: First-year college students vs. PIAAC 2012 comparators

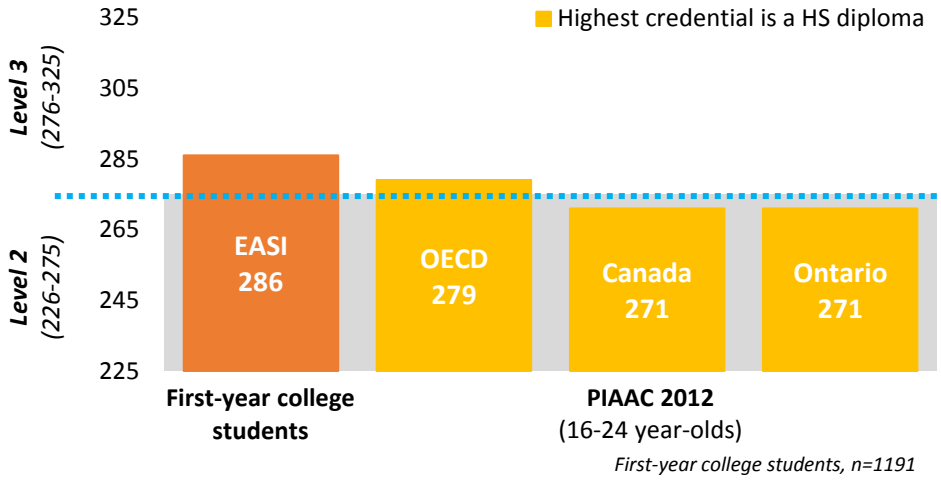
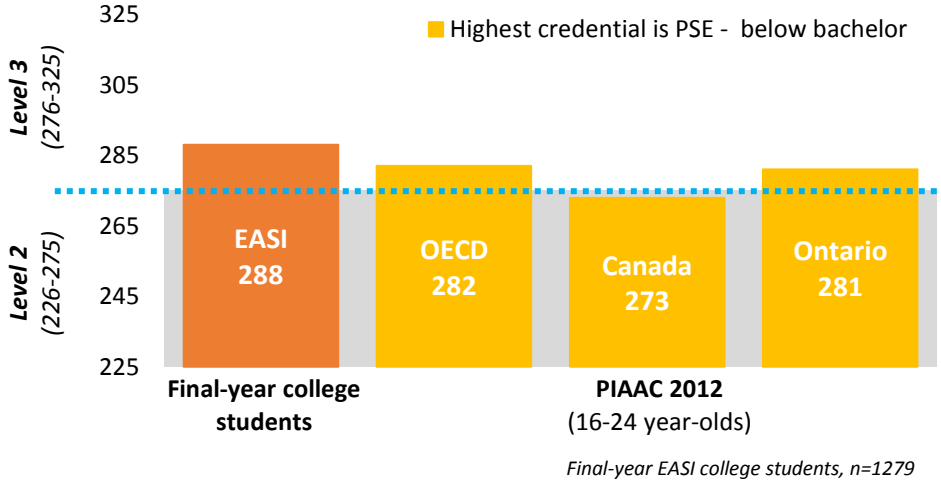


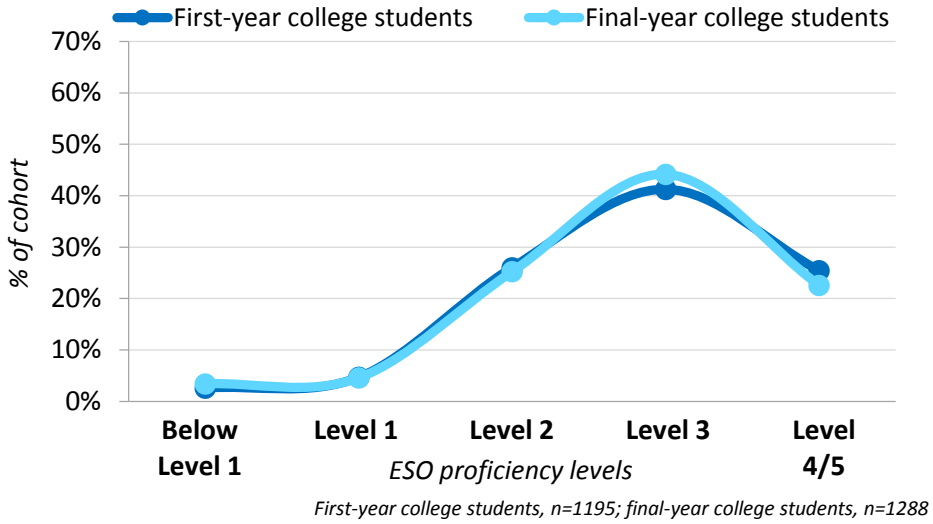
Figure 22: Average numeracy scores: Final-year college students vs. PIAAC 2012 comparators



PIAAC 2012 comparisons for the PS-TRE component are not available as Statistics Canada does not report average PS-TRE scores for PIAAC 2012.

When college student literacy scores were distributed by proficiency level, 66% of first-years and 67% of final-years were observed to have scored at or above Level 3 (Figure 23).

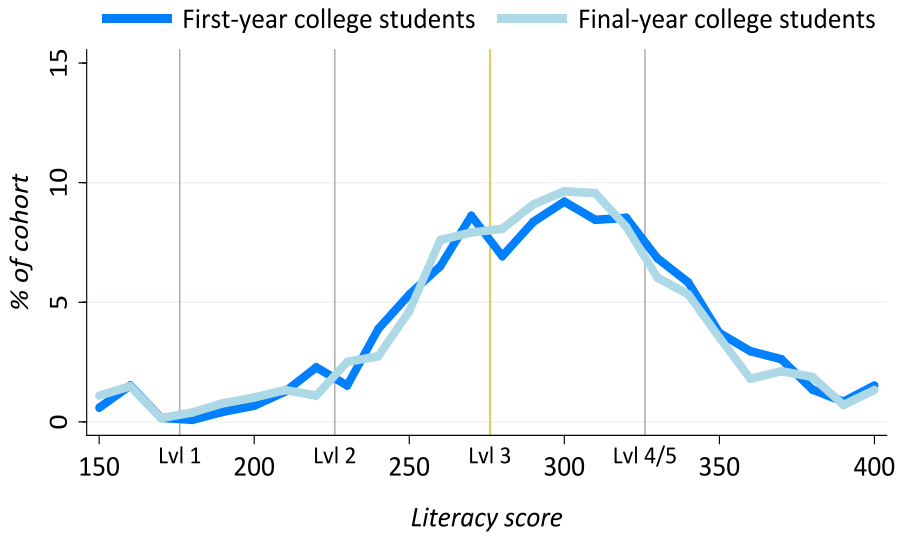
Figure 23: Literacy performance by cohort and proficiency level: College students



First-year college students, n=1195; final-year college students, n=1288

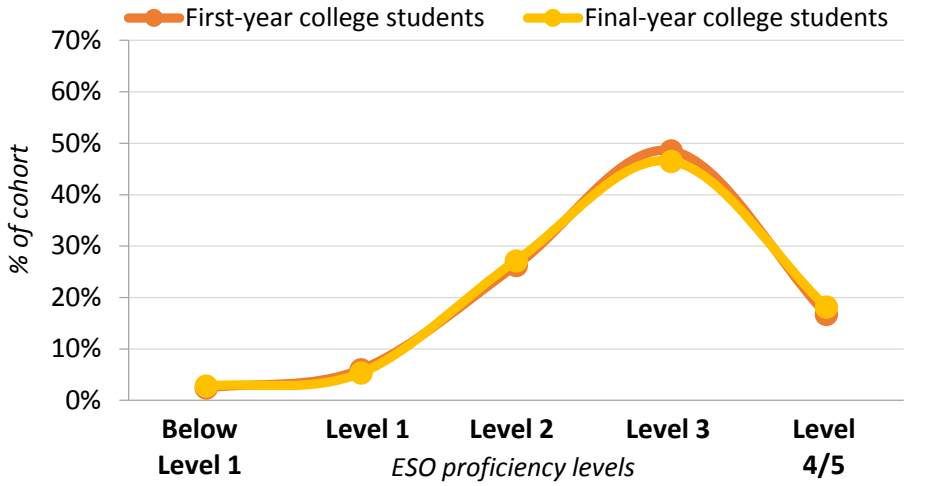
Figure 24 distributes the literacy performance of college students by cohort and numerical score. The vertical lines indicate the proficiency level cut-off points, with the gold-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 24: Literacy performance by cohort and score: College students



When college student numeracy scores were distributed by proficiency level, 65% of first-years and 65% of final-years were observed to have scored at or above Level 3 (Figure 25).

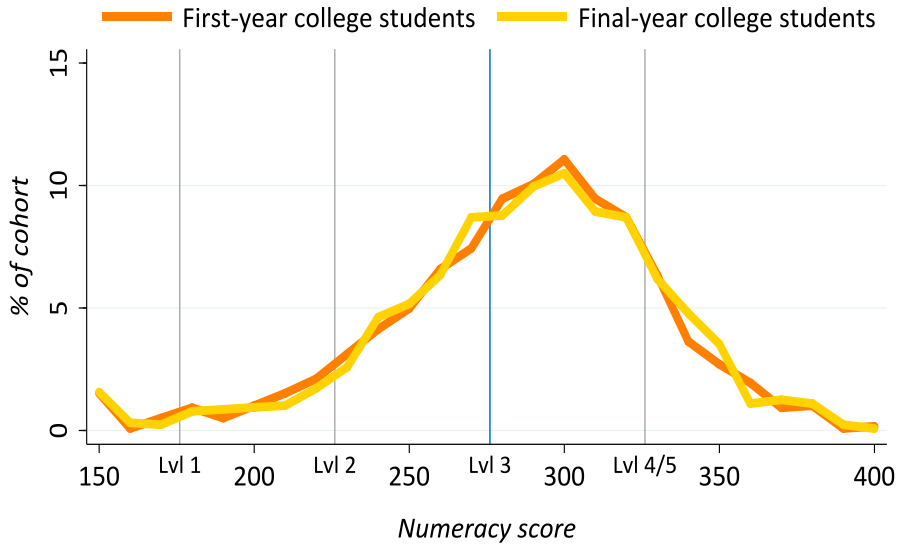
Figure 25: Numeracy performance by cohort and proficiency level: College students



First-year college students, n=1195; final-year college students, n=1288

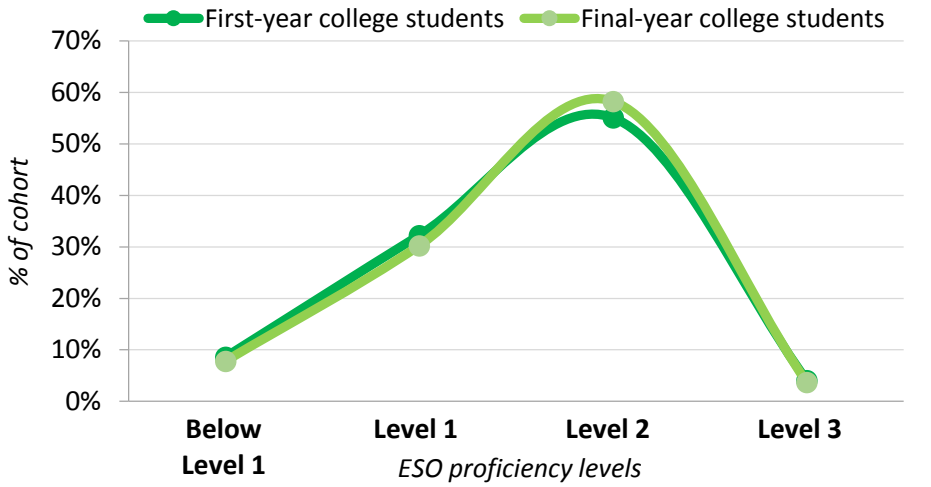
Figure 26 distributes the numeracy performance of college students by cohort and numerical score. The vertical lines indicate the proficiency level cut-off points, with the blue-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 26: Numeracy performance by cohort and score: College students



When college student PS-TRE scores were distributed by proficiency level, 59% of first-years and 62% of final-years were observed to have scored at or above Level 2 (Figure 27).

