

The NSSE National Data Project Report

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Executive Summary

The NSSE National Data Project is an element of ongoing engagement research and implementation practice in Canada. It has two primary objectives. The first is the construction of detailed NSSE reports (items means and frequencies, benchmarks and learning scales) at the academic program- and student subgroup-level for individual institutions rather than for peer groups. The second is the development of statistical (regression) models to measure the relative contribution to engagement variation of student characteristics, program mix and institutional character at both the student record- and institution-level. Both objectives address the broader goals of providing greater focus to engagement improvement efforts, identifying clusters of promising practices and best engagement results, supporting improved interpretation and use of institutional engagement scores, and informing the development of institutional accountability procedures and metrics.

The core of the project is a record-level data file containing the approximately 69,000 2008 or 2009 NSSE responses and additional student records system data representing 44 Canadian universities. Student responses were classified into 10 general academic programs (e.g., Social Sciences) and over 75 specific academic programs (e.g., History, Biology) and over 30 student subgroups (including first generation, First Nations and international).

The detailed NSSE reports indicate a considerable level of variation in student characteristics and program mix across Canadian universities; large differences in engagement item scores and benchmarks across academic program clusters and specific programs within clusters, and across student subgroups; and wide engagement variability across institutions of differing size. A summary of the results from these detailed reports is presented below. The program- and student subgroup-level NSSE reports provide a more focused basis for comparing engagement university by university, and strongly suggest that institution-level engagement comparisons should take account of student, program and size variation and should not be presented without context in ranked format.

The regression models provide a more formal basis for identifying and quantifying the role of student, program and size variation in engagement, and permit a number of conclusions. First, student characteristics, program mix and institutional character all contribute to a comprehensive statistical explanation of engagement variation. Second, the wide variation in institutional engagement scores is reduced considerably when student characteristics, program mix and institutional size are controlled. Third, each engagement benchmark requires a distinct statistical explanation: factors important to one benchmark are often quite different from those important to another. Fourth, Francophone and Anglophone institutions differ with respect to certain key engagement dynamics. And finally, the models suggest several approaches to defining the institutional contribution to engagement and the scope of institutional potential to modify engagement level.

Specific potential applications of the results include:

- Program and student subgroup benchmarking: The availability of institution-by-institution differences among similar programs and student subgroups at other universities permits benchmarking in relation to varying averages (national, provincial) and in relation to selected peer institutions. This in turn permits identification of best (or most applicable)

results at specific peer/comparator institutions and subsequent exploration of promising practices and their applicability at the program- and student subgroup-level.

- Institutional management: Focused engagement comparison and assessment in turn permit the development of a more efficient and effective implementation framework suggesting appropriate effort, expectations and incentives.
- Accountability: The roles of student, program and institutional factors as engagement drivers should be reflected in accountability processes and metrics. Justifiable differences in institutional engagement levels and the degree of effort required to achieve meaningful engagement improvements argue for an accountability framework based more on effort than outcomes (at least in the short term) and more on expected benchmark scores than top-tier or average benchmark scores.

Promising options for further research on NSSE National data include the pooling of NSSE responses over multiple administrations to increase sample size and reporting reliability particularly for small institutions, small academic programs and small student subgroups; producing detailed NSSE engagement reports that deal simultaneously with academic program and student subgroup where sample sizes permit; and extending the regression analysis to key engagement items (rather than benchmarks) and to specific academic programs and student subgroups (to move from the current identification of programs and subgroups as engagement predictors to a more detailed statistical explanation of the interactions among them).

1. Project Background and Rationale

The National Survey of Student Engagement (NSSE) measures student behaviours and institutional practices in a variety of areas that previous research has shown to be associated with positive educational outcomes. It is administered to first-year and final-year students in first-entry undergraduate university programs. Over 1,400 universities in the US and Canada have administered NSSE at least once. The survey is predicated on a wide range of research indicating that knowledge acquisition, skills development and personal growth are associated with, for example, students assuming an active and collaborative role in their own education, with their participation in such enrichment experiences as study abroad and community-based learning, with the supportiveness of the institution to their academic and social needs, and with high levels of various student-faculty and student-student interactions. Detailed information on the survey can be found at nsse.indiana.edu.

The first Canadian administration of NSSE in 2004 involved 11 institutions. Participation has grown steadily since, with over 40 universities participating in 2008. By the completion of the 2010 administration, 70 Canadian universities, satellite campuses and federated/affiliated institutions – almost the entire Canadian institutional population – had administered NSSE at least once.

Institutional response to NSSE results varies with institutional “experience” and has evolved over time. The initial Canadian response to NSSE results consisted largely of developing an understanding of the survey items and benchmarks at the institutional level, and of inter-institutional differences (particularly with respect to the large differences on several benchmark scores between Canadian and US peer institutions). Following this initial effort, several Canadian universities began to perform drilldown analysis on their own response data to explore Faculty- and (where sample size permitted) program-level and student subgroup engagement differences; and some began to exchange their results with other Canadian institutions to clarify the context for Canadian engagement performance and provide more meaningful “local” comparators. Beginning almost immediately after their first administration of the survey, most universities disseminated NSSE results internally to faculty and senior administration (generally at the university-level only) and over time, have begun to use the results in external communications and accountability reporting.

NSSE-based and engagement-related research activity has also expanded. In 2007, HEQCO provided funding to “The Ontario NSSE Interventions Project” – a series of engagement-based experiments at 10 Ontario universities intended to develop, document and share effective engagement field and assessment practices; to test the ability of NSSE and other data tools to measure the impacts of engagement experiments; and to contribute to policy discussions regarding the appropriate applications of NSSE to university accountability. (The final report for the project has been published by HEQCO and is available on its web site.) In the Fall of 2008, HEQCO funded another study with a goal to define the additional data and research required to support continued progress on NSSE implementation practice. The study – which relied heavily on the expertise and insights of NSSE participants at more than a dozen Canadian universities – identified three broad research priorities to address the outstanding engagement uncertainties that appeared to be limiting implementation progress: (a) the development of a mechanism for documenting and sharing engagement research and practice; (b) enhancements to the NSSE survey instrument to permit expanded analyses and to provide better Canadian context; and (c)

a multi-institution data sharing initiative that would create a Canada-wide record-level NSSE response file to support a range of reports and analyses that could not be performed using either summary survey results or institution-level or peer group data. These research priorities were shared with, and endorsed by Canadian university provosts at the October 2008 National Vice-Presidents' Academic Council (NATVAC) meeting. HEQCO committed to providing funding support for the third of these priorities: that is, the coordination and development of a national NSSE response file, and the analyses this file would make possible. It is this effort that became the NSSE National Data Project.

2. An Overview of the NSSE National Data Project

The NSSE National Data Project has two primary objectives. Both reflect the limitations of university-level (aggregate) data and of peer group (as opposed to institution-by-institution) comparisons. First, university faculty, academic administrators and service providers have indicated a desire for detailed program-level and student subgroup-level drilldown reports on a university-by-university (rather than peer group) basis for Canadian institutions in order to provide a clear reference point for academic unit-level engagement analysis, unit-level assessment, and the identification (and explanation) of promising engagement practices/results. The first objective then, was the creation of detailed NSSE reports at the academic unit/program level and for various student subgroups to facilitate focused academic and service delivery efforts within universities, and to clarify engagement opportunities across the sector. Second, drilldown analyses undertaken at Canadian universities, and research conducted by NSSE for US institutions has demonstrated that substantial engagement variation exists across programs and student subgroups. Other analyses also suggest that institutional size and other characteristics drive engagement levels. The roles of program mix, student characteristics and institutional character and context in determining institutional engagement measures are not well understood in the Canadian context. Thus, the second objective is a deeper understanding of the factors affecting engagement variation that will assist in interpreting and comparing institutional engagement scores, provide focus to institutional engagement strategies and support the development of policy regarding institutional accountability – for the level of and improvements to institutional engagement levels.

In April 2009, representatives of the 54 Canadian institutions that had participated in the 2008 or 2009 Canadian administrations of NSSE were sent a letter describing the general objectives, intended deliverables and likely participation requirements of the proposed project and were asked to provide an initial expression of interest in project involvement. Forty-six institutions indicated such an interest, a sufficient number to warrant development of a detailed analysis plan and participation protocol. A formal invitation to participate in the project, and a detailed participant package were sent to all institutions in August 2009. The participant package contained:

- a detailed analysis plan to implement the two primary project objectives above;
- a protocol governing use and disclosure of the data and reports generated from the project;
- a coding scheme for classifying academic programs;

- a record layout for submitted data (both NSSE responses and a series of additional fields containing student academic and biographic data from student records systems);
- additional information including a draft project schedule and membership of a project steering committee (constituted through volunteers from among the participating universities).

Forty-four universities ultimately participated in the project. Following data submission in October 2009, the 44 data files were merged, grading scales were standardized, and data were validated both centrally and through participant review. A version of the final data file with institutional code values was provided to HEQCO (whose analyst coordinated the multivariate analysis for the second objective). The NSSE National data file consists of approximately 69,000 records representing institutions that comprise about 60% of total undergraduate Canadian university enrolments. The file contains:

- 127 of the approximately 160 engagement, experience, demographic and benchmark score variables retained from NSSE response files;
- 7 fields appended to NSSE responses from student records (academic program code and name, subsequent September attrition/retention status, standardized admission grade average, standardized current semester/year academic grade average, application address postal code, basis of admission (direct/indirect from secondary school));
- Numerous additional fields generated from NSSE items, student records fields and/or institutional input (e.g., first/preferred language; university size grouping; first generation, First Nations, ethno-cultural statuses; student age grouping (traditional/non-traditional); province/region; student transfer status).

Definitions for several of the appended and calculated items are presented in Appendix 1 (academic programs) and Appendix 2 (student subgroups).

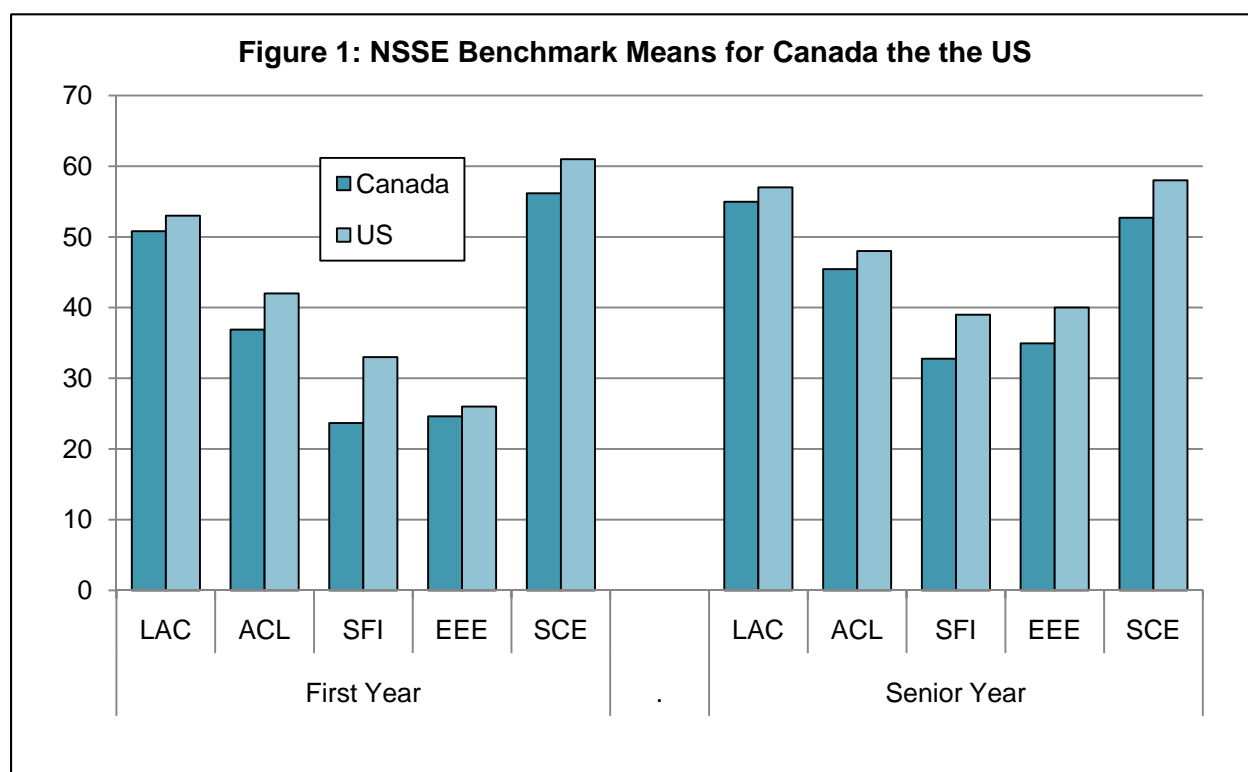
3. An Overview of University Engagement Patterns

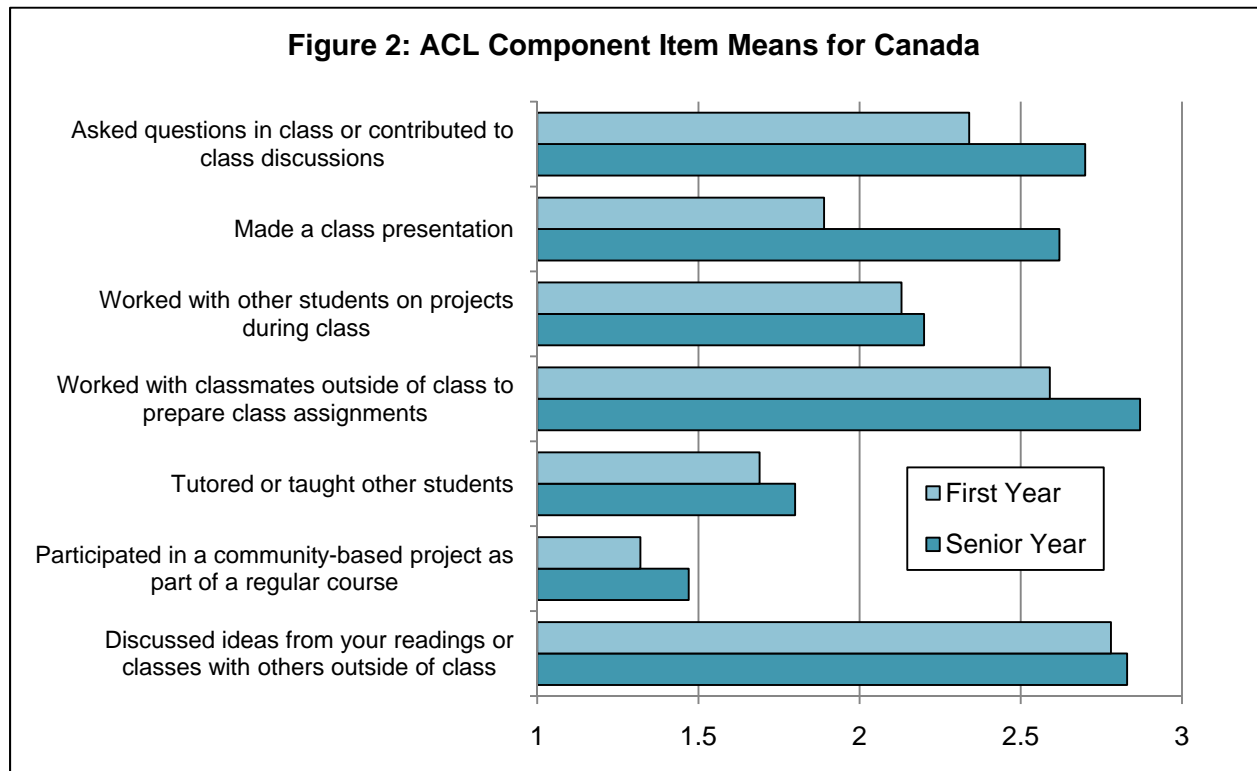
3.1 A National Perspective

The NSSE survey instrument contains over 100 engagement and experience response items, 42 of which deal specifically with various dimensions of student engagement. Engagement patterns can be explored at the individual item level; however, for the majority of this report, the 42 items are aggregated into NSSE's five established benchmarks of effective educational practice: Level of Academic Challenge (LAC), Active and Collaborative Learning (ACL), Student-Faculty Interaction (SFI), Enriching Educational Experiences (EEE) and Supportive Campus Environment (SCE). Canadian universities administering NSSE for the first time in 2004 and 2005 noticed significant differences between their own benchmark scores and those of peer institutions in the US. The NSSE National Data File demonstrates that this pattern continued through the 2008 and 2009 NSSE administrations as shown in Figure 1. Across all benchmarks and over both first- and senior-year students, average US engagement performance exceeds that in Canada, in one case (the first-year SFI benchmark) by almost 40%. Engagement within Canada varies by year of study (senior-year benchmark scores are

generally higher than first-year), and across benchmarks (with values ranging from the mid-twenties to the mid-fifties on standardized benchmark scales of 100).