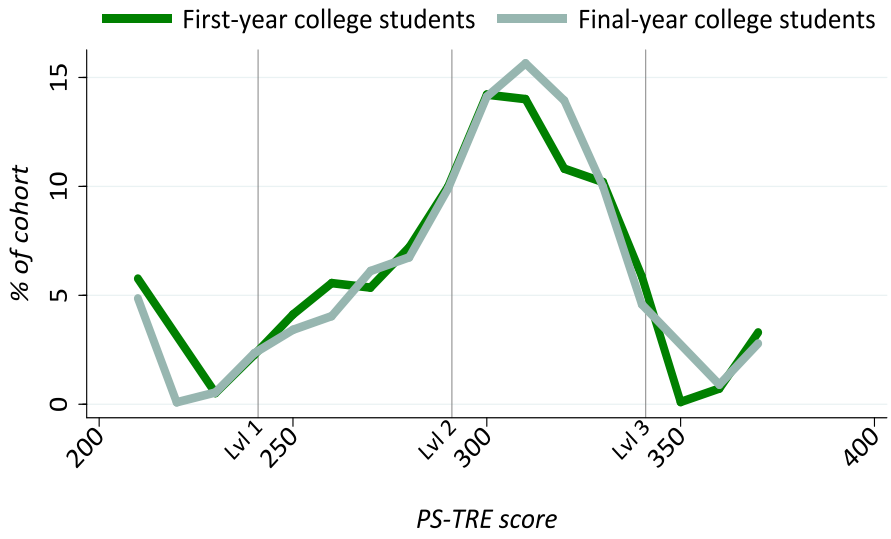
Figure 27: PS-TRE performance by cohort and proficiency level: College students



First-year college students, n=977; final-year college students, n=1114

Figure 28 distributes the PS-TRE performance of college students by cohort and numerical score. The vertical lines indicate the proficiency level cut-off points.

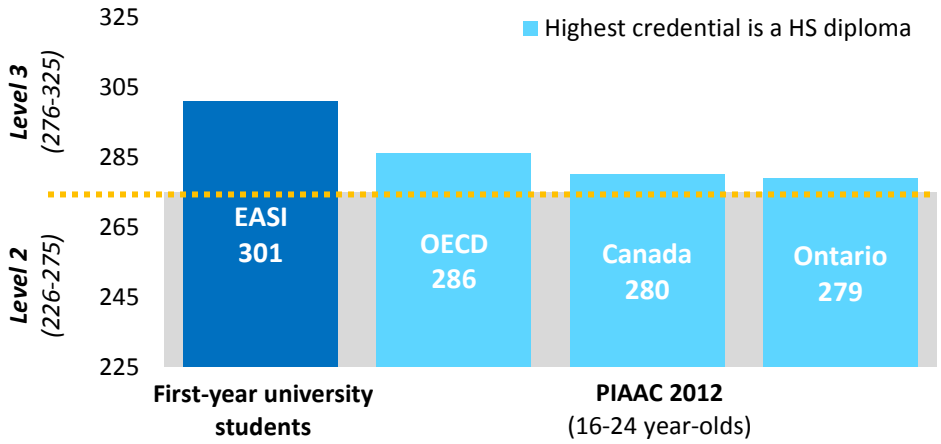
Figure 28: PS-TRE performance by cohort and score: College students



University Results

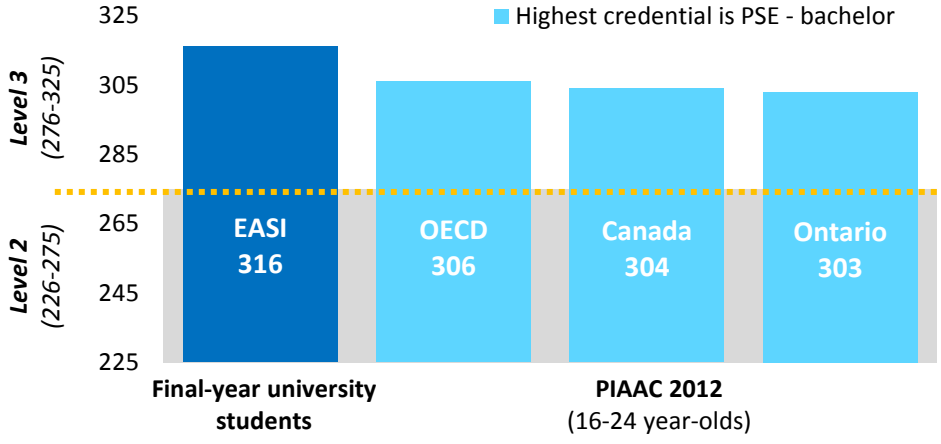
EASI scores for first- and final-year university students were gathered and compared to PIAAC 2012 results for OECD nations, Canada and Ontario. First-year university students had an average literacy score of 301 (Figure 29) and final-year students had an average literacy score of 316 (Figure 30). First-year university students who participated in EASI recorded average literacy scores higher than OECD nations (286), Canada (280) and Ontario (279) for PIAAC 2012. Final-year university students who participated in EASI recorded average literacy scores higher than OECD nations (306), Canada (304) and Ontario (303) for PIAAC 2012.

Figure 29: Average literacy scores: First year university students vs. PIAAC 2012 comparators



First-year university students, n=1029

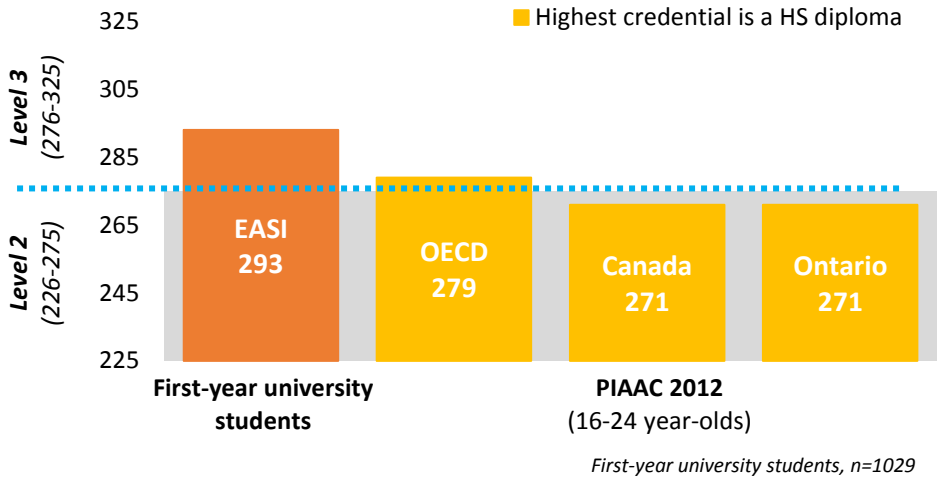
Figure 30: Average literacy scores: Final-year university students vs. PIAAC 2012 comparators



Final-year university students, n=1105

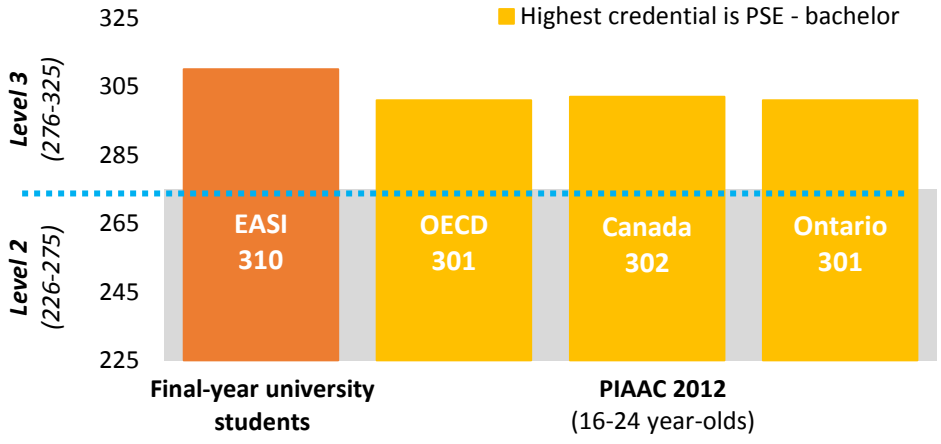
First-year university students who participated in EASI recorded average numeracy scores (293) higher than the average numeracy scores for OECD nations (279), Canada (271) and Ontario (271) for PIAAC 2012 (Figure 31). Final-year university students who participated in EASI recorded average numeracy scores (310) higher than the average numeracy scores for OECD nations (301), Canada (302) and Ontario (301) for PIAAC 2012 (Figure 32).

Figure 31: Average numeracy scores: First-year university students vs. PIAAC 2012 comparators



First-year university students, n=1029

Figure 32: Average numeracy scores: Final-year university students vs. PIAAC 2012 comparators

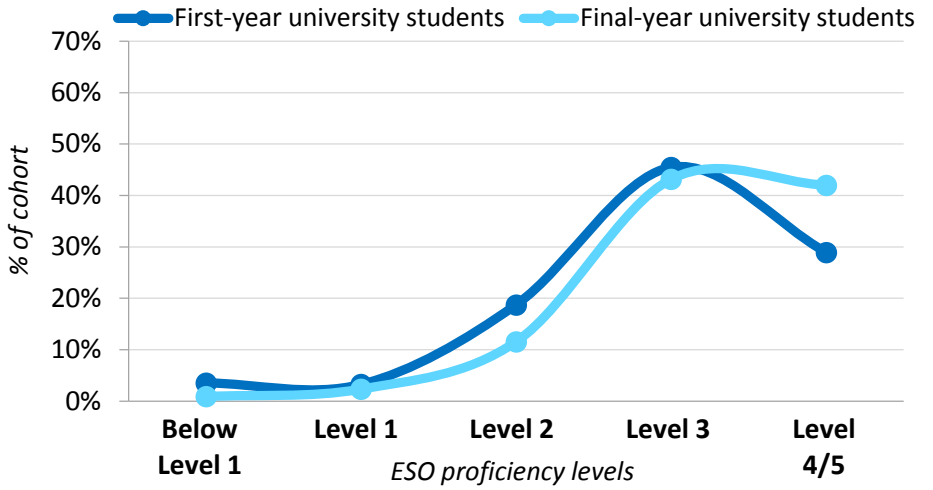


Final-year university students, n=1105

PIAAC 2012 comparisons for the PS-TRE component are not available as Statistics Canada does not report average PS-TRE scores for PIAAC 2012.

When university student literacy scores were distributed by proficiency level, 74% of first-years and 85% of final-years were observed to have scored at or above Level 3 (Figure 33).

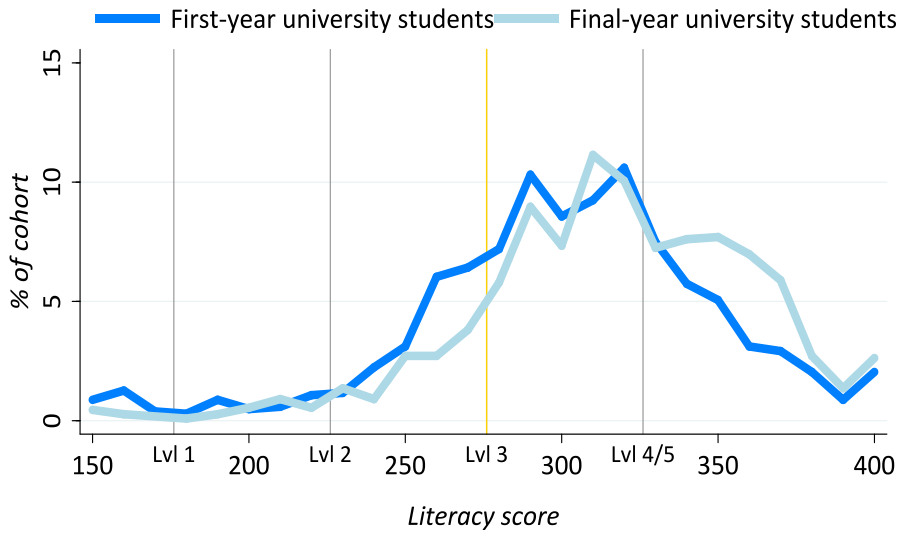
Figure 33: Literacy performance by cohort and proficiency level: University students



First-year university students, n=1040; final-year university students, n=1107

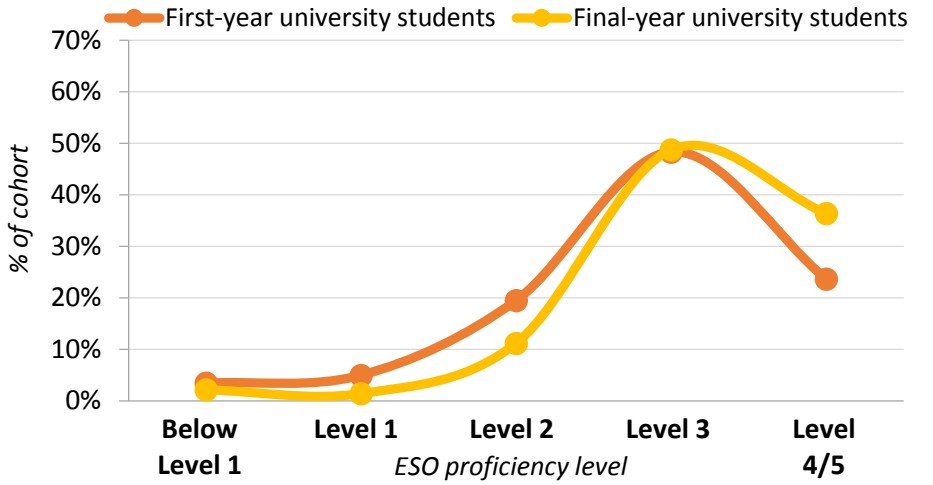
Figure 34 distributes the literacy performance of university students by cohort and numerical score. The vertical lines indicate the proficiency level cut-off points, with the gold-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 34: Literacy performance by cohort and score: University students



When university student numeracy scores were distributed by proficiency level, 72% of first-years and 85% of final-years were observed to have scored at or above Level 3 (Figure 35).

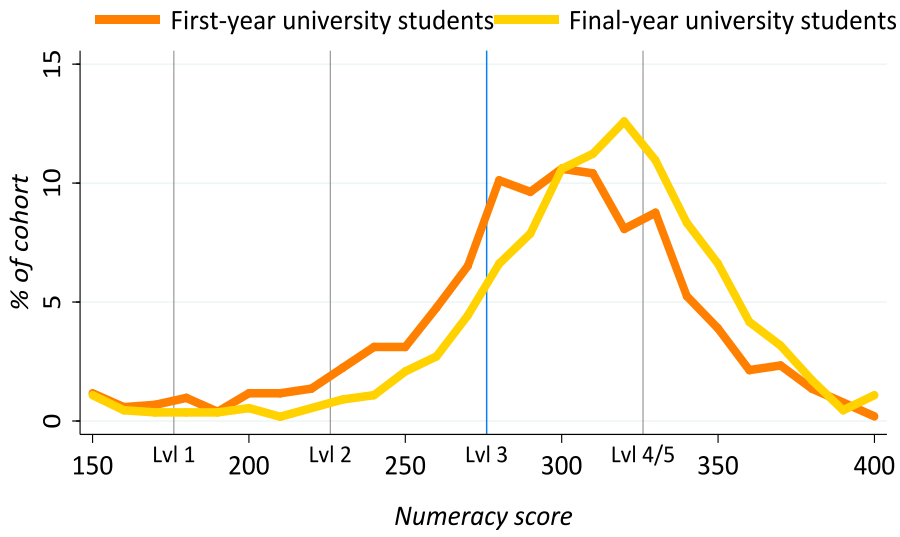
Figure 35: Numeracy performance by cohort and proficiency level: University students



First year university students, n=1040; final year university students, n=1107

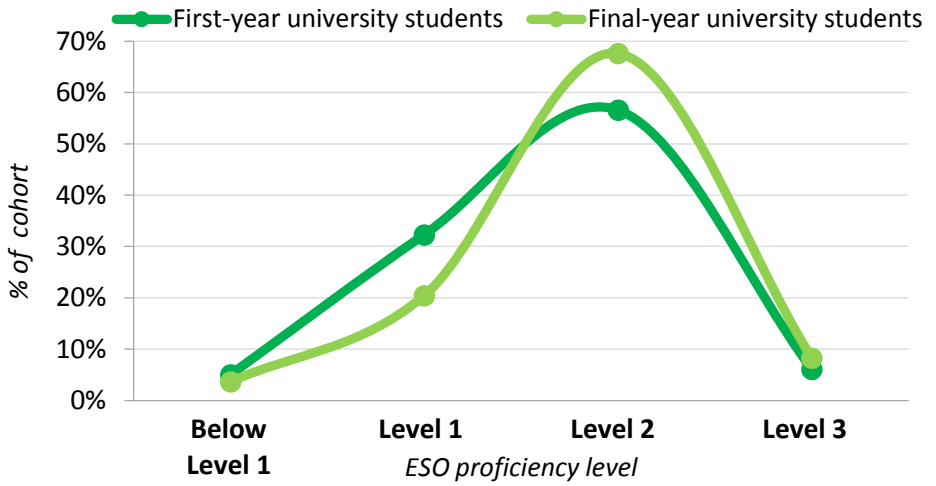
Figure 36 distributes the numeracy performance of university students by cohort and numerical score. The vertical lines indicate the proficiency level cut-off points, with the blue-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 36: Numeracy performance by cohort and score: University students



When university student PS-TRE scores were distributed by proficiency level, 63% of first-years and 76% of final-years were observed to have scored at or above Level 2 (Figure 37).

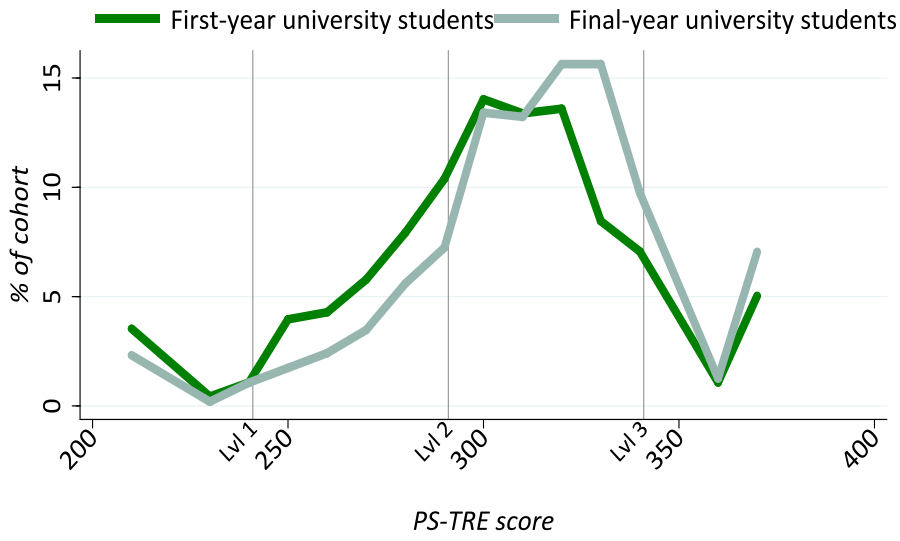
Figure 37: PS-TRE performance by cohort and proficiency level: University students



First-year university students, n=935; final-year university students, n=1037

Figure 38 distributes the PS-TRE performance of university students by cohort and numerical score. The vertical lines indicate the proficiency level cut-off points.

Figure 38: PS-TRE performance by cohort and score: University students



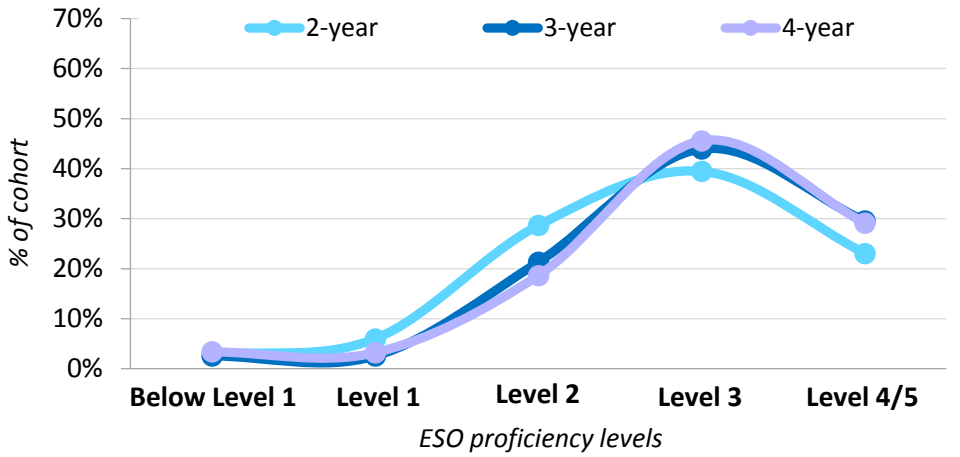
Performance by Program Length

Score distributions were also analyzed by the length of a student's program of study. Since some college participants were enrolled in four-year programs and some university participants were enrolled in three-year programs, these analyses display college and university students together.