As aggregate measures, the benchmarks provide an overall indication of engagement but do not identify the variation that may exist in the component items. Figure 2 provides an example of this item variation, and shows the components of the ACL benchmark for both first- and senior-year averaged across all Canadian participants. Significant item variation exists, with a fairly low level of student involvement in community-based projects and a much higher level of out-of-class interaction with peers.



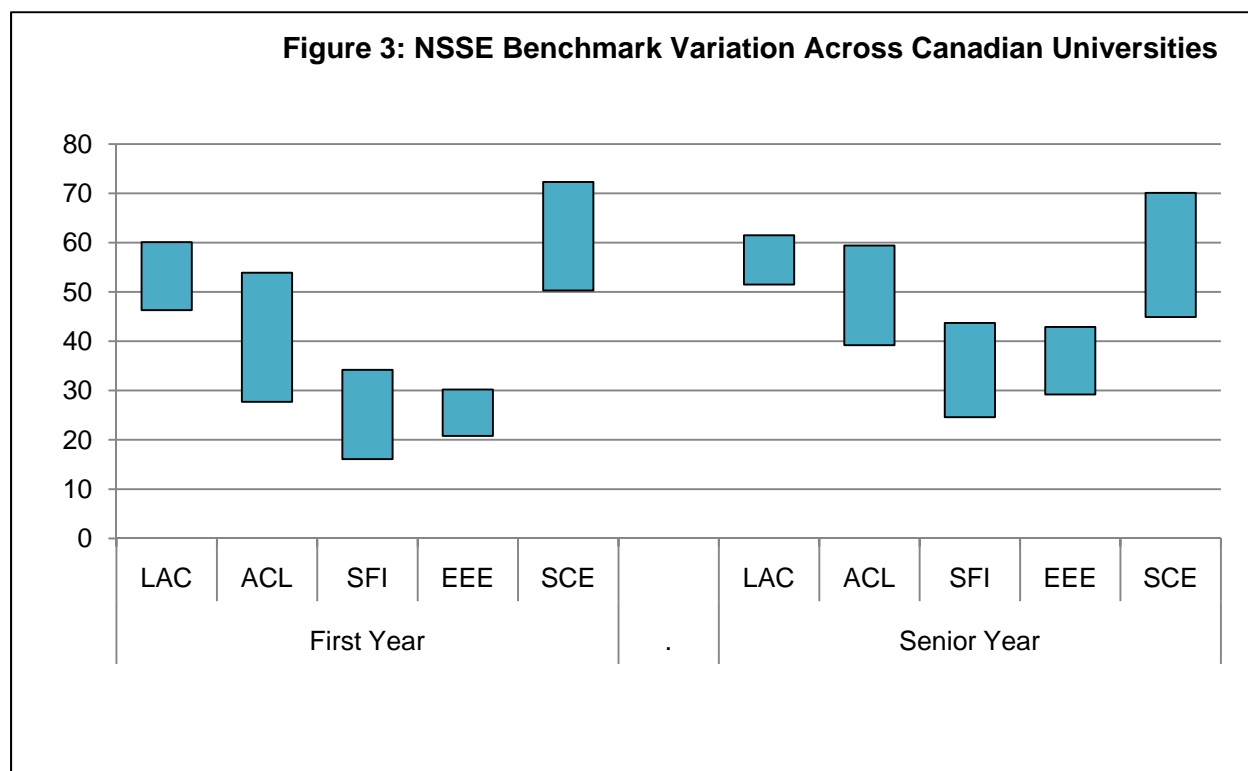


National averages like those presented above are a useful introduction to university engagement. However, in the past several years in Canada, analysis and exchange of NSSE response data have identified several additional dimensions of engagement that have been pursued to a limited degree but that can now be explored in more detail because of the existence of the NSSE National Data File. The following five sections (3.2 – 3.6) provide an overview of these dimensions: engagement variation across institutions, academic program-level engagement variation, student subgroup variation, variation by size of institution, and an overview of the interactions among these dimensions.

3.2 Institution-Level Variation in Engagement

Although most Canadian universities present their own NSSE benchmark scores (and selected items) individually on their institutional websites, Canadian institution-level engagement data are also published annually by Maclean's Magazine in the form of ranked and institutionally identified NSSE benchmark scores. A summarized version of these data is contained below in Figure 3, which indicates the difference between the minimum and maximum institution-level score for each of the five benchmarks. Substantial variation in the scores exists, with differences between the highest and lowest institutional benchmark scores ranging from 19% in the senior-year LAC benchmark to over 100% in the first-year SFI benchmark. While Maclean's does mention the individual items within each of the benchmarks, it provides no discussion of, or explanation for, the differences in benchmarks across institutions. In fact, the rank-order presentation in the absence of such an explanation and the use of the term "institutional accomplishment" in the text suggest that, as presented, benchmark scores are a sufficient indicator of quality; that quality attaches to the institution itself; that higher scores are

tantamount to higher quality; and that all institutions could and should achieve comparable engagement levels.



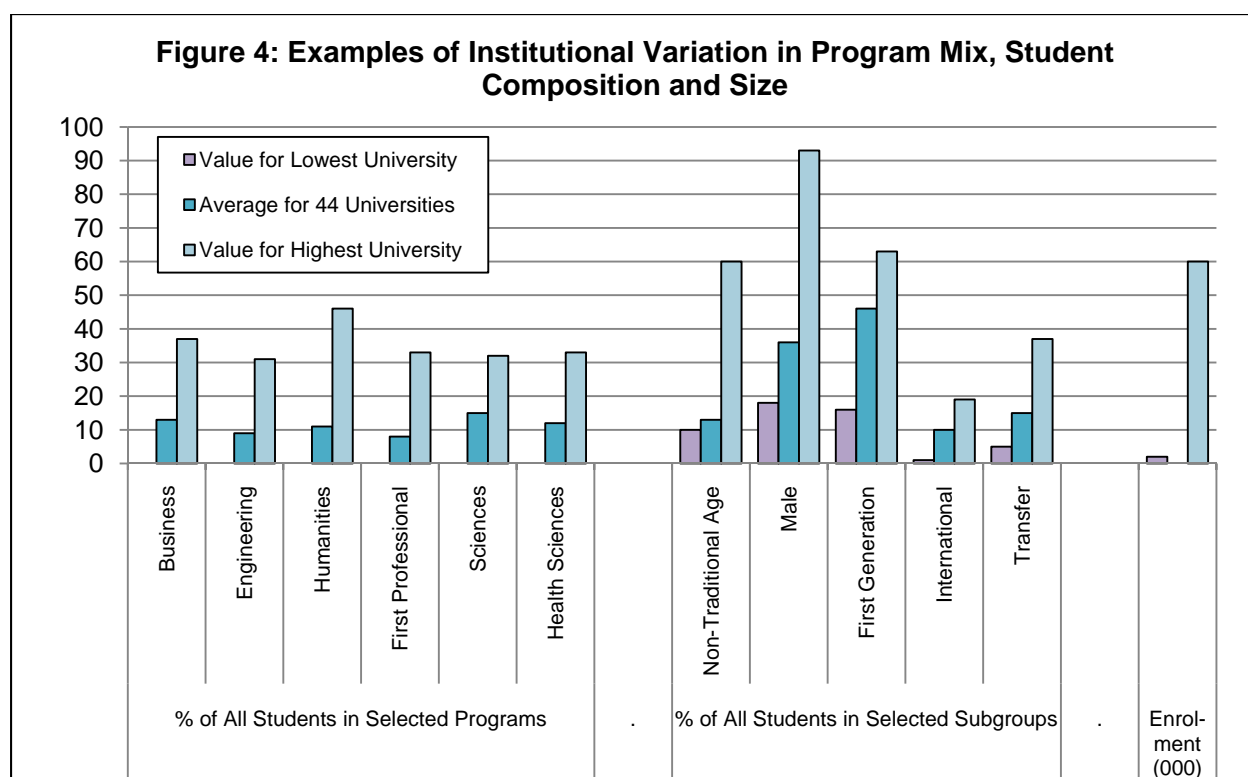
Such a suggestion, however, ignores two important facts. The first is that program mix and student composition differ institution by institution, and institutions vary with respect to their enrolment and the context in which they operate, all as a reflection of differing institutional mission, student demand and institution-specific issues and opportunities:

- **Program mix:** Canadian universities each deliver a different mix of academic programs and approach curriculum and program delivery in a different fashion. Some universities offer admission-to-program to students at the beginning of first-year; others involve a more general first-year with program declaration occurring in second or subsequent years. Some offer 3-year degrees (either as a general degree or in reflection of admission from CEGEPs); others offer only 4-year honours degrees. Some universities offer programs as first-entry, while (generally on a provincial basis) they are second-entry elsewhere. Some universities offer “transition year” programs that are structured differently from discipline-specific programs. Some universities offer a full range of programs at both the undergraduate, professional and graduate levels while others have a greater focus on specific undergraduate programs. Some have a greater focus on programs in the humanities and social sciences while others are dominated by professional programs.
- **Student composition:** The characteristics of students attending universities in Canada also show wide variation across institutions. The proportions of domestic and international students, traditional age and mature students, students from new Canadian and established Canadian families, students whose parents attended

university and those whose parents did not, students who commute to campus and those who live in residence, and students who attend full-time and those who attend part-time while maintaining employment vary significantly institution by institution.

- Enrolment and context: The sizes of Canadian universities and the environments in which they operate also differ. They range in size from a thousand to over 60,000 students. They are located in the heart of large cities and on the outskirts of small towns. They are often the only university in the city or region, but sometimes co-exist with one or more other nearby universities. Some offer residence/on-campus housing to only a small minority of students while others guarantee residence availability (at least to first-year students).

Figure 4 provides an overview of the diversity that exists with respect to program mix, student composition and institutional size across Canadian universities.



The second is that engagement varies across academic programs, student subgroups, and institutions of differing size and context. Each of these factors is discussed in greater detail below.