Literacy Performance by Program Length

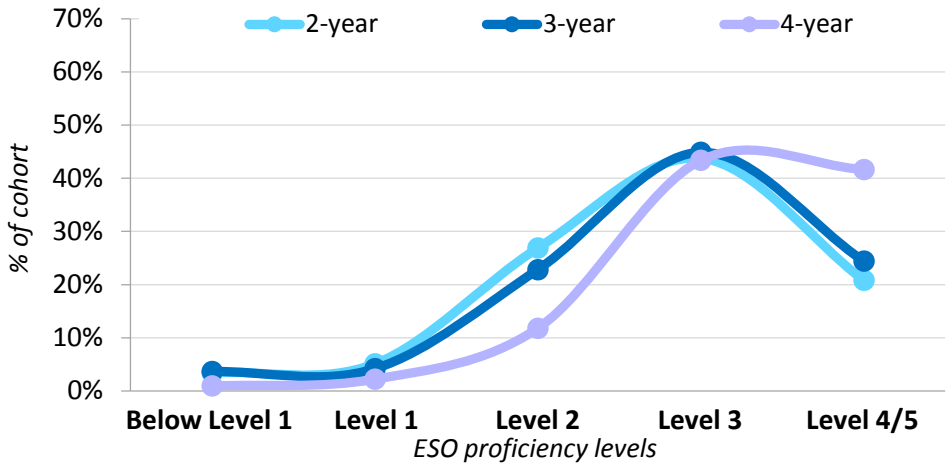
Of the first-year students, 62% of those enrolled in two-year programs, 74% of those in three-year programs, and 75% of those in four-year programs achieved literacy scores at Level 3 or higher (Figure 39). Of the final-year students, 65% of those enrolled in two-year programs, 69% of those in three-year programs, and 85% of those in four-year programs achieved literacy scores at Level 3 or higher (Figure 40). First-year students from both three-year and four-year programs had higher literacy scores than students from two-year programs, though there was no difference between the scores of first-year students in three-year and four-year programs. Final-year students from both three-year and four-year programs had higher literacy scores than students from two-year programs, and final-year students in four-year programs scored higher than final-years in three-year programs.

Figure 39: Literacy performance by program length and proficiency level: First-year students



First-year students in two-year programs, n=747; three-year programs, n=388; four-year programs, n=1077

Figure 40: Literacy performance by program length and proficiency level: Final-year students



Final year students in two-year programs, n=836; three-year programs, n=378; four-year programs, n=1166

Figure 41 and Figure 42 distribute the literacy performance of college and university students by cohort, program length and numerical score. The vertical lines indicate the proficiency level cut-off points, with the gold-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 41: Literacy performance by score and program length: First-year college and university students

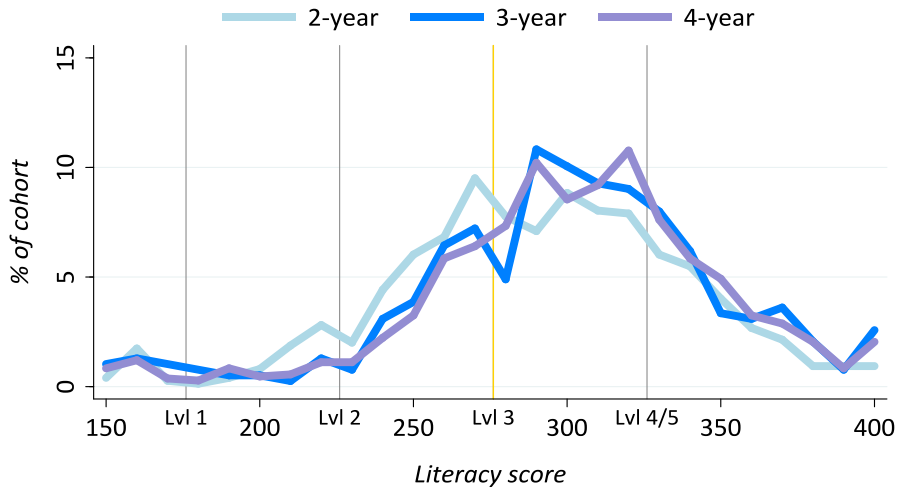
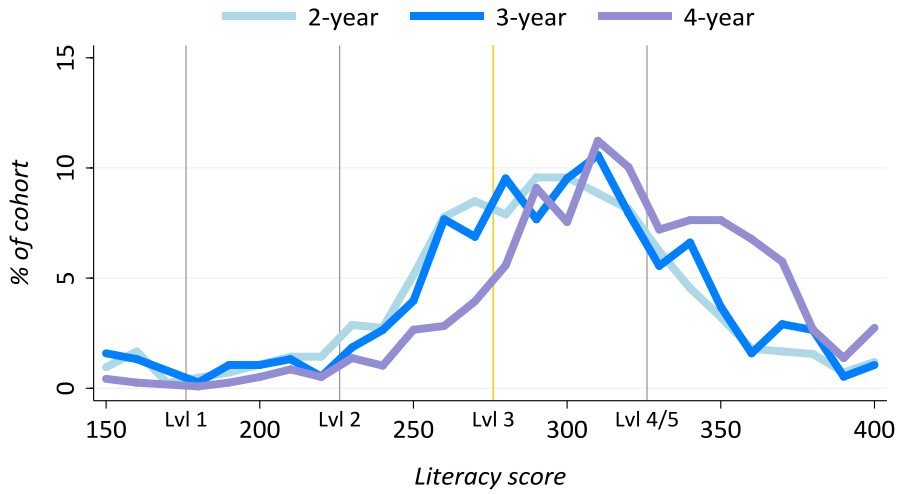


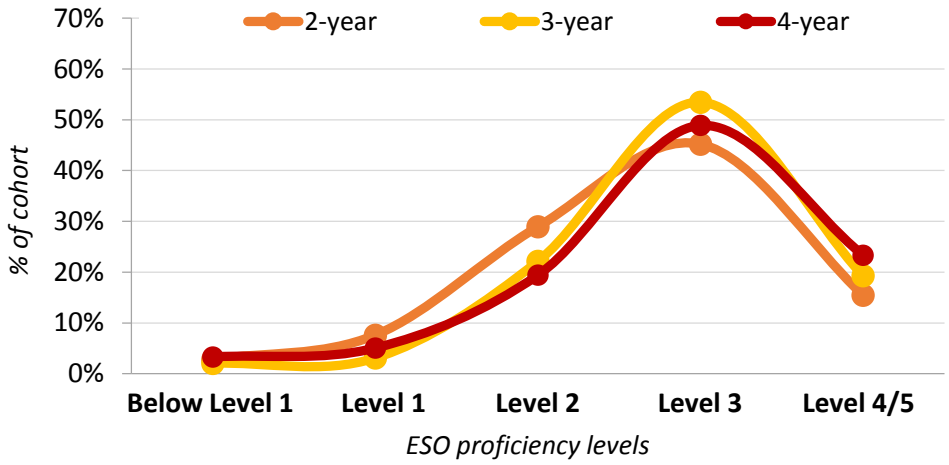
Figure 42: Literacy performance by score and program length: Final-year college and university students



Numeracy Performance by Program Length

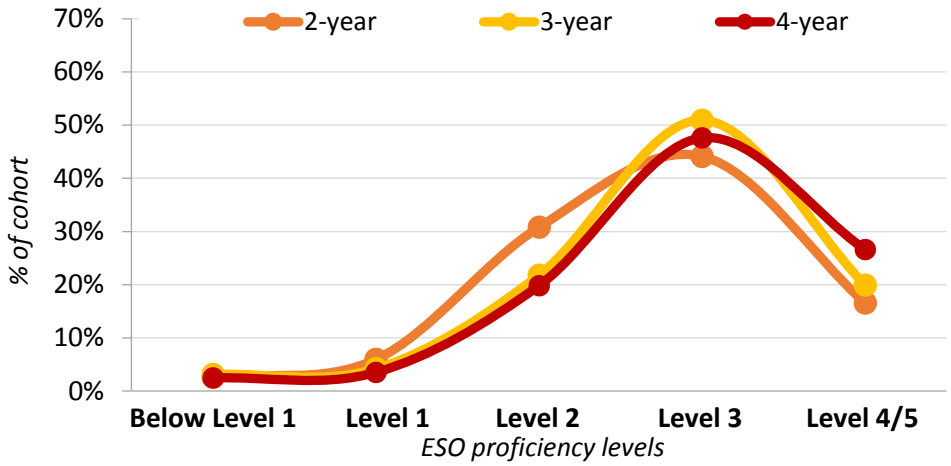
Figure 43 and Figure 44 display the numeracy performance of first- and final-year students according to program length. Of the first-year students, 61% of those enrolled in two-year programs, 73% of those in three-year programs, and 72% of those in four-year programs achieved numeracy scores at Level 3 or higher (Figure 43). Of the final-year students, 61% of those enrolled in two-year programs, 71% of those in three-year programs, and 75% of those in four-year programs achieved numeracy scores at Level 3 or higher (Figure 44). First-year students from both three-year and four-year programs had higher numeracy scores than students from two-year programs, though there was no difference in the scores of first-year students in three-year and four-year programs. Final-year students from both three-year and four-year programs had higher numeracy scores than students from two-year programs, and final-year students in four-year programs scored higher than students in three-year programs.

Figure 43: Numeracy performance by program length and proficiency level: First-year students



First-year students in two-year programs, n=747; three-year programs, n=388; four-year programs, n=1077

Figure 44: Numeracy performance by program length and proficiency level: Final-year students

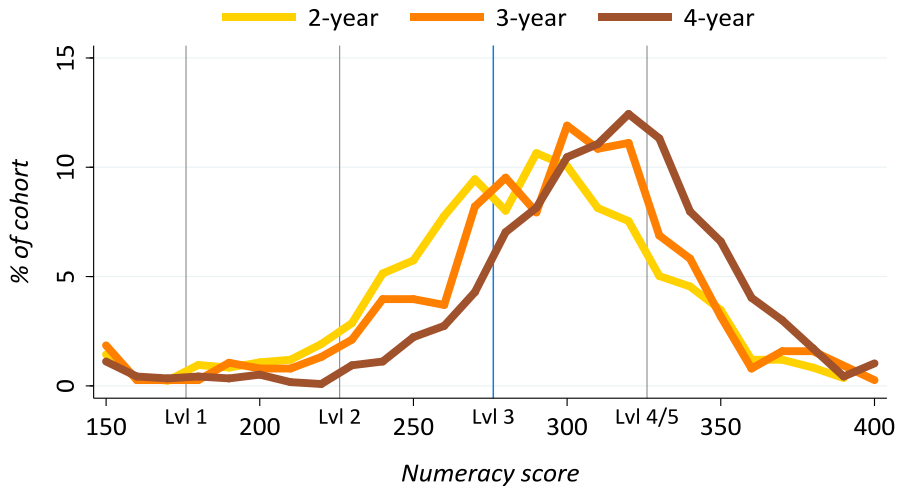


Final-year students in two-year programs, n=836; three-year programs, n=378; four-year programs,

Figure 45 and Figure 46 distribute the numeracy performance of college and university students by cohort, program length and numerical score. The vertical lines indicate the proficiency level cut-off points, with the blue-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 45: Numeracy performance by score and program length: First-year college and university students

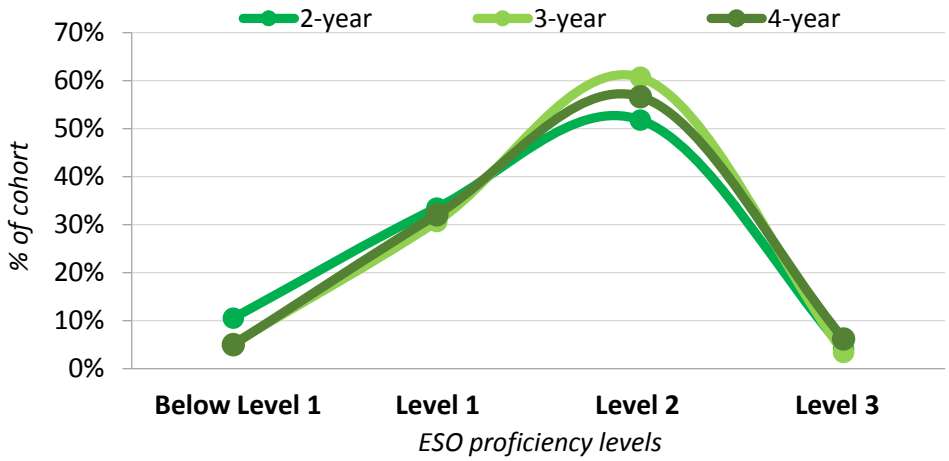
Figure 46: Numeracy performance by score and program length: Final-year college and university students



PS-TRE Performance by Program Length

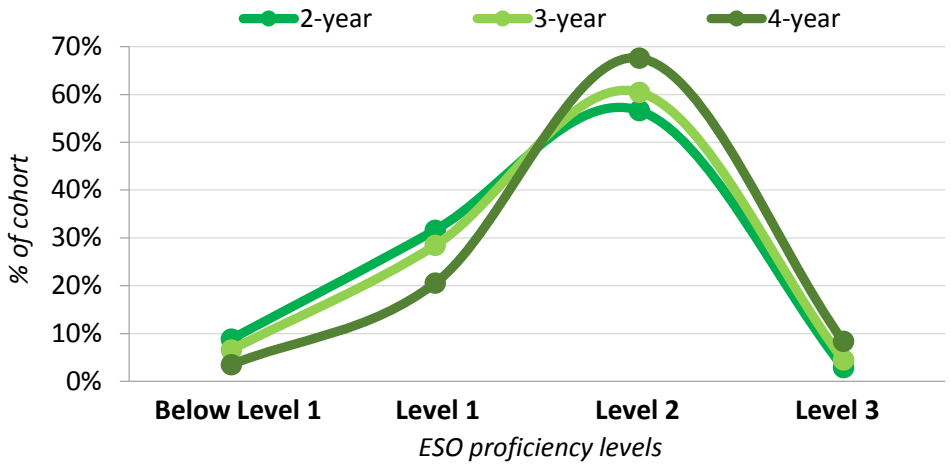
Figure 47 and Figure 48 display the PS-TRE performance of first- and final-year students according to program length. Of the first-year students, 56% of those enrolled in two-year programs, 64% of those in three-year programs, and 63% of those in four-year programs achieved PS-TRE scores of Level 2 or higher (Figure 47). Of the final-year students, 60% of those enrolled in two-year programs, 64% of those in three-year programs, and 76% of those in four-year programs achieved PS-TRE scores of Level 2 or higher (Figure 48). First-year students from both three-year and four-year programs had higher PS-TRE scores than students from two-year programs, though there was no difference in the scores of first-year students in three-year and four-year programs. Final-year students from both three-year and four-year programs had higher PS-TRE scores than students from two-year programs, and final-year students in four-year programs scored higher than final-year students in three-year programs.

Figure 47: PS-TRE performance by program length and proficiency level: First-year students



First-year students in two-year programs, n=606; three-year programs, n=303; four-year programs, n=976

Figure 48: PS-TRE performance by program length and proficiency level: Final-year students



Final-year students in two-year programs, n=724; three-year programs, n=324; four-year programs,

Figure 49 and Figure 50 distribute the PS-TRE performance of college and university students by cohort, program length and numerical score. The vertical lines indicate the proficiency level cut-off points.

Figure 49: PS-TRE performance by score and program length: First-year college and university students

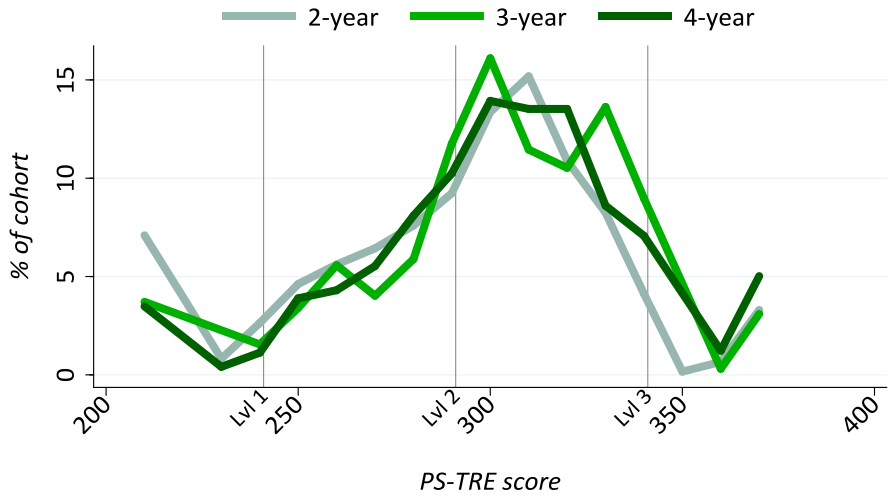
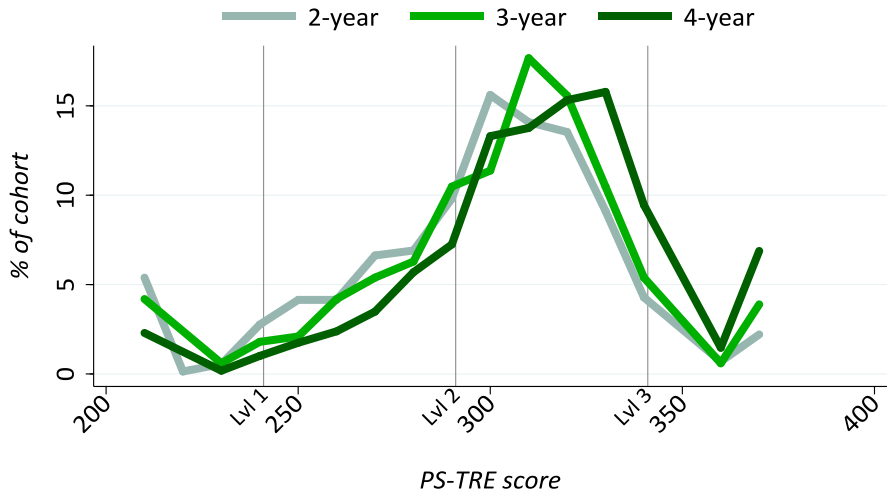


Figure 50: PS-TRE performance by score and program length: First-year college and university students

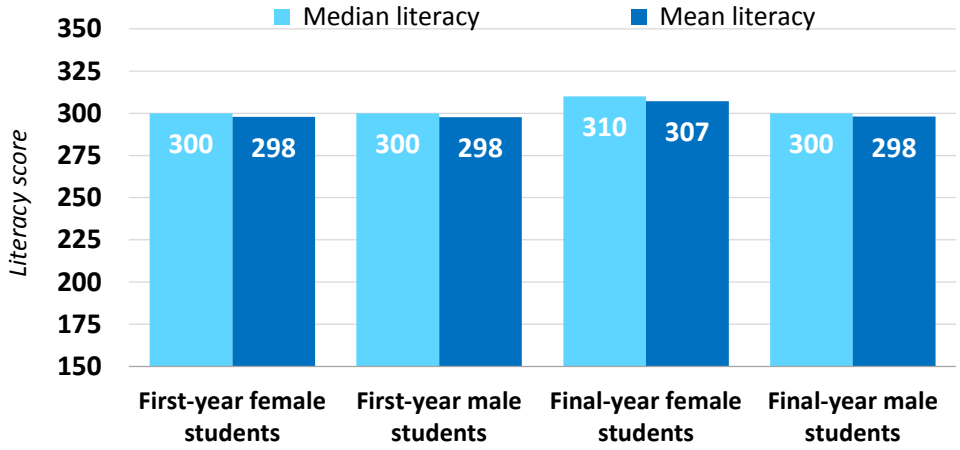


Performance by Gender

Literacy Performance by Gender

Mean and median literacy scores were calculated for male and female, first- and final-year students (Figure 51). The mean and median literacy scores for female and male first-year students were identical: both groups had a mean score of 298 and a median score of 300. Female final-year students had a mean literacy score of 307 and a median literacy score of 310, while male final-year students had a mean score of 298 and a median score of 300.