3.3 Program-Level Variation in Engagement

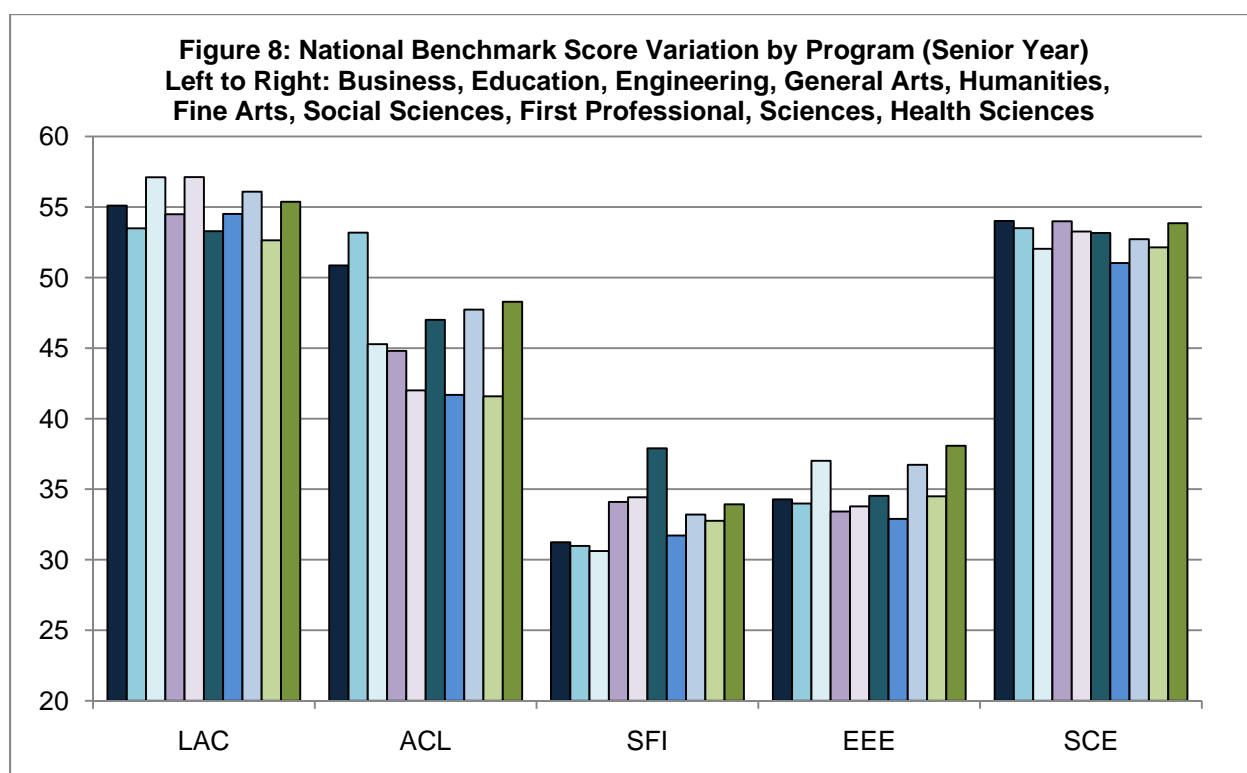
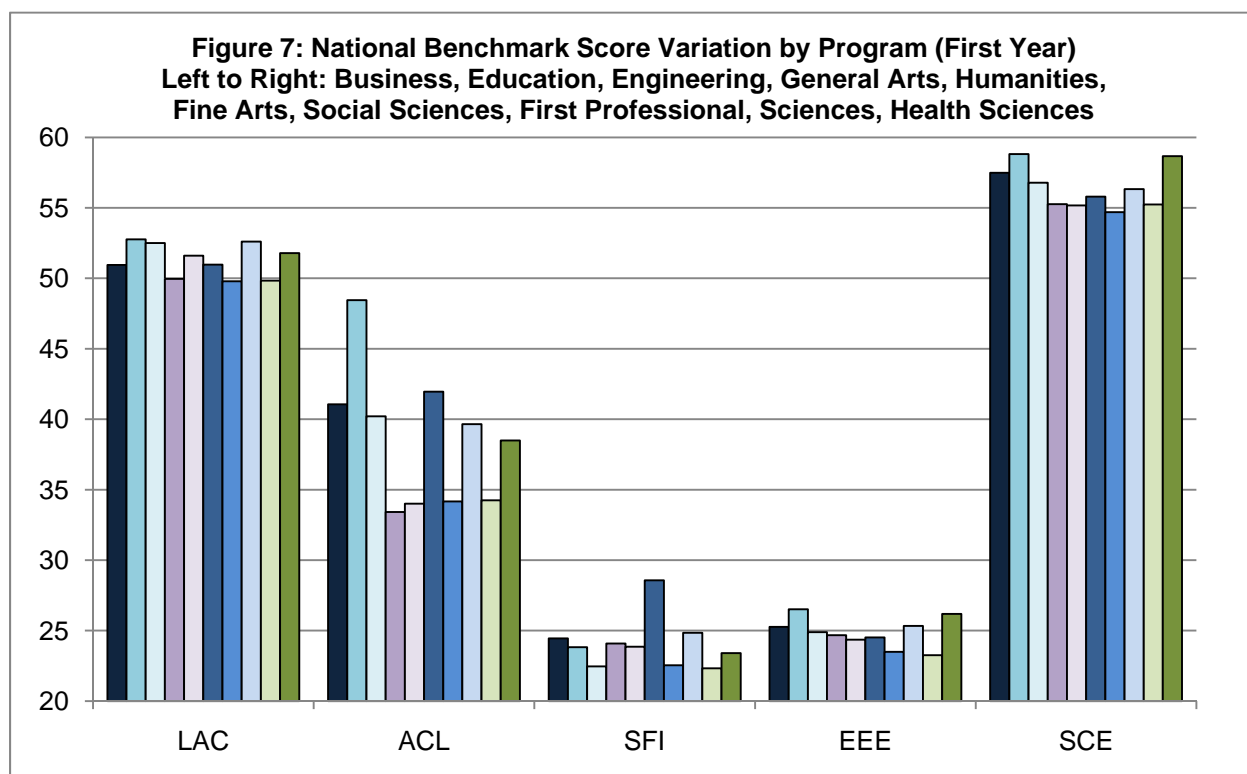
As noted above, academic programs of study differ in their delivery, pedagogy and professional focus. Analysis of engagement level and variation at the program level provide a substantial advantage by allowing these kinds of factors to be at least partly taken into account – for example by comparing one Sociology program to another, rather than one university to another regardless of program mix. The NSSE National Data File was developed in part to generate a

series of detailed reports (item means and frequencies, benchmarks and learning scales) presenting side-by-side NSSE results individually for each of the 44 participating institutions at the general discipline level (Unclassified, Business, Education, Engineering, General Humanities/Social Science/Liberal Arts, Humanities, Fine Arts, Social Sciences, First Professional, Science and Health Sciences) and at a more specific level (for about 75 academic program categories contained within the general disciplines). Mockups of portions of the program-level reports produced from the NSSE National Data File are presented in Figure 5 (means report) and Figure 6 (frequencies report).

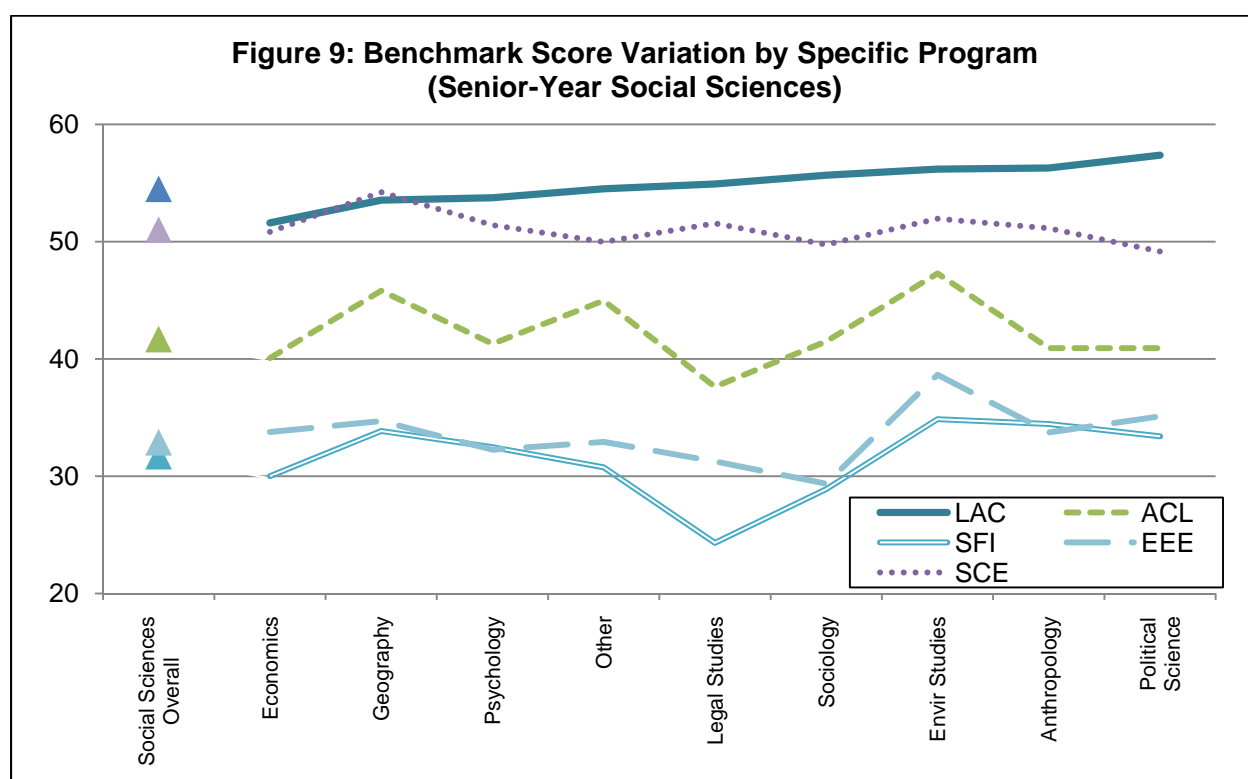
Figure 5: Mockup For Program-Level Means Report												
Program Group: Program X												
			University A	University B	University C	University D	University E	...	University X	University Y	University Z	Total
Asked questions in class or contributed to class discussions	FY	<i>N</i>	240	213	38	233	53		157	171	116	2510
		<i>Mean</i>	2.28	2.19	2.55	2.25	2.83		2.11	1.93	2.47	2.28
		<i>Std Dev</i>	0.75	0.77	1.06	0.86	0.80		0.81	0.74	0.76	0.82
		<i>Effect Size</i>	-0.25	-0.37	0.10	-0.27	0.47		-0.46	-0.72	0.00	.
	SR	<i>N</i>	110	115	42	100	62		90	87	79	1866
		<i>Mean</i>	2.85	2.73	2.83	3.19	2.97		2.88	2.83	2.68	2.75
		<i>Std Dev</i>	0.86	0.89	0.91	0.83	0.87		0.86	0.92	0.88	0.90
		<i>Effect Size</i>	0.20	0.06	0.17	0.60	0.33		0.23	0.17	0.00	
Made a class presentation	FY	<i>N</i>	240	212	38	234	52		157	172	116	2503
		<i>Mean</i>	1.75	2.00	1.58	2.35	2.54		1.58	1.61	1.53	1.99
		<i>Std Dev</i>	0.72	0.65	0.76	0.62	0.78		0.76	0.70	0.77	0.82
		<i>Effect Size</i>	0.30	0.68	0.07	1.22	1.31		0.07	0.11	0.00	
	SR	<i>N</i>	110	114	42	100	62		88	87	79	1864
		<i>Mean</i>	3.07	3.32	3.14	3.43	3.32		3.06	2.85	2.51	3.06
		<i>Std Dev</i>	0.86	0.74	0.84	0.74	0.65		0.85	0.97	0.68	0.84
		<i>Effect Size</i>	0.71	1.14	0.86	1.30	1.22		0.71	0.41	0.00	

Figure 6: Mockup for Program-Level Frequencies Report																
Program Group: Program Q (First-Year)																
	University A		University B		University C		University D		...		University Y		University Z		Total	
	N	%	N	%	N	%	N	%			N	%	N	%	N	%
<i>In your experience at your institution during the current school year, about how often have you done each of the following?</i>																
Asked questions in class or contributed to class discussions																
Never	40	22	8	18	1	4	7	9			7	18	11	35	230	13
Sometimes	93	51	28	64	13	48	39	51			12	32	14	45	894	51
Often	37	20	5	11	10	37	24	31			10	26	6	19	433	25
Very Often	11	6	3	7	3	11	7	9			9	24	.	0	194	11
Total	181	100	44	100	27	100	77	100			38	100	31	100	1751	100
Made a class presentation																
Never	32	18	10	24	.	0	1	1			21	55	5	16	258	15
Sometimes	122	69	30	71	13	48	32	42			13	34	16	52	947	54
Often	18	10	1	2	12	44	34	44			3	8	10	32	450	26
Very Often	5	3	1	2	2	7	10	13			1	3		0	93	5
Total	177	100	42	100	27	100	77	100			38	100	31	100	1748	100

An analysis of the means and frequencies reports reveals substantial benchmark and item variation by program at both the general discipline and specific program level. Figures 7 and 8 (for first-year and senior-year benchmarks respectively) indicate that while the LAC and SCE benchmark scores are reasonably consistent across the 10 general disciplines, there exists quite substantial variation in the ACL, SFI and EEE benchmarks. (Campus environment and academic challenge are more clearly, though apparently not exclusively, institution-level measures, since many services are delivered institution-wide and the overall academic climate is influenced by factors more general than the program itself.) Within general disciplines, relative benchmark scores also show considerable variation. The Health Sciences discipline, for example, shows an ACL benchmark score close to the all-disciplines average in both first-year and senior-year, but a very low score on the first-year SFI benchmark and the highest score for any discipline on the senior-year EEE benchmark.

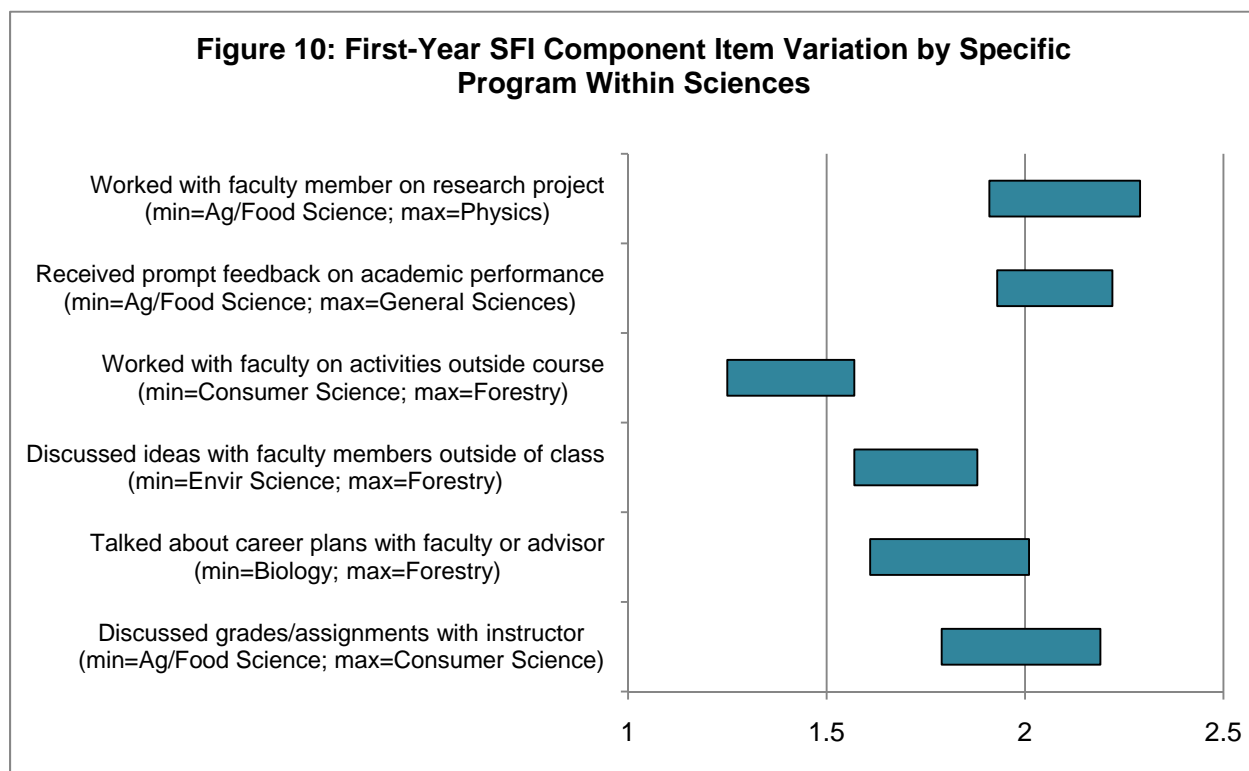


Benchmark scores across specific programs within the same general discipline also vary, as shown in Figure 9. Using senior-year Social Sciences as an example, Figure 9 displays the benchmark scores for each of the specific component academic programs, in ascending order of their LAC score. As was the case at the general discipline level, LAC and SCE scores are relatively consistent across the specific programs. However, Social Sciences programs vary substantially with respect to their student-faculty interaction, active and collaborative learning and enriching educational experiences scores. Programs that score well on one benchmark do not necessarily perform well on others. A glance at Environmental Studies programs shows average scores higher than the general discipline average on three of the five benchmarks, and supports at least a preliminary conclusion that the use of general discipline (or university-wide) benchmark scores may lead to unfocused engagement activity when applied at the academic unit level.