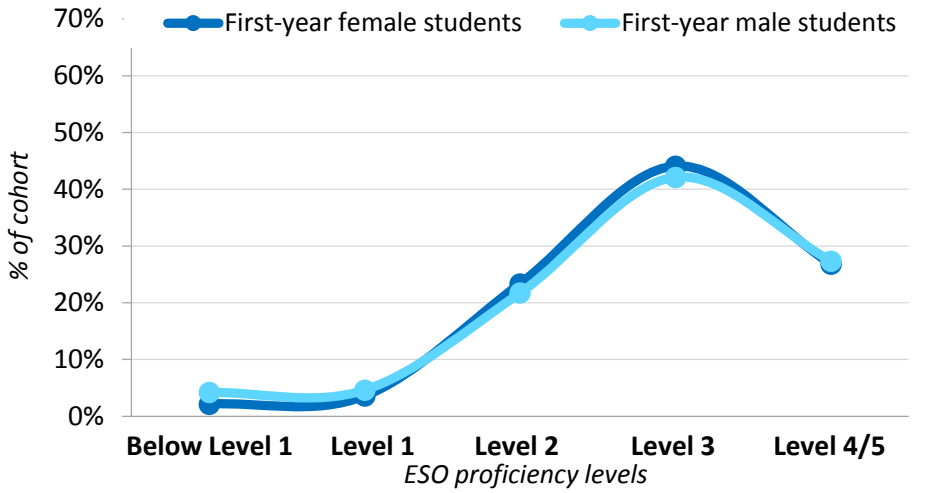
Figure 51: Mean and median literacy performance by cohort and gender: College and university students



First-year female students, n=1253; first-year male students, n=967
Final-year female students, n=1381; final-year male students, n=1003

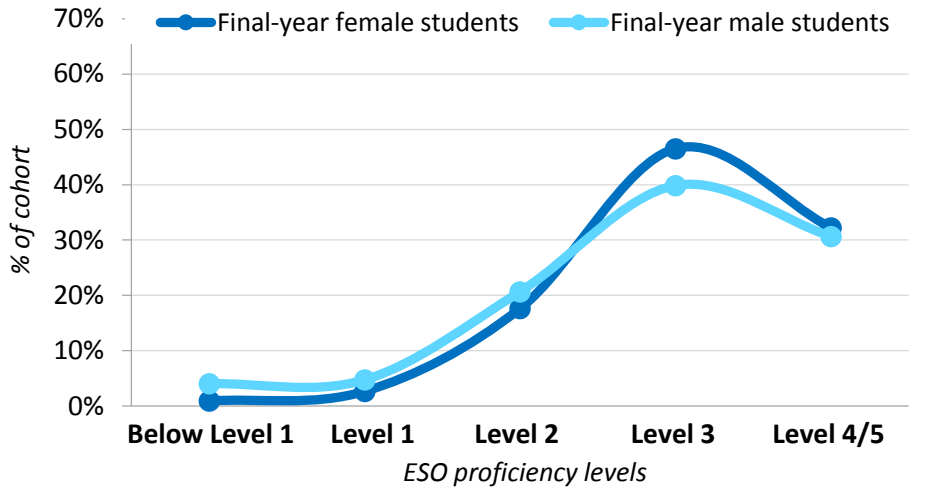
Literacy score distributions were analyzed by cohort, proficiency level and gender. Of the first-year students, 71% of females and 69% of males performed at Level 3 or higher (Figure 52). Of the final-year students, 79% of females and 71% of males performed at Level 3 or higher (Figure 53).

Figure 52: Literacy performance by gender and proficiency level: First-year college and university students



First-year female students, n=1259; first-year male students, n=976

Figure 53: Literacy performance by gender and proficiency level: Final-year college and university students



Final-year female students, n=1284; final-year male students, n=1011

Figure 54 and Figure 55 distribute the literacy performance of college and university students by cohort, gender and numerical score. The vertical lines indicate the proficiency level cut-off points, with the gold-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 54: Literacy performance by score and cohort: Female college and university students

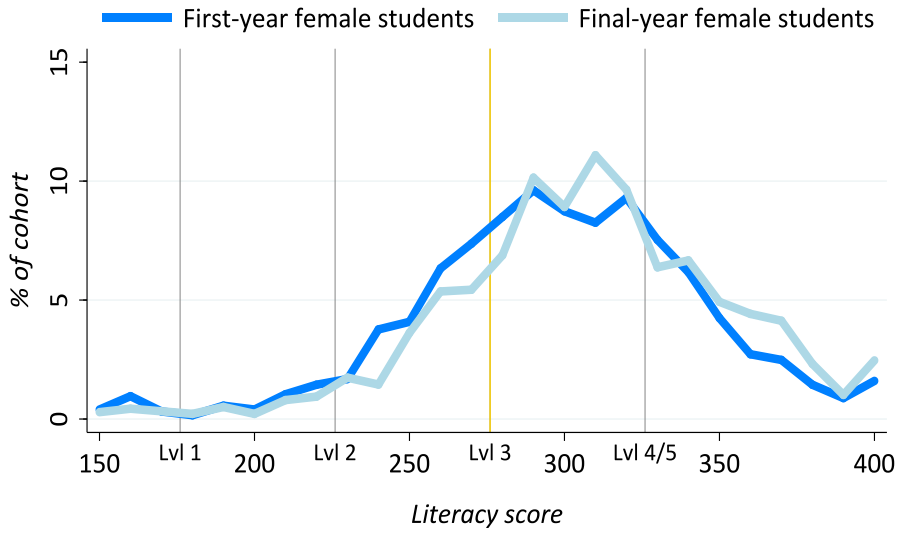
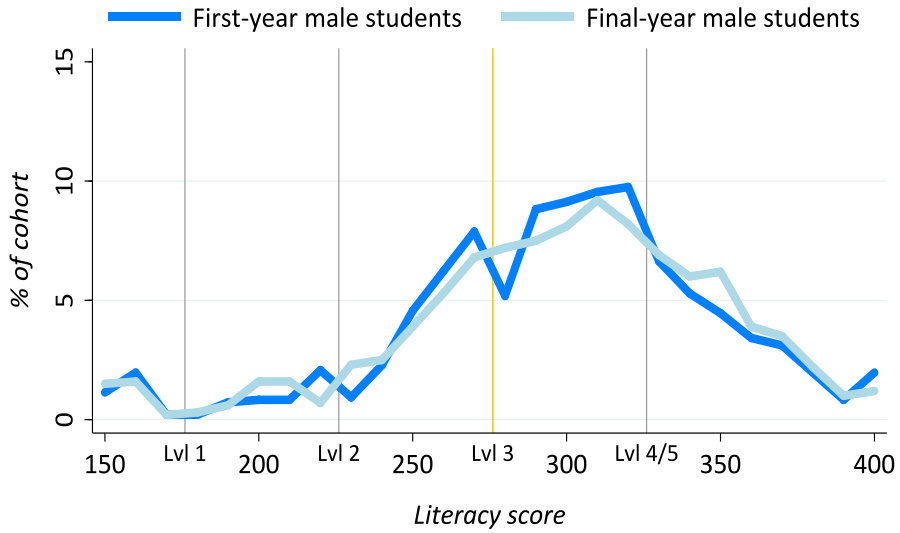


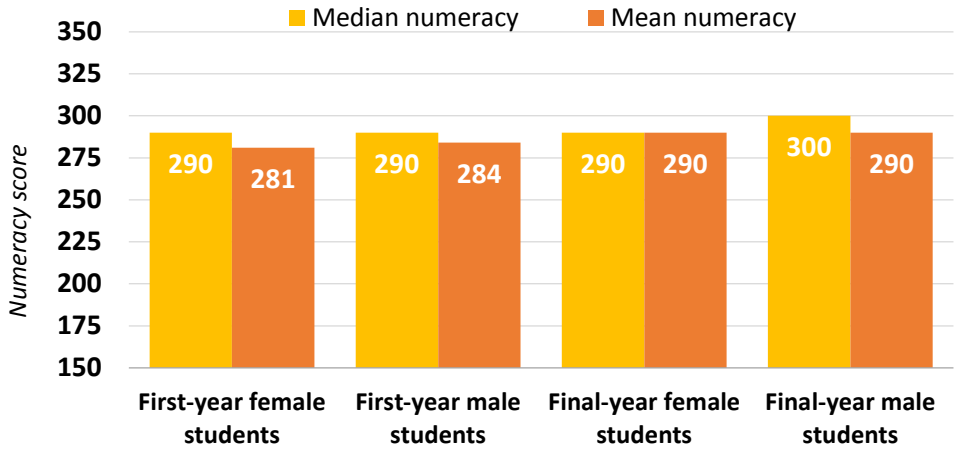
Figure 55: Literacy performance by score and cohort: Male college and university students



Numeracy Performance by Gender

Mean and median numeracy scores were calculated for male and female first- and final-year students (Figure 56). Female first-years had a mean numeracy score of 281 and a median numeracy score of 290. Male first-years had a mean numeracy score of 284 and a median numeracy score of 290. Male and female final-year mean numeracy scores were identical (290).

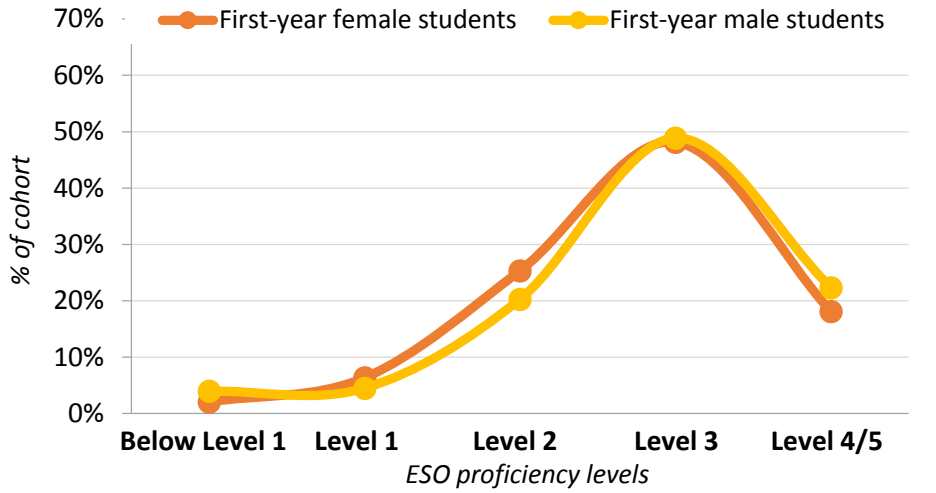
Figure 56: Mean and median numeracy performance by cohort and gender: College and university students



First-year female students, n=1253; first-year male students, n=967
Final-year female students, n=1381; final-year male students, n=1003

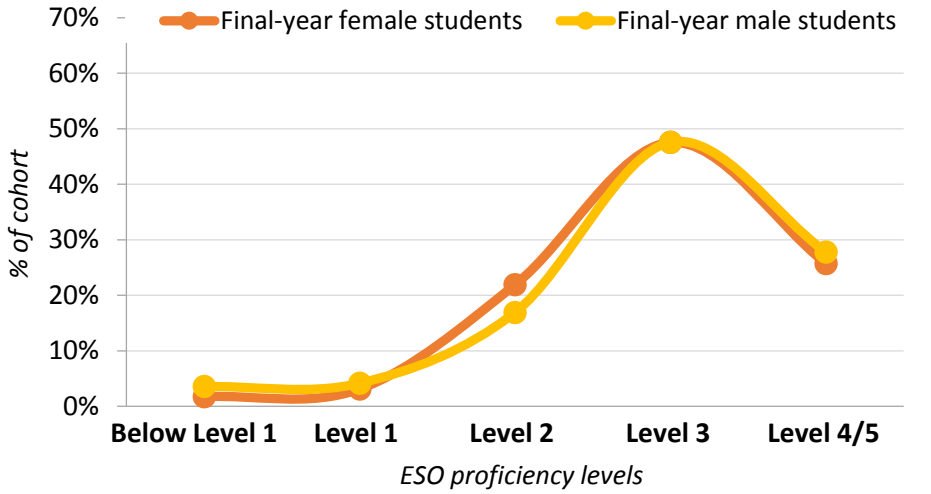
Numeracy score distributions were analyzed by cohort, proficiency level and gender. Of the first-year students, 66% of females and 71% of males performed at Level 3 or higher (Figure 57). Of the final-year students, 73% of females and 75% of males performed at Level 3 or higher (Figure 58)).