This pattern of program-level engagement variability carries over to individual items within the benchmarks. Figure 10 indicates the component items of the SFI benchmark and shows the minimum and maximum item means along with the specific academic programs with which they are associated. For example, within the Sciences overall, means for the “worked with faculty members on research” item vary from about 1.9 (Agriculture and Food Sciences) to about 2.3 (Physics) – a difference of about 20%.

Figure 10: First-Year SFI Component Item Variation by Specific Program Within Sciences



With respect to academic programs, the data demonstrate two key issues. First, engagement variation across both general disciplines and specific programs will translate into variations in institution-level benchmark scores when institutional program mix differs, and should be accounted for in institution-level benchmark comparisons. Second, program-level engagement variation is the result, in part, of differences in pedagogy, course format and course/program delivery that appear to set at least loose boundaries on program-level engagement potential.

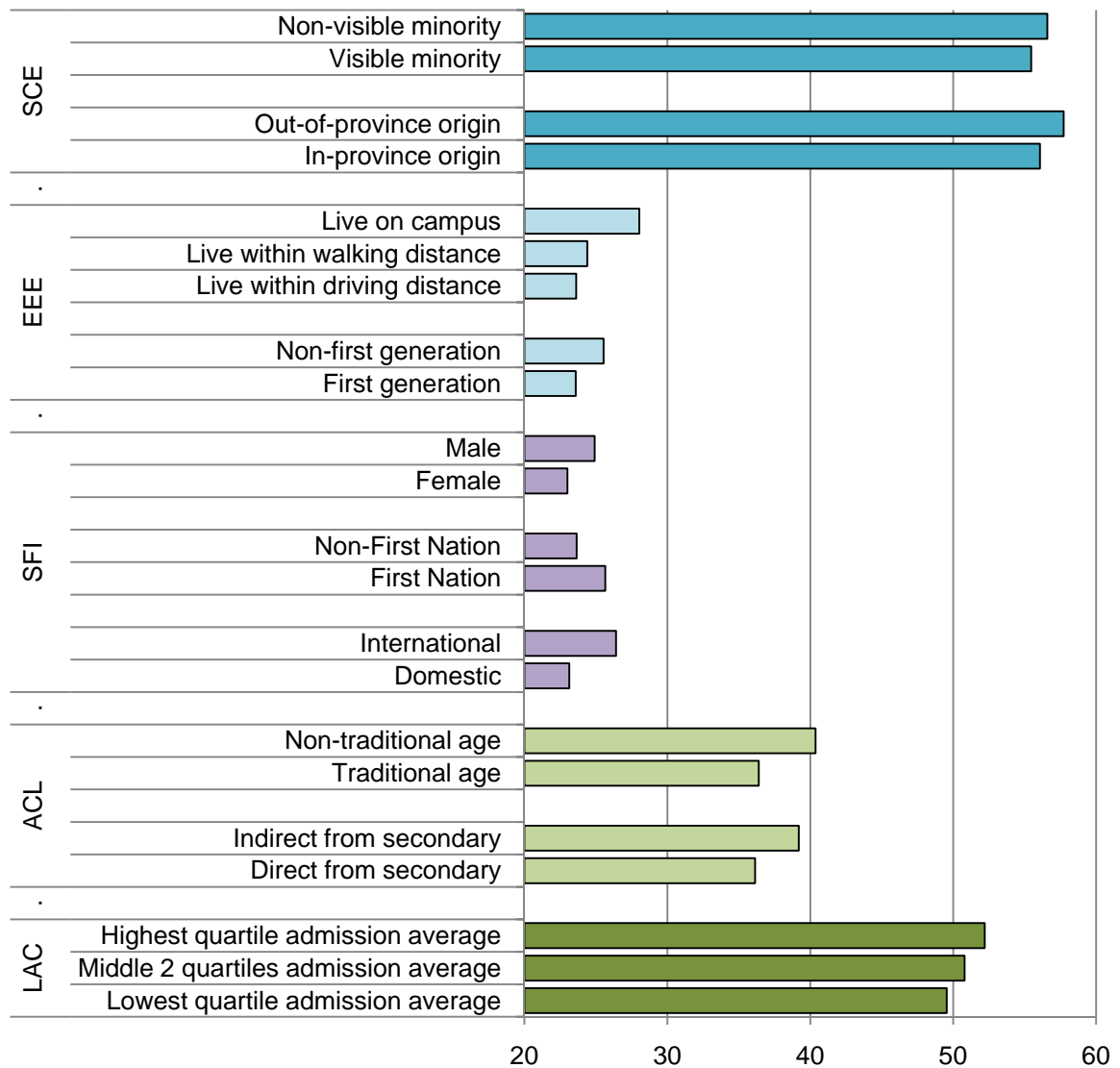
3.4 Student Subgroup Variation in Engagement

The NSSE National Data File categorizes students in numerous ways and permits engagement comparisons within and across these categories. A mock-up of the overall national student subgroup means report is presented in Figure 11. Some of these categories have particular relevance to academic operations (e.g., admission average) and to university service delivery (e.g., domestic vs. international student status). Others are of current public policy interest (e.g., first generation students). The composition of the student body varies substantially across Canadian universities. Some institutions serve a primarily local commuter population while others accommodate more widely dispersed students. Some have a substantial number of international or First Nations students. Several institutions admit most of their students direct from secondary school while others admit greater numbers of transfer students or serve a relatively high proportion of non-traditional older learners. The different learning styles, service needs and academic interests of these groups of students are well documented; if these differences translate into equally diverse engagement patterns, then an understanding of student subgroup engagement is essential to interpreting differences in university-wide engagement scores.

Figure 11: Mockup For Student Subgroups Means Report											
			First Generation		Admission Average			...	Accommodation & Location		
			Yes	No	Lowest Quartile	Middle Two Quartiles	Highest Quartile		In Residence	Short Commute/ Walking Distance	Long Commute/ Driving Distance
Asked questions in class or contributed to class discussions	FY	N	240	213	38	233	53		157	171	116
		Mean	2.28	2.19	2.55	2.25	2.83		2.11	1.93	2.47
		Std Dev	0.75	0.77	1.06	0.86	0.80		0.81	0.74	0.76
		Effect Size	0.00	-0.11	0.33	-0.04	0.67		-0.21	-0.43	0.23
	SR	N	110	115	42	100	62		90	87	79
		Mean	2.85	2.73	2.83	3.19	2.97		2.88	2.83	2.68
		Std Dev	0.86	0.89	0.91	0.83	0.87		0.86	0.92	0.88
		Effect Size	0.11	-0.02	0.09	0.49	0.24		0.14	0.09	-0.08
Made a class presentation	FY	N	240	212	38	234	52		157	172	116
		Mean	1.75	2.00	1.58	2.35	2.54		1.58	1.61	1.53
		Std Dev	0.72	0.65	0.76	0.62	0.78		0.76	0.70	0.77
		Effect Size	-0.30	0.01	-0.50	0.45	0.67		-0.50	-0.47	-0.56
	SR	N	110	114	42	100	62		88	87	79
		Mean	3.07	3.32	3.14	3.43	3.32		3.06	2.85	2.51
		Std Dev	0.86	0.74	0.84	0.74	0.65		0.85	0.97	0.68
		Effect Size	0.01	0.31	0.10	0.44	0.31		0.00	-0.25	-0.66

Figure 12 provides a few examples of the many student subgroup engagement comparisons available in the data. It presents national average benchmark scores for selected student groups and indicates, for example, that visible minority students have slightly lower scores on the SCE benchmark than non-visible minority students; that EEE scores decline significantly as the distance from the student's lodgings to campus increases; and that the most highly qualified students (in terms of their admission average) experience the highest level of academic challenge. Though not presented in the table, individual item scores within each of the benchmarks also show substantial variation by student group, and student groups scoring above average on one benchmark or item frequently show lower than average scores on other benchmarks or items.

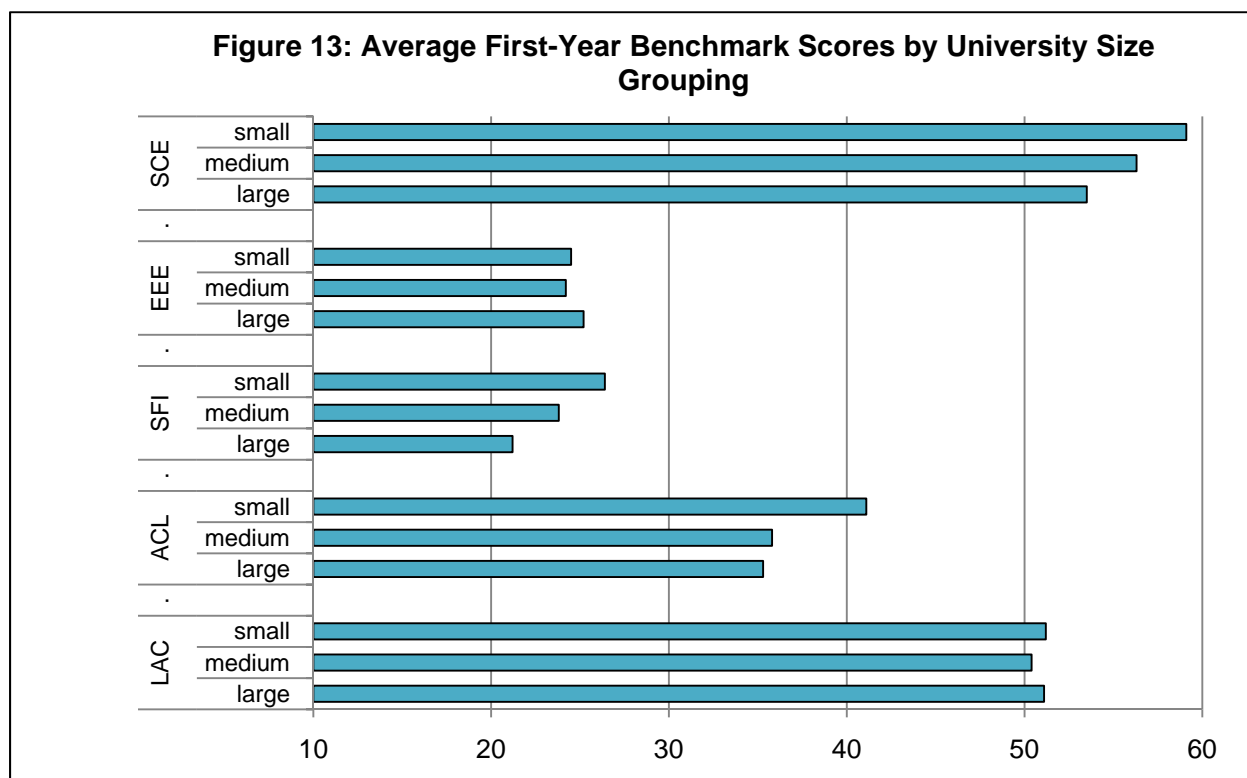
Figure 12: National First-Year Benchmark Score Variation by Student Subgroup (Selected Examples)



3.5 Engagement Variation by Size and Character of Institution

Data available in the NSSE National Data File permit an analysis of the relationship between institutional size and engagement and of a limited number of other “institutional context and character” issues. With respect to institutional size for example, NSSE research on US institutions has indicated a general decline in engagement level for several benchmarks as institutional enrolment increases. Figure 13 confirms that roughly the same pattern applies in Canada. Small institutions experience higher average scores for the first-year SCE, SFI and

ACL benchmarks. However, the EEE and LAC benchmarks appear largely insensitive to institutional size. Highly similar results hold for senior-year students.



3.6 Institution, Program and Student Subgroup Interactions

A university in which Science programs constitute a larger-than-average share of the total and whose students are primarily first generation is, all else equal, likely to generate engagement scores different from those at a university where Social Sciences programs dominate and whose students come from families with a history of postsecondary involvement. As such, institution-wide engagement levels and inter-institutional differences are not single best measures of institutional quality (as implied by context-free rankings) but rather, the result of various institutional, program and student factors and of the interactions among them. And although higher engagement is certainly preferable to lower engagement, expectations for and interpretation of engagement scores, and institutional responses to them should take account of engagement drivers.

Figure 14: An Example of Institution, Program and Student Subgroup Interactions for First-Year Students

University	Program A						Program B					
	% Female	% Male	% in Lowest Quartile Admission Average	% in Highest Quartile Admission Average	SFI Score	LAC Score	% Female	% Male	% in Lowest Quartile Admission Average	% in Highest Quartile Admission Average	SFI Score	LAC Score
1	26%	74%	37%	19%	22.83	52.79	40%	60%	53%	0%	27.90	47.42
2	17%	83%	9%	28%	21.75	55.41	61%	39%	51%	7%	20.45	47.91
3	17%	83%	40%	11%	23.84	53.80	64%	36%	33%	21%	24.18	50.69

Figure 14 demonstrates that Program “A” at University “1” has an enrolment that is one-fourth female, and admits more than the average proportion of students from the university’s lowest quartile of admission averages. Program “A” at University “2” consists of only 17% female students and admits disproportionately fewer students from the bottom grades quartile. The SFI and LAC scores for the two universities each differ by about 5%. Program “B” at the three universities varies from 40% - 64% female and admits students from the highest grade quartile at rates ranging from 0% - 21%. SFI scores across the three institutions differ by over 35% and LAC scores by about 7%. The Program “B” LAC benchmark score is lower (within each institution) than that of Program “A” by 6% - 16% but its SFI benchmark score is typically higher than that in Program “A”. The variation in program-based and student subgroup-based engagement discussed above confirms that these differences are not entirely attributable to the institution itself. (Actual data are used in the figure.) SFI benchmark differences as high as 35% due in some part to varying program and student characteristics (but not institutional characteristics) are not trivial: in the 2009 Maclean’s magazine issue that presented NSSE benchmark rankings, a 35% difference captured the top 30 of all 50 institutions reported on.

3.7 Summary of Engagement Drivers and Interactions

The preceding discussion likely raises more questions than it answers. In a sense, that was its intention – to demonstrate the complexities associated with interpreting engagement scores and identifying the key dimensions of engagement variation. It is clear that institutional characteristics and program and student mix – presumably along with numerous factors not included in the discussion – play a role in engagement variation and that context-free university-wide engagement comparisons are at best an incomplete basis for quality assessment. The central questions discussed above – how to “sort out” the various factors associated with engagement, and how to use this information to appropriately focus engagement improvement efforts – are addressed in Section 4 below.

3.8 First-to-Second Year Attrition

While the primary focus of this project is an exploration of engagement variation by institution, academic program and student subgroup, the NSSE National Data File also provided an opportunity to record the registration status of first-year students in the Fall semester immediately following NSSE administration. It therefore permits an analysis of the engagement patterns of first-year students who are retained and those who are not, and perhaps some preliminary conclusions concerning the relationships between engagement and attrition.