Figure 57: Numeracy performance by gender and proficiency level: First-year college and university students



First-year female students, n=1259; first-year male students, n=976

Figure 58: Numeracy performance by gender and proficiency level: Final-year college and university students



Final-year female students, n=1284; final-year male students, n=1011

Figure 59 and Figure 60 distribute the numeracy performance of college and university students by cohort, gender and numerical score. The vertical lines indicate the proficiency level cut-off points, with the blue-coloured vertical line marking the cut-off between Level 2 and Level 3.

Figure 59: Numeracy performance by score and cohort: Female college and university students

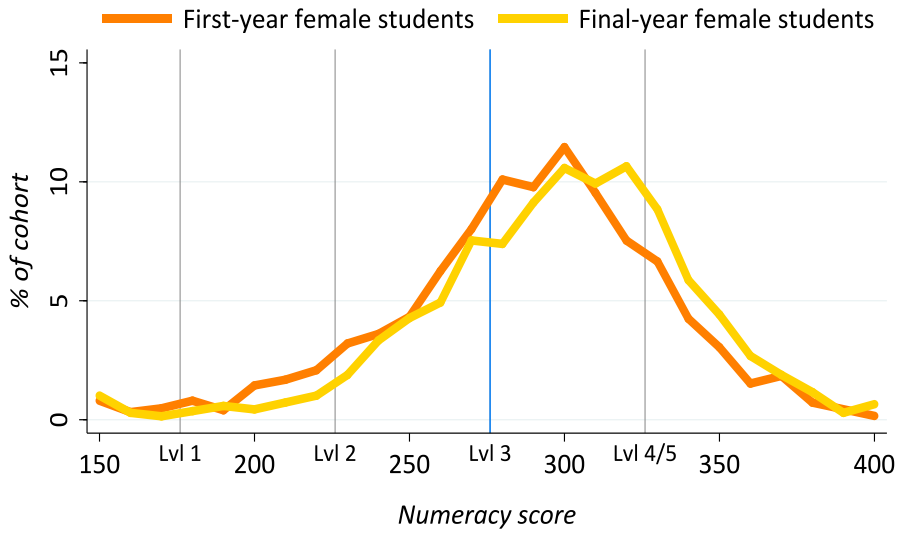
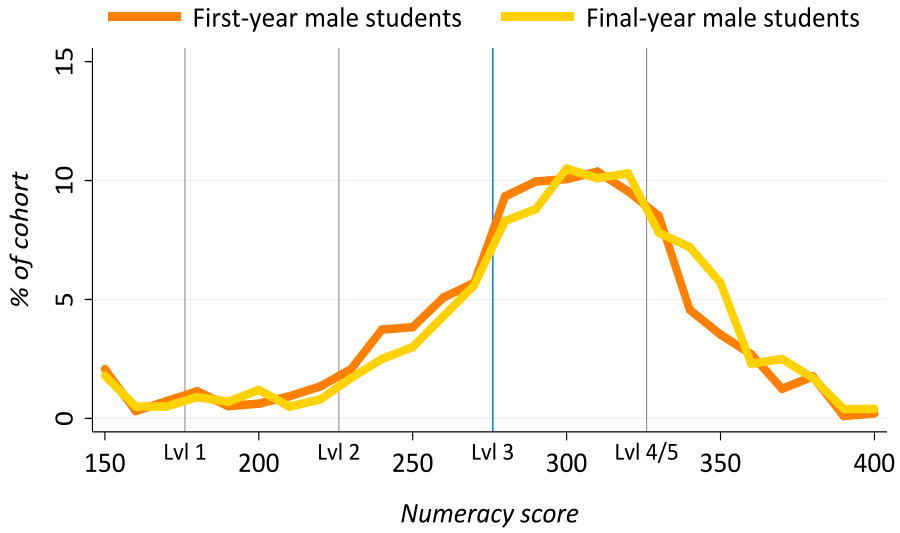


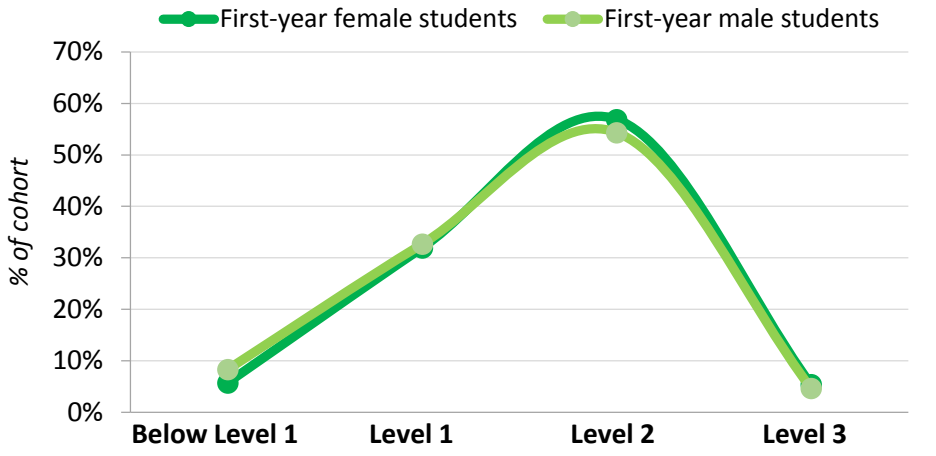
Figure 60: Numeracy performance by score and cohort: Male college and university students



PS-TRE Performance by Gender

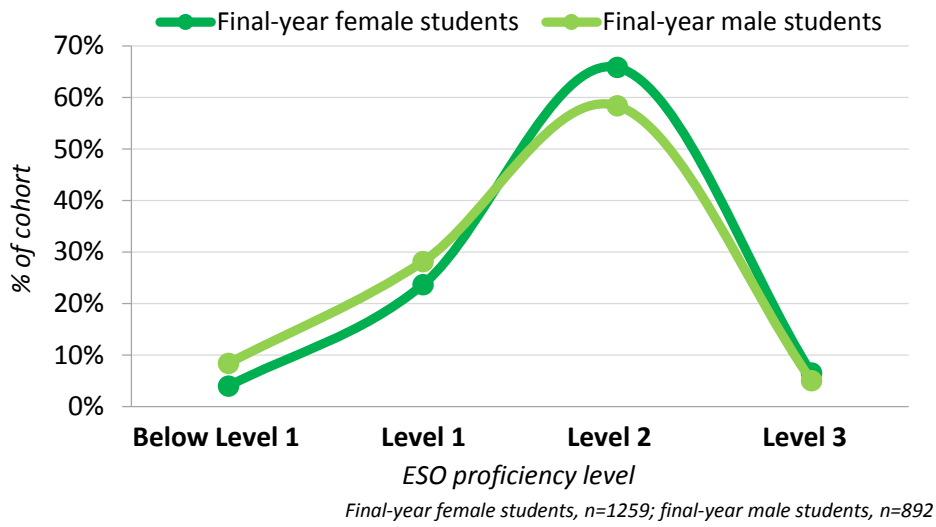
PS-TRE levels were assessed for male and female first- and final-year students (Figure 61, Figure 62). PS-TRE score distributions were analyzed by cohort, proficiency level and gender. Of the first-year students, 62% of females and 60% of males performed at Level 3 or higher (Figure 61). Of the final-year students, 72% of females and 63% of males performed at Level 3 or higher (Figure 62).

Figure 61: PS-TRE performance by gender and proficiency level: First-year college and university students



First-year female students, n=1095; first year-male students, n=817

Figure 62: PS-TRE performance by gender and proficiency level: Final-year college and university students



Final-year female students, n=1259; final-year male students, n=892

Figure 63 and Figure 64 distribute the PS-TRE performance of college and university students by cohort, gender and numerical score. The vertical lines indicate the proficiency level cut-off points.

Figure 63: PS-TRE performance by score and cohort: Female college and university students

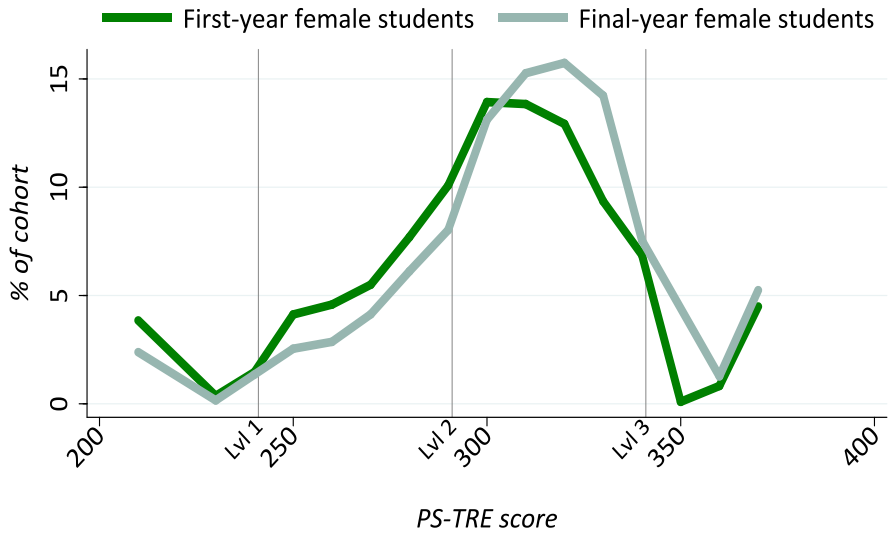
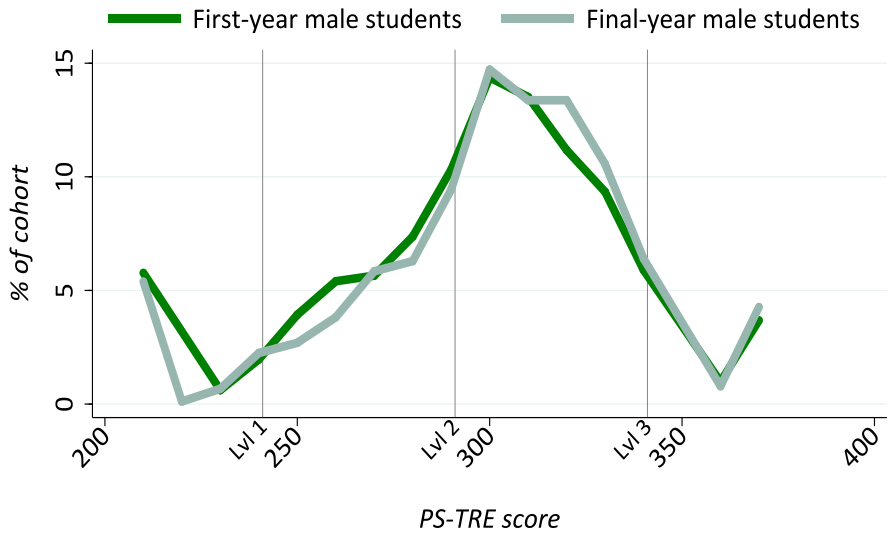


Figure 64: PS-TRE performance by score and score: Male college and university students