Figure 15 compares students in the two categories of subsequent Fall registration status with respect to their engagement profiles in the preceding academic year. Mean item and benchmark score differences greater than (an arbitrary) 5% are highlighted. The figure is intended to provide a preliminary descriptive overview only, for several reasons. First, we know that student retention/attrition behaviour results from a variety of factors, and is associated with more than just the engagement/experience items presented. Second, it is impossible to determine from the data whether (generally lower) engagement was a key contributing factor in student departures, or whether the decision to depart contributed to a particular engagement profile. Third, while departing students left the university, they did not necessarily leave the postsecondary system: they may have transferred or stopped out. Despite these qualifiers, the data clearly indicate that soon-to-depart students report lower levels of engagement across the majority of the benchmarks, and report a less positive and supportive experience overall. To

the extent that engagement appears to be associated in some way with attrition, an analysis of multiple attrition drivers (including engagement) appears to be worthwhile. Certain factors – participation in part-time employment, providing care to others and self-assessed learning and skills acquisition provide preliminary clues to the engagement-attrition link but they must be placed in context with other possible contributors.

Figure 15: Engagement Profiles for Retained and Attritioned First-Year Students					
Item/Benchmark/Scale†	Retained	Attritioned	Item/Benchmark/Scale†	Retained	Attritioned
Asked questions in class or contributed to class discussions	2.35	2.31	Quality of relationships with faculty members	4.95	4.72
Made a class presentation	1.91	1.81	Quality of relationships with administrative personnel and offices	4.53	4.39
Prepared 2+ drafts of a paper before turning it in	2.30	2.28	Preparing for class (studying, reading, writing, etc.)	4.25	3.72
Worked on project that required integrating ideas	3.01	2.89	Working for pay on campus	1.19	1.26
Included diverse perspectives in discussions or assignments	2.48	2.46	Working for pay off campus	2.41	2.96
Come to class without completing readings or assignments	2.20	2.25	Participating in co-curricular activities	1.81	1.71
Worked with other students on projects during class	2.14	2.06	Relaxing and socializing	3.85	3.87
Worked with classmates outside class to prepare assignments	2.62	2.33	Providing care for dependents living with you	1.79	2.16
Put together ideas from different courses in assignments	2.69	2.53	Commuting to class (driving, walking, etc.)	2.56	2.62
Tutored or taught other students	1.69	1.54	Spending significant amounts of time studying	3.12	3.00
Participated in a community-based project as part of a course	1.32	1.32	Providing the support you need to help you succeed academically	2.92	2.74
Used electronic medium to discuss or complete an assignment	2.78	2.56	Encouraging contact among students from different backgrounds	2.43	2.34
Used e-mail to communicate with an instructor	2.82	2.78	Helping you cope with your non-academic responsibilities	2.02	1.95
Discussed grades or assignments with an instructor	2.16	2.13	Providing the support you need to thrive socially	2.27	2.10
Talked about career plans with a faculty member or advisor	1.66	1.68	Attending campus events and activities	2.62	2.45
Discussed ideas with faculty members outside of class	1.72	1.68	Using computers in academic work	3.21	3.07
Received prompt feedback from faculty on academic performance	2.27	2.23	Acquiring a broad general education	3.07	2.87
Worked harder than you thought you could to meet expectations	2.49	2.38	Acquiring job or work-related knowledge and skills	2.72	2.43
sWorked with faculty on activities other than coursework	1.37	1.34	Writing clearly and effectively	2.80	2.66
Discussed ideas with others outside of class	2.80	2.65	Speaking clearly and effectively	2.53	2.40
Had serious conversations with students of different race/ethnicity	2.64	2.53	Thinking critically and analytically	3.17	2.96
Had serious conversations with students of different beliefs, etc.	2.64	2.55	Analyzing quantitative problems	2.85	2.64
Memorizing facts, ideas, methods from your courses and readings	2.88	2.81	Using computing and information technology	2.80	2.63
Analyzing the basic elements of an idea, experience, or theory	3.09	2.94	Working effectively with others	2.80	2.55
Synthesizing and organizing ideas, information, or experiences	2.80	2.67	Voting in local, provincial or federal elections	1.98	1.87
Making judgments about value of info, arguments, or methods	2.73	2.65	Learning effectively on your own	2.93	2.70
Applying theories or concepts to practical problems	3.03	2.82	Understanding yourself	2.66	2.51
Number of assigned textbooks or packs of course readings	3.28	3.16	Understanding people of other racial and ethnic backgrounds	2.45	2.35
Number of books read for enjoyment or enrichment	2.11	2.22	Solving complex real-world problems	2.57	2.36
Number of written papers or reports of 20 pages or more	1.42	1.44	Developing a personal code of values and ethics	2.49	2.32
Number of written papers or reports between 5 and 19 pages	2.43	2.35	Contributing to the welfare of your community	2.24	2.09
Number of written papers or reports of fewer than 5 pages	2.56	2.50	Developing a deepened sense of spirituality	1.73	1.74
Number of problem sets that take you > 1 hour to complete	2.89	2.75	Overall, evaluate the quality of academic advising you received	2.87	2.67
Number of problem sets that take you < 1 hour to complete	2.31	2.25	Evaluate your entire educational experience at this institution	3.12	2.78
The extent to which exams challenged you to do your best work	5.39	5.06	If you could start over, would you go to the same institution	3.30	2.83
Examined the strengths and weaknesses of your own views	2.42	2.43	Level of Academic Challenge	51.21	47.51
Tried to better understand someone else's views	2.65	2.66	Active and Collaborative Learning	37.36	33.56
Learned something that changed the way you understand an issue	2.84	2.77	Student-Faculty Interaction	23.88	23.40
Practicum, internship, field experience, co-op experience, etc. *	0.09	0.08	Enriching Educational Experiences	24.82	23.26
Community service or volunteer work *	0.28	0.27	Supportive Campus Environment	56.65	51.91
Participate in a learning community *	0.11	0.09	Deep Learning - Higher Order Thinking Subscale	67.30	63.99
Work on research project with faculty outside of course *	0.03	0.04	Deep Learning - Integrative Learning Subscale	61.07	59.20
Coursework in a foreign or additional language *	0.14	0.14	Deep Learning - Reflective Learning Subscale	59.68	60.09
Study abroad *	0.04	0.06	Deep Learning Scale	62.97	61.29
Independent study or self-designed major *	0.01	0.05			
Quality of relationships with other students	5.46	4.97	* differences subject to high volatility		

4. Explaining Engagement and Retention Variation in Canadian Universities

4.1 Methodology

Sorting out the role of various engagement and attrition drivers, and of the interactions among them, can be performed through the use of multiple regression analysis. A regression model measures the degree to which variation in the dependent variable (in this project, engagement level and attrition/retention status) is accounted for by one or more independent variables (i.e., institutional, program and student characteristics in the case of engagement, and these three factors plus engagement in the case of attrition). Both continuous/ ordinal and dichotomous dependent variables can be modeled using different forms of regression analysis. Regression models are useful both for understanding the factors associated with engagement variation, and for comparing actual data with predicted results (i.e., after applying controls). Several measures exist for assessing the quality of a regression analysis: the proportion of the total variation in the dependent variable that is explained by the independent variables in the model (R^2), and the strength, direction and importance of each of the independent variables in the model (significance/prob-value, coefficient sign and coefficient).

The NSSE National Data File contains about 69,000 student records representing 44 university campuses. Multiple regressions can be used to explain engagement at both the student level and at the institutional level. At the student level, a regression model predicts each individual student's engagement score (in this project, at the benchmark level) as a function of student-specific variables such as program of enrolment and personal characteristics, and institution-level variables such as institution size and identity. The explanatory power of student-level regression models is likely to be fairly low because of the wide variation in student engagement (i.e., from 0 to 100 on any of the benchmarks) and more generally because the available dependent variables presumably capture only a small portion of the student engagement “dynamic” at the individual student level. Student characteristics can also be aggregated to the institutional level: for example, a 0/1 variable indicating whether each student has domestic or international status can be aggregated to an institution-level variable expressing the percentage of total enrolment arising from domestic or international students. At the institutional level, a regression model predicts each institution's engagement score as a function of, for example, the percentage of its students in each of various programs, the percentage of its students having first generation status, and its size (enrolment). The explanatory power of institution-level models is likely to be considerably higher than that of the student-level models because aggregation masks a substantial proportion of engagement variability (i.e., institutional benchmark scores are likely to vary only between, say, 40 and 60 rather than between 0 and 100). The signs for the independent variable coefficients (that is, whether engagement drivers are positively or negatively correlated with engagement) will likely be the same in both types of models.

Regression models were constructed using both forced inclusion (of individual independent variables and clusters of independent variables) in order to identify the role of program, student and institutional drivers, and stepwise entry (of individual independent variables) to avoid multicollinearity and generate more reliable coefficients for controls. Not all students or institutions could be included in all models because of missing data.

4.2 Student Record-Level Model Results - Engagement

The results of the LAC first-year regression analysis are presented in detail in Figure 16. Variables were entered into the models in stepwise clusters, resulting in models that included only student characteristics, student characteristics plus academic program mix plus university size, etc. (In other words, all student characteristics were entered, then additionally all program mix variables, etc.) The figure permits a number of observations:

- Several student characteristics were significant predictors of LAC engagement: gender, parental educational attainment, ethnocultural status, commuting behaviour, high school and current grades, full-time/part-time attendance, and university transfer status. Age, language (French/English), domestic/international status, province of origin, and CEGEP/college transfer status were not significant predictors. The significance of student characteristics alone was retained following the inclusion of academic program of study variables, and for the most part, survived the entry of institutional size as well.
- The majority of programs showed engagement patterns significantly different from the reference program (Social Sciences) and remained significant following entry of both institutional size and institutional identity dummy variables.
- Given the LAC intercept value (approximately 50 on a theoretical scale of 0 to 100), the general pattern is for individual student characteristics to predict changes in student LAC scores of less than ± 2 , or $\pm 4\%$ of the mean. Academic program appears to have slightly larger effects (up to ± 3 points, or 6% of the mean). The coefficient for the “small university” group of 9.7 (almost 20% of the average LAC) after institutional, student and program controls, indicates a powerful engagement effect in play at small institutions relative to the “medium-sized university” reference group. Interestingly, the coefficient for the “large university” variable indicated it was not significantly different from the “medium university” reference group.
- Of the 39 institutions whose students were included in the model, slightly more than half (20 to 23) generated significant coefficients (relative to the reference university: a mid-sized institution whose benchmark scores were closer to the national average than any other institution); these coefficients ranged from -14.7 to 1.3. Inclusion of institutional size in the model increases rather than decreases the number of institutions with significant dummy coefficients, suggesting LAC engagement is driven by factors quite distinct from institutional size.
- Student characteristics alone explain less than 2% of LAC variation measured at the student level. The inclusion of academic programs and size and then of institutional identities increases the total explained variation to just over 4%. Caution is warranted given the relatively low R^2 , but it appears that institutional size and (for slightly more than half of the institutions) institutional identity are somewhat stronger engagement drivers than the (still significant) student characteristics and academic program mix variables. Clearly, student-level LAC engagement is associated with far more factors than those captured in the NSSE National Data File.

**Figure 16: First-Year Student-Level Regression Model Results
(LAC Benchmark)**

Independent Variable	Model Types			
	Student Only	Student + Program + University Size	Student + Program + University Size + University	University Only
Student Characteristics				
Age (traditional=1)	-0.291	-0.155	-0.249	
Gender (male=1)	-1.118***	-1.381***	-1.326***	
Language (French=1)	0.456	-0.424	-0.674	
Parental Attainment (first gen=1)	-0.542***	-0.617***	-0.479***	
Ethnocultural Status (visible minority=1)	0.741***	0.618***	0.258	
Residency (international=1)	0.586	0.565	0.726	
Accommodation (short commute=1)	-1.098***	-0.886***	-0.31	
Accommodation (long commute=1)	-0.955***	-0.843***	-0.421*	
Provincial Origin (out of province=1)	-0.369	-0.305	-0.0642	
High School Grade (lowest quartile=1)	-0.493**	-0.311	-0.271	
High School Grade (highest quartile=1)	0.954***	0.910***	0.767***	
Current Grades (lowest quartile=1)	-1.577***	-1.501***	-1.545***	
Current Grades (highest quartile=1)	0.582***	0.578**	0.696***	
Attendance (full-time=1)	3.461***	3.358***	3.369***	
Transfer Status (from college=1)	0.498	0.325	0.139	
Transfer Status (from university=1)	1.229***	1.007**	0.603	
Transfer Status (from CEGEP=1)	0.392	0.234	-0.637	
Program Mix				
Program (Business=1)		1.113***	1.135***	
Program (Education=1)		2.671***	2.679***	
Program (Engineering=1)		2.786***	3.252***	
Program (General=1)		0.283	0.245	
Program (Humanities=1)		0.921**	0.954**	
Program (Fine Arts=1)		0.564	0.063	
Program (First Professional=1)		2.496***	2.133***	
Program (Sciences=1)		-0.152	0.0398	
Program (Health Sciences=1)		0.922***	1.097***	
University Size				
University Size Group (small=1)		0.749***	9.732***	
University Size Group (large=1)		0.347	1.875	
University Identity				
Institutions with significant coefficient at < .05			23	20
maximum (-) institutional coefficient			-14.74***	-5.398***
maximum (+) institutional coefficient			1.326*	8.999
Constant	48.78***	47.88***	48.45***	51.38***
Number of Observations	22,398	21,791	21,791	33,232
R-Squared	0.017	0.022	0.042	0.023
Note: *** = <.01; ** = <.05; * = <.10; 39 of 44 institutions modelled				

The model results for all first-year and senior-year benchmarks are presented in a more summarized format in Figure 17 (first-year) and Figure 18 (senior-year). The figures suggest:

Figure 17: Summary of First-Year Student Record-Level Regression Model Results - Engagement (Student + Program + University Size + University Identity Model)					
Model Item	LAC	ACL	SFI	EEE	SCE
Student Characteristics					
Age (traditional=1)					1.751
Gender (male=1)	-1.326	1.760	2.366		
Language (French=1)		3.657			
Parental Educational Attainment (first gen=1)	-0.479	-1.408	-1.256	-1.193	-0.771
Ethnocultural Status (visible minority=1)			2.027	1.349	
Residency (international=1)		1.686	2.679	-0.878	3.287
Accommodation (short commute=1)				-1.003	-2.868
Accommodation (long commute=1)		-0.677	-0.949	-1.472	-3.020
Provincial Origin (out of province=1)				0.719	
High School Grade (lowest quartile=1)					0.739
High School Grade (highest quartile=1)	0.767	0.539		1.249	-0.581
Current Grades (lowest quartile=1)	-1.545	-1.835			-1.132
Current Grades (highest quartile=1)	0.696	1.600	0.917		1.416
Attendance (full-time=1)	3.369				1.351
Transfer Status (from college=1)		1.175	1.525		
Transfer Status (from university=1)		1.430	2.116	2.155	
Transfer Status (from CEGEP=1)					
Program Mix					
Program (Business=1)	1.135	5.563		1.022	1.875
Program (Education=1)	2.679	9.780	1.652	4.780	2.643
Program (Engineering=1)	3.252	4.992	-2.782		1.314
Program (General=1)					
Program (Humanities=1)	0.954				
Program (Fine Arts=1)		6.056	5.177		1.748
Program (First Professional=1)	2.133	3.541	1.575	1.265	1.181
Program (Sciences=1)			-1.733	-1.928	
Program (Health Sciences=1)	1.097	2.386		1.412	2.502
University Size					
University Size Group (small=1)	9.732	9.970	9.720		6.098
University Size Group (large=1)		-3.706			
University Identity					
Institutions with significant coefficient at < .05	23	24	25	16	16
Maximum (-) institutional coefficient	-14.740	-13.430	-13.860	-7.757	-11.590
Maximum (+) institutional coefficient	1.326	none	none	3.075	5.160
Constant	48.45	36.16	22.05	24.15	55.51
Number of observations	21,791	21,562	21,687	21,738	21,751
R-Squared					
student only	0.017	0.049	0.019	0.023	0.024
student + program + university size	0.022	0.103	0.045	0.032	0.044
student + program + university size + university identity	0.042	0.134	0.058	0.049	0.069
university only	0.023	0.084	0.033	0.023	0.043

Note: 39 of 44 universities included in models; all coefficients shown are significant at < .05

(a) for first-year students:

- Student characteristics play varying roles across the five benchmarks. Typically, 6 to 10 of the 17 student characteristics modeled are significant for any single benchmark. Age (traditional vs. non-traditional) is significant only for one benchmark; parental educational

attainment is significant for all five benchmarks

Figure 18: Summary of Senior-Year Student Record-Level Regression Model Results - Engagement (Student + Program + University Size + University Identity Model)					
Model Item	LAC	ACL	SFI	EEE	SCE
Student Characteristics					
Age (traditional=1)				2.436	
Gender (male=1)	-2.640		1.123	-1.954	
Language (French=1)	2.763	5.977			5.476
Parental Educational Attainment (first gen=1)		-1.182	-1.319	-2.070	
Ethnocultural Status (visible minority=1)					
Residency (international=1)					2.114
Accommodation (short commute=1)					
Accommodation (long commute=1)		-1.073	-1.309	-3.145	-3.502
Provincial Origin (out of province=1)		1.529	2.601	2.531	
High School Grade (lowest quartile=1)				-1.216	
High School Grade (highest quartile=1)			2.938	2.510	
Current Grades (lowest quartile=1)				0.759	
Current Grades (highest quartile=1)				-1.727	
Attendance (full-time=1)	3.280	2.435	1.753	3.608	1.166
Transfer Status (from college=1)					
Transfer Status (from university=1)		1.010	2.089		
Transfer Status (from CEGEP=1)					
Program Mix					
Program (Business=1)	1.228	8.333	-1.202	2.692	3.717
Program (Education=1)		11.300		3.744	
Program (Engineering=1)	4.366	3.766	-2.135	3.116	2.222
Program (General=1)		1.415			
Program (Humanities=1)	1.875		1.493		2.009
Program (Fine Arts=1)	-1.305	4.122	5.705		3.110
Program (First Professional=1)	1.116	7.290	1.662	3.507	2.195
Program (Sciences=1)					
Program (Health Sciences=1)		4.786		3.917	3.011
University Size					
University Size Group (small=1)					
University Size Group (large=1)	-4.979		-9.081	2.021	
University Identity					
Institutions with significant coefficient at < .05	13	12	8	7	9
Maximum (-) institutional coefficient	-13.840	-8.291	-7.715	-7.092	-6.789
Maximum (+) institutional coefficient	7.190	5.991	12.120	4.852	6.216
Constant	52.14	41.41	30.11	33.46	50.13
Number of observations	15,807	15,605	15,724	15,783	15,786
R-Squared					
student only	0.022	0.011	0.028	0.047	0.018
student + program + university size	0.043	0.081	0.047	0.058	0.046
student + program + university size + university identity	0.053	0.104	0.061	0.071	0.070
university only	0.021	0.048	0.037	0.026	0.046

Note: 40 of 44 universities included in models; all coefficients shown are significant at < .05

with first generation status carrying a consistent negative coefficient; gender and high school grades have a positive coefficient for some benchmarks but a negative coefficient for others. Visible minority and international students show selectively higher levels of engagement; commuter students (both long- and short-distance commuters) show engagement levels generally lower than those of on-campus students.

- Engagement within academic programs (relative to the Social Sciences reference program and after controlling for student characteristics and institutional size) is highest in First Professional, Business, Education and Health Sciences programs. Of particular

note are the high positive ACL coefficients for Education, Fine Arts and Business, and the high positive SFI coefficient for Fine Arts.

- Benchmark engagement is affected by university size but primarily only at small institutions. Small institutions show much higher engagement levels for four of the five benchmarks relative to the medium-sized reference group, but only the ACL benchmark shows a difference between medium-sized and large institutions.
- About half of the institutions (between 16 and 24 across each of the five benchmarks) carry significant coefficients, indicating that institutional identity is related to engagement after controlling for student and program characteristics.

(b) for senior-year students:

- The number of student characteristics serving as significant drivers of engagement declines for each benchmark and overall relative to first-year students. In particular, high school grades and current grades are no longer the strong engagement predictors they were for first-year students. However, first generation status is still associated with lower engagement, and the role of full-time (FT)/part-time (PT) status is now significant across all five benchmarks. The SFI and EEE benchmarks remain the most sensitive to student characteristics. The decline in the explanatory role of student characteristics may imply that students overcome numerous predisposition barriers as they become “socialized” to academic and social life on-campus, or more simply that students are disproportionately retained into senior-year when they display predisposition advantages rather than barriers.
- The explanatory role of program mix remains important in senior-year. Business, Education and First Professional programs remain the strongest (relative to the Social Sciences reference) and the ACL and SFI benchmarks provide the highest degree of differentiation across programs.
- The small vs. medium+large institution engagement difference for first-year students transforms into significant small+medium vs. large institution differences for senior-year students, with large institutions showing significant and large negative coefficients for the LAC and SFI benchmarks.
- Fewer than one-third of all universities carry a significant institutional coefficient but those that do continue to represent a wide range of engagement effects across all five benchmarks.

4.3 Student Record-Level Model Results – First-to-Second Year Retention

While Figure 15 above indicates a statistical relationship between first-year attrition and numerous engagement and experience items, the nature of that relationship is unclear. It cannot be determined from Figure 15 whether low engagement precedes and contributes to attrition, or whether impending attrition contributes to disengagement. If the latter is true, or even if it dominates the former, explanatory models would be tautological. If the former is true, the relationship could provide insight into institutional attrition risk management efforts. Given the low explanatory power of student record-level regressions and the absence of admission or early-in-semester measures to permit construction of an appropriate experimental design, no effort will be made here to formally pursue a causal engagement-attrition link. (Research undertaken for HEQCO at York University on attrition risk prediction and at the University of Guelph dealing with expectations and engagement is more appropriate for this purpose.)

Rather, we focus attention on the role of student, program and institutional factors in explaining attrition behaviour. Explanatory models of attrition (a dichotomous dependent variable) involve the use of logistic modeling which requires a somewhat different interpretation from those using OLS methods. Assignment of code=0 to those who drop out after first-year and code=1 to those who are retained results in model coefficients (marginal effects) that represent the predicted increase or decrease in the probability of retention. In other words, a variable coefficient of .05 implies – all else equal – that a student having the characteristic of that variable is 5% more likely to be retained than a student who does not. Low model pseudo R² indicates that the model identifies only the minority of factors that ultimately contribute to student retention/attrition. The value of the student-level regressions then, is to identify key associations between students/programs/institutions and attrition behaviour in order to compare with and support and possibly guide further research.

Figure 19: Summary of First-Year Student Record-Level Regression Model Results - Retention/Attrition (Student + Program + University Size + University Identity Forced Entry Models)				
Model Item	Student Only	Student + Program + University Size	Student + Program + University Size + University Identity	University Identity Only
Student Characteristics				
Age (traditional=1)	0.036	0.032		
Gender (male=1)	0.010			
Language (French=1)	0.017			
Parental Educational Attainment (first gen=1)				
Ethnocultural Status (visible minority=1)	0.027	0.019	0.017	
Residency (international=1)				
Accommodation (short commute=1)	-0.035	-0.026	-0.017	
Accommodation (long commute=1)	-0.015	-0.012		
Provincial Origin (out of province=1)	-0.037	-0.032	-0.025	
High School Grade (lowest quartile=1)	-0.016	-0.009		
High School Grade (highest quartile=1)	0.010			
Current Grades (lowest quartile=1)	-0.106	-0.103	-0.110	
Current Grades (highest quartile=1)				
Attendance (full-time=1)	0.052	0.051	0.053	
Transfer Status (from college=1)	-0.022	-0.027		
Transfer Status (from university=1)				
Transfer Status (from CEGEP=1)	0.021	0.025		
Program Mix				
Program (Business=1)		0.025	0.021	
Program (Education=1)				
Program (Engineering=1)		0.025	0.019	
Program (General=1)				
Program (Humanities=1)				
Program (Fine Arts=1)			-0.029	
Program (First Professional=1)				
Program (Sciences=1)		0.030		
Program (Health Sciences=1)			0.031	
University Size				
University Size Group (small=1)				
University Size Group (large=1)		0.019		
University Identity				
Institutions with significant coefficient at < .05			13	19
Maximum (-) institutional coefficient			-0.080	-0.322
Maximum (+) institutional coefficient			0.070	0.077
Number of observations	21,580	20,976	19,549	34,612
Number of institutions	44	44	38	42
Pseudo R-Squared	0.072	0.076	0.101	0.039

Figure 19 presents the results of four regression models each of which forces the entry of all variables in one or more of the student, program, university size or university identity clusters. Stepwise entry models ($p\text{-in}=.05$; $p\text{-out}=.20$) run for individual variables independent of cluster produced virtually identical results.

Figure 19 indicates:

- With respect to student characteristics alone, traditional age, male gender, full-time study and the highest quartile of high school grades significantly increase the probability of retention while commuting, the lowest quartile of high school grades, transfer from college and movement to university from out-of-province significantly increase the probability of attrition. (Low university grades also increase the probability of attrition but are difficult to interpret as cause or effect of attrition. French language and transfer from CEGEP both increase retention probability but are also difficult to interpret as they seem to serve as system-level as opposed to student-level predictors.)
- The inclusion of program and university size in the model produces results that are roughly similar with respect to student characteristics. Business, Engineering and Science program enrolment predict a higher probability of retention, as does enrolment in the “large” university size group.
- The inclusion of university identity in the model weakens the role of the student-level predictors: only visible minority status and full-time enrolment are significantly associated with retention while short commute and out-of-province origin are associated with attrition. University size is no longer significant with the inclusion of university identity. About one-third of all 44 universities carried a significant institutional coefficient.
- R^2 values ranging from .07 (for the student-only model) to .10 (for the student + program + university size + university identity model) indicate that the variables available for the analysis explain only a small portion of the first-year attrition/retention picture.

4.4 Institution-Level Model Results – Engagement

As the preceding sections demonstrate, context-free comparisons of engagement scores fail to account for what the data show to be the significant effects of student composition, program mix and institutional size – at least at the student record-level. This section undertakes a multivariate analysis of variation in engagement benchmarks at the institutional level in order to identify the determinants of engagement (and perhaps to confirm those observed at the student record-level), to provide a clearer basis for institutional engagement comparisons, and to support the focusing of engagement improvement efforts within universities.

The student record-level models discussed above utilized institutional dummy variables in an attempt to isolate intrinsic institutional factors that, after controlling for student composition, program mix and institutional size, can be seen as a direct linkage between institution and engagement. Those models suggested that about half of all the institutions were significant contributors to their own engagement level, but the low R^2 for the models limits the pursuit of this issue. The institution-level models run on 44 institutional observations rather than tens of thousands of student observations and for statistical reasons (i.e., limited degrees of freedom), institutional dummy variables cannot be included. Thus, interpreting the institutional contribution to engagement through these models involves examining the proportion of variation that

remains unexplained, and the degree of fit between actual and regression-predicted engagement levels.

A number of multiple regression designs were constructed for the analysis.

(a) Forced Stepwise Entry of All Independent Variables by Cluster

First, regression models for each benchmark and year (i.e., 10 in total) were constructed that contained all student, program and university-based variables, entered sequentially by cluster. The models did not produce reliable coefficients because of multicollinearity. However, such models tend to generate “highest possible” R^2 values that indicate in general terms the explanatory power of each cluster, and provide a basis against which the explanatory power of other (more statistically robust) models can be assessed. As indicated in Figure 20, the models generated R^2 values of between .94 and .99 (first-year) and .91 and .97 (senior-year). Each cluster contributes to total explained variation (with the student- and program-based clusters being measured as the proportion of all students in a given demographic or program category).

Figure 20: Summary of Institution-Level Regression Model Results - Engagement (Student + Program + University Size + Region Forced Entry by Cluster Model)					
Model Item	LAC	ACL	SFI	EEE	SCE
First-Year R-Squared					
student only	0.430	0.765	0.590	0.514	0.644
student + program	0.836	0.955	0.907	0.864	0.889
student + program + university size + region	0.945	0.987	0.986	0.953	0.939
Senior-Year R-Squared					
student only	0.432	0.630	0.729	0.596	0.632
student + program	0.682	0.840	0.879	0.806	0.754
student + program + university size + region	0.916	0.923	0.967	0.920	0.907
Note: 39 of 44 universities included in models					

(b) Common Independent Variables Across All Benchmarks

Based on a review of institution-level correlation coefficients, a second series of models was constructed that used a common set of frequently significant independent variables across all of the 10 models. These variables were selected from each of the student, program and institutional clusters. Because of extensive multicollinearity, the models resulted in a predominance of insignificant variables (and unreliable coefficients). In addition, they generated somewhat lower R^2 values than those achieved using other model types. The exercise nonetheless demonstrates that at the institutional level (as at the student level) each benchmark score warrants a distinct statistical explanation and more specifically, that student characteristics and/or program mix do not have similar impacts across all benchmarks and years.

(c) Stepwise Entry by Individual Variable

A final set of regression models used the stepwise technique to enter (and eject) variables one at a time in order to avoid multicollinearity. This technique ensures most variables in the models are significant (by using a p-in value of .05 and a p-out value of .20); it selects from between two “competing” (multicollinear) variables the one with the greater contribution to R^2 ; and it generates relatively high R^2 values that increase confidence in the predictive power and reliability of the models. In light of long-standing questions about potential cultural, cognitive and linguistic differences between Francophone/Anglophone, and Quebec/non-Quebec institutions, models were constructed at both the national and “national less Quebec” levels to permit comparisons. (Quebec-only analysis would have severely restricted the number of variables in the models because of limited degrees of freedom.) The results are presented in Figures 21 and 22 for first-year and senior-year students respectively (and in greater detail in Appendix 3).