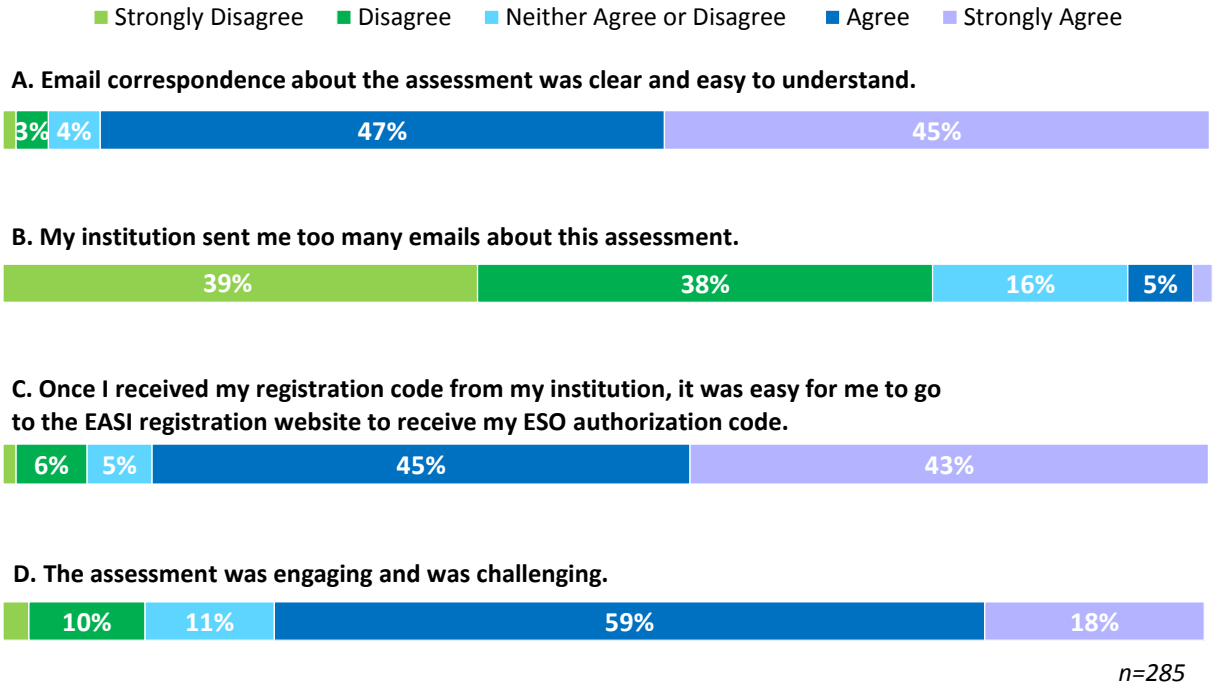
4.4 Student Feedback Survey Responses

Upon completing the assessment, participants in the EASI college and university pilots were invited to complete a brief online feedback survey. The survey was voluntary and anonymous, and was designed to collect information on students' experiences participating in EASI. Completion of the survey was not tied to any incentives. Figure 65 and Figure 66 display student responses to several key survey questions. Results from the college and university pilots are presented separately as the EASI university pilot's feedback survey differed slightly from the survey distributed to college participants.

Highlights from the EASI College Pilot Feedback Survey

In total, 285 first- and final-year college students completed the feedback survey. The survey was voluntary and anonymous, and completion was not tied to any incentives. Survey responses suggest that participants found the EASI college pilot to be straightforward. Specifically, 92% of participants agreed that email correspondence was clear and easy to understand, while 77% agreed that they did not receive too many emails about the study; 88% of participants reported that the process of registering for EASI and accessing the ESO test portal was simple; most participants (77%) also reported finding the assessment to be engaging and challenging.

Figure 65: Post-test feedback survey responses: First- and final-year college students

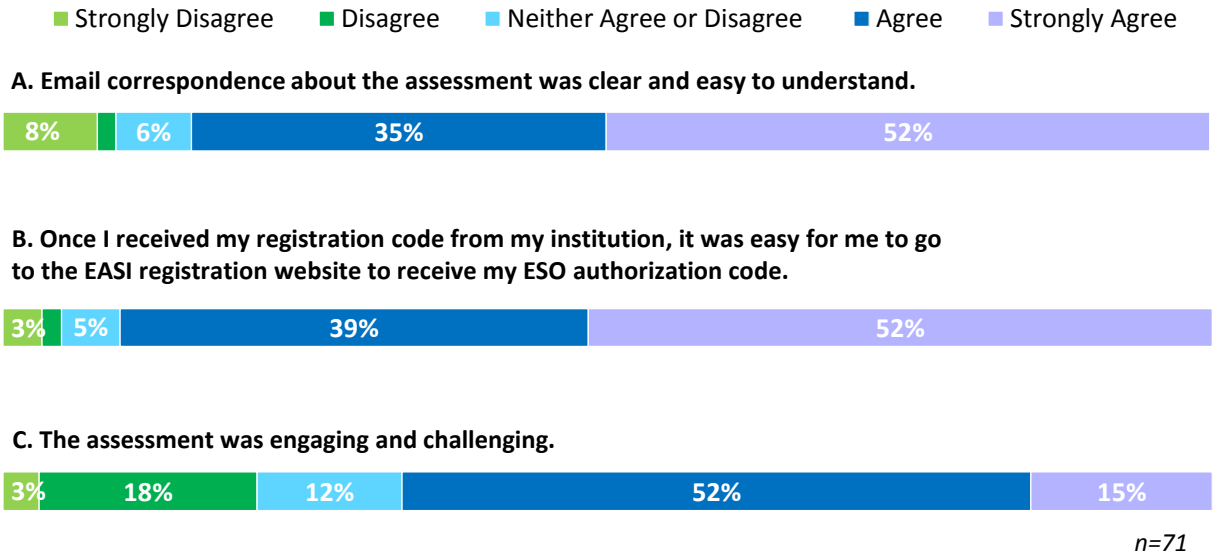


n=285

Highlights from the EASI University Pilot Feedback Survey

In total, 71 first- and final-year university students completed the feedback survey. Like the college student feedback survey, this survey was voluntary and anonymous, and completion was not tied to any incentives. Survey responses suggest that participants found the EASI university pilot to be straightforward. Specifically, 87% of participants agreed that email correspondence was clear and easy to understand, while 91% reported that the process of registering for EASI and accessing the ESO test portal was simple; most participants (67%) also reported finding the assessment to be engaging and challenging.

Figure 66: Post-test feedback survey responses: First- and final-year university students



n=71

5. Conclusion

In this section we review the key findings of the EASI college and university pilots. We begin by returning to the research questions.

1. **The Education and Skills Online assessment is a suitable measure of postsecondary students' literacy, numeracy and problem-solving skills.**

We found the ESO to be an efficient measure of postsecondary student skills. From a performance standpoint, the fact that the average scores of EASI participants were similar to those of their OECD, Canadian and Ontarian comparators from PIAAC 2012 reaffirmed the instrument's suitability for this audience. We recognize that this assumption needs to be analyzed further with better sampling controls in place in order to better understand the influence of possible confounding factors like student motivation and institutional differences in test delivery on the performance data. That being said, several key data points reinforce our conclusion:

(a) The majority of students who started the ESO completed the assessment.

(b) Nearly two-thirds of students who completed the ESO finished the test within 24 hours of starting it. Roughly half took a break of only 10 minutes or less between completing the longest portion of the test (the Core Assessment) and starting the final component (PS-TRE), which suggests that these students did not find the assessment to be too tiring. Additionally, the mean and median test times for both first- and final-year students were very close to the 90-minute estimate provided by ETS.

(c) Though only a small number of students completed the voluntary feedback survey, most of those who did so indicated that they found the assessment to be engaging and challenging.

(d) The assessment results were normally distributed. This indicates that when steps are taken to prevent sample bias, the data collected by the ESO can be used for advanced statistical analyses.

2. **The distribution of skill levels and relatively minor skill gain demand further research.**

The proximity of average EASI literacy and numeracy scores for first- and final-year students to those of their PIAAC 2012 comparators, who were identified based on age group and level of completed education, suggests that skill gain is occurring to some degree. However, the skill gain appears to be occurring in some situations and not others. The distribution of skill levels among graduating students also raises concerns. While the majority of graduating students are demonstrating average skills, too many present below-average skill levels and too few present superior skill levels.

These findings demand further investigation through larger trials, and we have given consideration to the optimal design of these projects. Skill development is best measured when large-scale assessments are integrated with routine evaluations of student performance. We are confident that future large-scale assessment projects could explore skill gain in more robust ways by instituting better sampling controls, employing a longitudinal design and by including large-scale assessment among the standard assessment activities students encounter in postsecondary education.

3. Large-scale skills assessment is feasible in postsecondary contexts.

The EASI implementation process has been refined and streamlined over the course of the college and university pilots. In effect, the process managed testing windows at 19 separate Ontario institutions and one out-of-province university, often simultaneously. We attribute the success of the process to its flexibility, which allowed testing windows to be tailored to suit institutions of all sizes and capacities. Additionally, because HEQCO co-ordinated the administration of the testing windows, the demands placed on participating institutions were reduced. Throughout both trials, we were able to resolve important logistical and methodological issues regarding student recruitment, test administration, participant privacy and so on — issues that are important to us as we consider scaling up.

While the EASI model succeeded in simplifying the logistics of administering large-scale assessments, we must note that institutions still contributed a considerable amount of resources, primarily in the form of staff time spent on the project. Local staff members served as the bridge between HEQCO and students, spearheading recruitment activities on campus and fielding student inquiries about the project in addition to the scheduled distribution of invitation emails, reminders and incentives. They were also responsible for gathering institutional data and contact information for the sample, which, depending on an institution's IT infrastructure, can be a complex task. HEQCO acknowledges that further rounds of testing will require greater support for institutions in these areas, whether it be in the form of funds to alleviate the personnel costs associated with EASI or further streamlining of the logistics of test delivery on campus.

Institutions, to a far greater extent than we had anticipated, were interested in participating in the college and university pilots. We cannot overstate the importance of institutional partnership to EASI's success. The administrative data provided by institutions added invaluable context to the data set, and the institutional investigators were essential to the smooth administration of the testing windows. There is no better substitute for the direct measurement of student skills in demonstrating institutional quality, and the level of interest and support EASI has received from Ontario's colleges and universities confirms that postsecondary institutions share our goal of developing methodologies that maximize the benefit and utility of large-scale assessment.

In light of these findings, we are confident that the EASI process can easily be scaled up to a provincial or national level.

In conclusion, the Essential Adult Skills Initiative exceeded HEQCO's expectations. We developed a flexible, efficient methodology for measuring student skills at multiple institutions, established the suitability of the Education and Skills Online assessment for postsecondary audiences, and with the support of our partner colleges and universities, demonstrated that large-scale assessment is eminently feasible. The data collected through the EASI pilots provided invaluable insight not only into student skill development but also the design of future studies of learning gain. The results are consistent with other skills measurement research that HEQCO and others have conducted. Nevertheless, questions of interpretation remain. We are struck by the number of important questions knowledgeable people ask about the interpretation of our findings that they see as relevant to their policy development, financial investments or program designs. These can be answered, but only with increased funds and supports for the administration of testing on campus, larger trials that provide better control over sampling and with a longitudinal experimental design.

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