Figure 21: Summary of First-Year Institution-Level Regression Model Results - Engagement (Stepwise Entry by Variable Model)										
Model Item	National (n=44)					National less Quebec (n=32)				
	LAC	ACL	SFI	EEE	SCE	LAC	ACL	SFI	EEE	SCE
Student Characteristics										
% in traditional age category			-0.130			0.073	-0.136			
% male		-0.251		-0.136		-0.333	-0.373	-0.115	-0.225	-0.432
% French speaking			-0.108	-0.033						
% first generation	-0.224	-0.186	-0.193	-0.148	-0.241	-0.115	-0.247	-0.081	-0.122	-0.243
% First Nation	-0.378	-0.561				-0.497	-0.768		-0.432	
% visible minority										
% international origin	-0.328	-0.281				-0.321	-0.305			
% with short/walk commute							-0.197			
% with long/drive commute									-0.037	-0.078
% out of province origin	-0.095	-0.143		-0.106		-0.122	-0.188		-0.120	-0.190
% in lowest HS grade quartile	-0.132		-0.114	-0.071	-0.214					
% in highest HS grade quartile	-0.079					-0.504	-0.601	-0.235	-0.172	-0.305
% studying full-time		-0.138								
% with previous university					-0.331					
Program Mix										
% in business program		0.154					0.222			
% in education program			0.134		0.176			0.141		
% in engineering program		0.283		0.120	0.240	0.260	0.434		0.266	
% in general arts etc. program						0.030				
% in humanities program								-0.099		
% in fine arts program		0.088		-0.037			0.090		-0.036	-0.118
% in first professional program	0.183	0.250	0.154	0.112	0.157	0.202		0.195	0.079	
% in sciences program	0.062	0.107				0.073	0.130			-0.104
% in health sciences program					0.130					
University Size										
university in "small" category	3.029	5.810	4.734	2.029	3.476	3.221	5.964	4.368	2.921	5.760
university in "large" category					-4.304		-2.599			-4.702
Constant	69.19	63.76	48.29	38.20	82.44	62.93	60.52	34.60	41.14	94.60
R-Squared	0.776	0.918	0.876	0.785	0.781	0.934	0.930	0.807	0.891	0.911
Note: all coefficients shown are significant at < .05										

From a national perspective:

- All student characteristics (i.e., the percentage of students having a given characteristic) except commuting behaviour and visible minority status significantly predict first-year engagement in one or more of the benchmarks. The percentage of first generation students, for example, varies inversely with all five benchmarks; the percentage of students in the lowest high school grade quartile with four of the five benchmarks; and the percentage of students from out of province with three benchmarks. Each benchmark differs with respect to the student characteristics that contribute to explaining its variation.
- Academic programs (excluding general and humanities programs) are also significant predictors of first-year institution-level engagement. Variation in the LAC benchmark, for example, is explained by the percentage of students in first professional and science programs, while the ACL benchmark is significantly affected by the enrolment mix between Business, Engineering, Fine Arts, First Professional and Science Programs.
- Institutional position in the “small” size category consistently predicts higher first-year engagement levels across all five benchmarks; in only one of the five benchmarks (SCE) does placement in the “large” size group contribute to explaining benchmark variation. In this sense, medium and large size statuses differ little with respect to their explanatory power.

Figure 22: Summary of Senior-Year Institution-Level Regression Model Results - Engagement (Stepwise Entry by Variable Model)

Model Item	National (n=39)					National less Quebec (n=29)				
	LAC	ACL	SFI	EEE	SCE	LAC	ACL	SFI	EEE	SCE
Student Characteristics										
% in traditional age category										
% male	-0.127	-0.419				-0.262	-0.870	-0.290	-0.388	
% French speaking	-0.033	-0.054	-0.153	-0.050	-0.067		-0.159	-0.147	-0.191	-0.298
% first generation	-0.101		-0.137	-0.321	-0.201		-0.733	-1.435	-1.481	-1.092
% First Nation			-1.116	-0.633	-1.214	-0.552		-0.289	-0.144	-0.234
% visible minority			-0.151	-0.120	-0.264			-0.660	-0.442	-0.316
% international origin							-0.728	-0.376	-0.605	
% with short/walk commute		-0.108				-0.063		-0.452	-0.232	-0.449
% with long/drive commute	0.088		0.051						-0.052	
% out of province origin	-0.073			-0.125					-0.176	
% in lowest HS grade quartile		-0.072			-0.093	-0.095	-0.288	-0.125	-0.165	
% in highest HS grade quartile	0.112	0.234						0.081		
% studying full-time										
% with previous university			-0.168		-0.451					-0.485
Program Mix										
% in business program		0.240	0.158	0.151			0.440	0.079	0.163	
% in education program				0.146			-0.570		-0.314	0.351
% in engineering program	0.117	0.336		0.147	-0.113	0.377	0.903	0.299	0.738	-0.274
% in general arts etc. program				0.158			0.098	0.087	0.171	
% in humanities program	0.084				-0.207	0.190			0.213	-0.344
% in fine arts program		0.663			-0.086		0.100	0.041	0.087	-0.130
% in first professional program	0.119	0.178	0.128	0.190						-0.138
% in sciences program								0.070		
% in health sciences program	0.108	0.119	0.180	0.265		0.109		0.121	0.167	
University Size										
university in "small" category	2.372	3.246	5.203		5.719			4.177	-2.197	7.898
university in "large" category	-2.35	-2.584	-2.681		-3.485	-3.013	-3.916	-5.139	-3.187	-5.454
Constant	51.96	59.35	49.05	44.08	91.32	83.46	134.9	73.39	105.00	79.57
R-Squared	0.822	0.889	0.936	0.870	0.865	0.905	0.910	0.983	0.985	0.963

Note: all coefficients shown are significant at < .05

- The combined explanatory power of the student, program and university size variables ranges from a low of .78 to a high of .92. In other words, about 80% or more of the variation in the benchmark scores is accounted for by the models, leaving only about 10 – 20% of unexplained variation attributable to factors outside the model (e.g., other student characteristics, more refined program definitions or institutional size measures, or institutional identity itself).
- Institutional variation in senior-year benchmark scores is also significantly affected by student characteristics, program mix and institutional size, but in ways that are different from those affecting first-year engagement. Figure 23 indicates whether each student, program and institutional size variable affects only first-year engagement (shown as “1”), only senior-year engagement (“4”), or both (“1,4”). While some variables exert similar influence in both years, some appear only in first year and others only in senior year.

Figure 23: Comparison of National First-Year and Senior-Year Institution-Level Engagement Predictors (Stepwise Entry by Variable Model)

Model Item	National (n=39)				
	LAC	ACL	SFI	EEE	SCE
Student Characteristics					
% in traditional age category			1		
% male	4	1,4		1	
% French speaking	4	4	1,4	1,4	4
% first generation	1,4	1	1,4	1,4	1,4
% First Nation	1	1	4	4	4
% visible minority			4	4	4
% international origin	1	1			
% with short/walk commute		4			
% with long/drive commute	4		4		
% out of province origin	1,4	1		1,4	
% in lowest HS grade quartile	1	4	1	1	1,4
% in highest HS grade quartile	1,4	4			
% studying full-time		1			
% with previous university			4		1,4
Program Mix					
% in business program		1,4	4	4	
% in education program			1	4	1
% in engineering program	4	1,4		1,4	1,4
% in general arts etc. program				4	
% in humanities program	4				4
% in fine arts program		1,4		1	4
% in first professional program	1,4	1,4	1,4	1,4	1
% in sciences program	1	1			
% in health sciences program	4	4	4	4	1
University Size					
university in "small" category	1,4	1,4	1,4	1	1,4
university in "large" category	4	4	4		1,4

From a “national-less-Quebec” perspective:

- There exist several similarities between the national and national-less-Quebec regression results:
 - At both levels, the proportion of first generation students is a significant predictor in all five first-year benchmarks.
 - The proportion of first-year international students is a significant predictor of only the LAC and ACL benchmarks.
 - Membership in the “small” university group significantly contributes to variation in all five first-year benchmarks both nationally and in the absence of Quebec.
 - With respect to senior-year students, the percentages in the first generation, First Nation and international student categories play broadly similar (but not identical) roles nationally and without Quebec.
- However, a number of striking differences exist between the two levels. The exclusion of Quebec universities from the models (i.e., analysis of almost exclusively Anglophone institutions) generates the following results:
 - The percentage of male students has a consistent negative effect on engagement across all benchmarks. (With Quebec institutions included, the proportion of male students is significant for only two of the five benchmarks, and with smaller coefficients.)
 - The student commuter rate has selective negative effects on engagement. (Inclusion of Quebec institutions results in commuter behaviour being consistently insignificant.)
 - The percentage of “highest performing” high school students is significantly and inversely related to all five benchmarks. (With Quebec included, the dominant pattern is for students in the “lowest performing” high school grade quartile to be less engaged.)
 - The explanatory power of program mix differs between the two levels, though there is no consistent pattern at the specific program level. Modeling of Anglophone institutions appears to result in more significant program mix variables (e.g., three programs are significant predictors of SFI benchmark variation nationally, but six are significant when Quebec is excluded). Such results must be interpreted with caution because of differences in first-entry and second-entry program admission.

It seems reasonable to conclude that Quebec universities display a somewhat different engagement “dynamic” than institutions elsewhere in Canada, based on the apparent “dilution” of commuter and male disengagement effects (and several other factors) resulting from the inclusion of Quebec institutions in the models

4.5 Institution-Level Model Results – First-Year Retention

Institution-level attrition/retention analysis was attempted using stepwise variable-by-variable entry/ejection ($p\text{-in}=.05$; $p\text{-out}=.20$) independent of cluster. The dependent variable was defined as institutional retention rate expressed as a percentage (e.g., 80%). Although the model generated a relatively high R^2 value and resulted in about 20 significant attrition predictors across the student, program and institutional size clusters, the results were difficult to interpret. Unexpected coefficient signs, high coefficient values (elasticities) and a very high regression

intercept suggest possible specification errors. The results are presented in Figure 24; however, no analysis has been attempted here. This is clearly an issue requiring further exploration.

Figure 24: Summary of First-Year Institution-Level Regression Model Results - Retention/Attrition (Stepwise Entry by Variable Model)	
Model Item	Coefficient
Student Characteristics	
% in traditional age category	
% male	-4.004
% French speaking	
% first generation	1.569
% First Nation	5.113
% visible minority	1.175
% international origin	
% with short/walk commute	
% with long/drive commute	
% out of province origin	0.739
% in lowest HS grade quartile	0.890
% in highest HS grade quartile	-2.877
% in lowest current grade quartile	-5.136
% in highest current grade quartile	
% studying full-time	0.915
% with previous college	
% with previous university	-4.303
% with previous CEGEP	0.556
Program Mix	
% in business program	0.804
% in education program	
% in engineering program	2.922
% in general arts etc. program	0.434
% in humanities program	
% in fine arts program	1.449
% in first professional program	1.667
% in sciences program	1.039
% in health sciences program	1.167
University Size	
university in "small" category	-37.500
university in "large" category	-22.460
# Observations	36
Constant	168.600
R-Squared	0.930
Note: all coefficients shown are significant at < .05	

5. Application: Actual vs. Predicted Engagement

5.1 Methodology

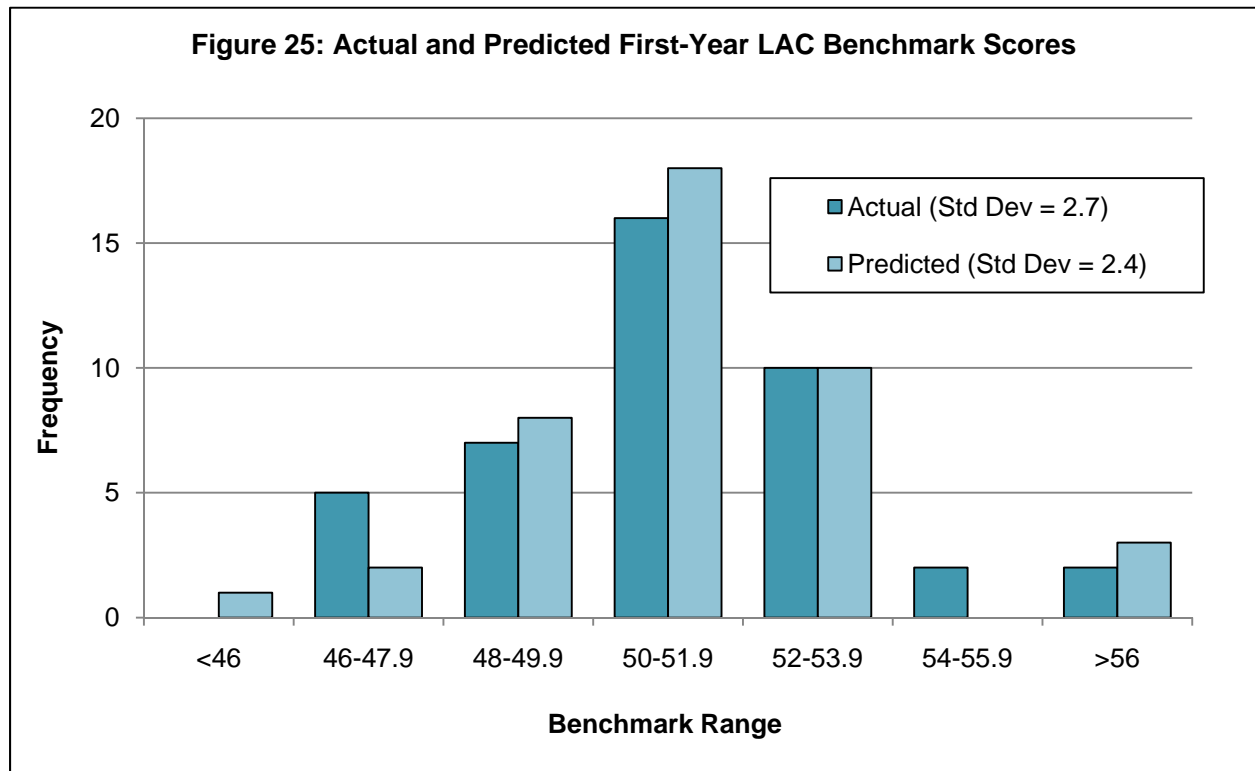
The institution-level engagement models discussed above are quite robust (high R^2 , numerous significant variables overall and in each cluster). They demonstrate that student characteristics, program mix and university size each account for a substantial proportion of institutional engagement variation at the benchmark level. This section of the report explores an important application of this finding: the relationship between actual and predicted engagement (i.e., the engagement level expected after controlling for student characteristics, program mix and institutional size). Given the engagement variation associated with these factors, it is clear that attributing institution-level benchmark differences as “quality” variation is inappropriate and inaccurate. Rather, the difference between actual and predicted benchmark engagement is the critical metric, and only at this level is a careful and qualified analysis of institutional quality (i.e., institutional engagement “contribution” independent of student characteristics, program mix and size) meaningful.

Engagement prediction is performed for each university by inserting into the regression model each institution’s independent variable values, multiplying each value by its coefficient, and adding the sum of these products to the model intercept value. The regression models used are the national-level stepwise entry models presented in Figures 21 and 22 above.

This exercise is similar in spirit to that undertaken by NSSE itself in the 2004 administration (but subsequently discontinued). NSSE used the population of US institutions and a number of student- and institution-based variables to generate predicted engagement scores that were (after minor model adjustments) applied to Canadian participants. The models explained about 30 – 50% of US institutional engagement variation (a lower rate than achieved here, reflecting the far more diverse US university sector) and an unknown percentage of Canadian institutional engagement variation. In addition, it utilized predictors many of which were more relevant in the US context than in Canada.

5.2 Results

Figure 25 presents distributions of both actual and predicted first-year LAC benchmark scores grouped into 2-point clusters. Both raw and predicted values vary from about the mid-40s to the mid-50s with both distributions (by definition) having equal means.



Whether the high degree of similarity between the two distributions overall also indicates a high degree of correspondence between actual and predicted scores at the individual institution level is indicated in Figure 26. Figure 26 demonstrates that variation in actual benchmark engagement (the upper portion of the figure) is substantially greater than variation expressed as the difference between actual and predicted performance. Actual benchmark scores range from about 46 to 60 – a difference of 14 points, or about 27% of the benchmark mean. Differences between actual and predicted scores, however, range from -2 to +3 – a difference of less than 6 points, or about 10% of the benchmark mean. In other words, no institution is more than 3 benchmark points distant from its predicted value (and the vast majority of institutions are within 2 points). A summary analysis for all benchmarks is presented in Figure 27.

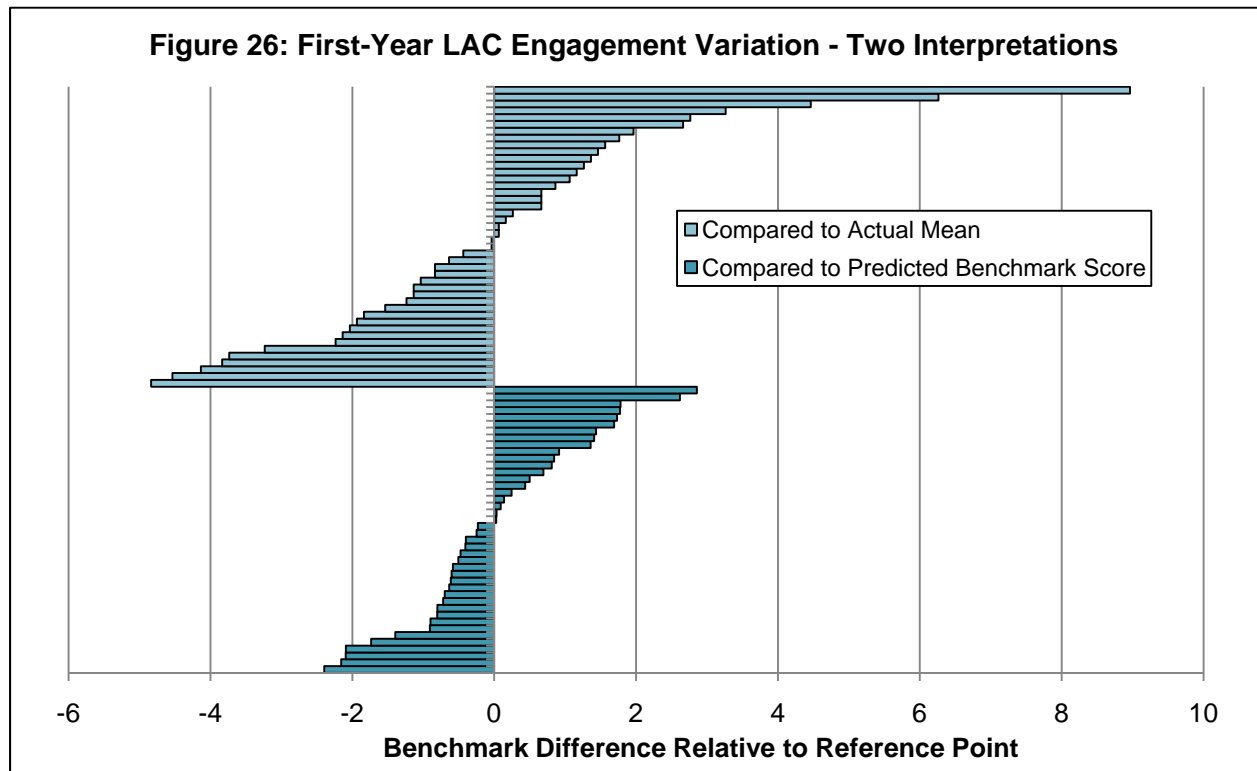


Figure 27 compares these two interpretations of engagement variation: variation in raw scores relative to a single mean, and variation in raw scores relative to each institution's predicted engagement level (the two sets of bolded entries). After controlling for student characteristics, program mix and institutional size, there exists significantly less meaningful variation across all benchmarks than comparisons of actual (raw) scores would suggest. The R^2 values in the various regression models previously confirmed this, but the same finding can now be presented in more concrete terms - not for the overall institutional population but for individual institutions.

Figure 27: Comparisons of Engagement Variation Using Raw Benchmarks and Regression Predictions						
Year	Benchmark Measures	LAC	ACL	SFI	EEE	SCE
First-Year	Benchmark Mean (Actual)	51.14	38.31	24.57	24.47	57.00
	Benchmark Minimum (Actual)	46.30	27.70	16.10	20.80	50.30
	Benchmark Maximum (Actual)	60.10	53.90	34.20	30.20	72.30
	Benchmark Range (Actual)	13.80	26.20	18.10	9.40	22.00
	Benchmark Range (Actual) as % of Benchmark Mean	27%	68%	74%	38%	39%
	<u>Benchmark (Actual) Standard Deviation</u>	<u>2.71</u>	<u>5.71</u>	<u>3.83</u>	<u>2.21</u>	<u>4.45</u>
	Largest Negative Difference, Actual vs. Predicted	-2.40	-3.62	-5.08	-1.79	-4.71
	Largest Positive Difference, Actual vs. Predicted	2.86	3.72	2.46	2.53	3.84
	Difference Range (Actual vs. Predicted)	5.26	7.34	7.55	4.33	8.55
	Difference Range (Actual vs. Predicted) as % of Benchmark Mean	10%	19%	31%	18%	15%
	<u>Difference (Actual vs. Predicted) Standard Deviation</u>	<u>1.28</u>	<u>1.73</u>	<u>1.55</u>	<u>1.01</u>	<u>2.11</u>
Senior-Year	Benchmark Mean (Actual)	55.49	46.80	33.78	34.34	54.38
	Benchmark Minimum (Actual)	51.50	39.20	24.60	29.20	44.90
	Benchmark Maximum (Actual)	61.50	59.40	43.70	42.90	70.10
	Benchmark Range (Actual)	10.00	20.20	19.10	13.70	25.20
	Benchmark Range (Actual) as % of Benchmark Mean	18%	43%	57%	40%	46%
	<u>Benchmark (Actual) Standard Deviation</u>	<u>2.31</u>	<u>4.22</u>	<u>5.02</u>	<u>3.24</u>	<u>5.17</u>
	Largest Negative Difference, Actual vs. Predicted	-1.99	-2.70	-2.78	-3.22	-7.33
	Largest Positive Difference, Actual vs. Predicted	2.06	2.77	9.04	3.32	3.72
	Difference Range (Actual vs. Predicted)	4.05	5.47	11.82	6.54	11.05
	Difference Range (Actual vs. Predicted) as % of Benchmark Mean	7%	12%	35%	19%	20%
	<u>Difference (Actual vs. Predicted) Standard Deviation</u>	<u>0.89</u>	<u>1.34</u>	<u>1.88</u>	<u>1.25</u>	<u>2.02</u>

6. Summary and Conclusions

The program-level NSSE reports for individual (rather than groups of) institutions

- Partially (if not substantially) control for discipline pedagogy and accommodate program-specific aspects of course and curricular delivery;
- Identify institution-specific best results, suggest promising practices and encourage further exploration of varying results and of the applicability of promising practices elsewhere;
- Highlight major item and benchmark engagement variation across programs (at both the program cluster level and the specific program level within each of the broad clusters);
- Provide as a result greater focus for program assessment against comparator programs and greater accuracy than would be achieved at either the institutional or broad program cluster level.

The student subgroup-level reports

- Demonstrate substantial item and benchmark engagement variation across student subgroups;

- Identify wide variation in the composition of the student body across programs and institutions;
- Inform and facilitate directed engagement interventions for the various subgroups of interest at each institution;
- Support policy development related to first generation, international, mature and First Nations student groups of particular relevance to postsecondary policy in most Canadian provinces.

The student-level regression analysis of engagement variation

- Provides statistical confirmation and more precise measures of the role of student characteristics, program mix and institutional size and identity in contributing to engagement variation at the benchmark level;
- Demonstrates that the control variables included in the analysis explain only a small portion (typically less than 10%) of engagement variation across all benchmarks and years of study but that several predictors are nonetheless significant;
- Indicates that engagement is driven by different student, program and institutional factors across the five benchmarks and first/senior years of study.

The institution-level regression analysis of engagement variation

- Largely corroborates the student-level analysis with respect to the direction and importance of various student, program and institutional characteristics as benchmark engagement drivers;
- Explains the vast majority of institutional engagement variation and by extension, provides much needed context for interpreting inter-institutional engagement differences;
- Highlights the existence of Francophone/Anglophone differences in the roles of several engagement drivers and indicates the need for more detailed analysis;
- Confirms that student, program and institutional factors remain statistically significant even in each others' presence, and therefore suggests further avenues for analysis at the sub-institution and sub-benchmark level.

The student-level and institution-level analyses of retention/attrition yielded results of limited value.

- Available data did not, nor was it intended to permit analysis that would prove the direction of the engagement-attrition relationship (i.e., whether lower engagement precedes and predicts attrition or vice versa).
- The analysis did support a conclusion that engagement and attrition are strongly correlated, and that numerous student, program and institutional factors predict attrition behaviour.
- As was the case with engagement, attrition analysis at the student level explained only a relatively small proportion of attrition behaviour. Though the results of the institution-level analysis are difficult to interpret, the model's high explained variation and the apparent significance of predictors within the student, program and institutional clusters both provide at least some insight into the direction of retention improvement strategies within institutions.

The analysis overall provides insight into the process and metrics of institutional accountability for engagement.

- Academic unit heads and service providers now have access to the data they need to compare engagement levels, to identify and explain engagement strengths and weaknesses relative to peer institutions, to isolate and pursue best results and promising practices, and to begin/continue specific improvement efforts in light of the data.
- Concurrent with this activity, university administration should incorporate and/or improve structures and processes that encourage and facilitate engagement improvement efforts both generally and with particular reference to their own institution.
- In Ontario at least, greater accountability expectations overall (including but not limited to multi-year agreements) and more specifically, the data requirements of the new OCAV quality assurance process, suggest that academic units, service providers and university administrators should move forward with engagement implementation as indicated above to the additional degree afforded by the NSSE National data and analyses.
- Neither average nor top-tier institutional benchmark engagement scores constitute an appropriate basis for engagement comparison or institutional accountability. Rather, accountability overall should be predicated on an institution's expected engagement score, and accountability for the scale and focus of institutional improvement effort should be predicated on academic program- and student subgroup-level performance. Provincially mandated accountability frameworks should incorporate these clear findings of the current analysis.

Central to all the above points is a set of related questions and issues. If the predictors identified in the student-level regressions explain a relatively small proportion of total engagement variation, to what extent can institutional effort based on them affect improvement? How should the lower explained variation in the student record-level models and the higher explained variation in the institution-level models be interpreted with respect to the scale of potential engagement improvement? In the case of the institution-level models, if student characteristics, program mix and institutional size account for the majority of institution-level engagement variation, what role remains for “institutional quality improvement”? By extension, what does institutional quality improvement even mean in this context?

The predictors employed in the student record-level regression analysis were those available from student records systems and that were consistently available across participating institutions. Clearly, they have limited explanatory value, and as biographic and academic variables, they serve as likely surrogates for more meaningful and statistically powerful predictors. For example, one could speculate that first generation students are less engaged because they have acquired through family life less – or less useful – “postsecondary educational context” – for example, the reality or perception of lower levels of family support, or of the personal habits associated with successful post-secondary attendance. Such information is not of course available in student records systems. Attention must be paid to the specific personal and attitudinal factors that explain lower levels of first generation student engagement and of the institutional effort required to address them (perhaps through focus groups or psychometric analysis). While first generation status is a consistently significant predictor of engagement, model coefficients of less than 2 (on a benchmark mean of about 40 to 60) hardly suggest an insurmountable engagement increase.

If institutional effort was limited to improving the engagement of just one or a few student subgroups, it would likely have limited aggregate effect. However, as noted above, the predictors were limited to those available, and there are almost certainly other variables affecting engagement that could be uncovered in future analysis (e.g., students of limited financial means may be less engaged because of their preoccupation with their financial situation; students who are unsure of their academic path may be less engaged because they have not fully engaged with their discipline). Also, program-level interventions have the potential to improve the engagement of all affected students; and institution-level intervention (e.g., learning communities of various sorts) have the potential to ameliorate the apparent negative effects of institution size on engagement.

Certain student, program and institutional factors achieve statistical significance in the regression models precisely because reasonably consistent relationships between engagement and these factors exist: it is not that one or a few universities experience lower or higher engagement in a particular academic program, but that most if not all do so, albeit to varying degrees. In other words, an insufficient number of universities have achieved a sufficiently different engagement score to “dilute” the consistent pattern that results in the statistical significance of a particular academic program. This suggests that institutional quality improvement involves an institution “escaping” from one or more of these relatively consistent patterns of engagement. If enough institutions achieve sufficiently high engagement gains in a particular low engagement academic program, for example, the statistical significance of that program will likely decrease, as it approaches average program engagement. At the same time, engagement scores will likely increase at those institutions “bucking” the engagement pattern; the program-level engagement increases at these institutions will likely become apparent in detailed NSSE academic program reports (if not in their overall institutional scores); and their actual engagement scores will increase relative to their predicted scores (which will remain relatively constant because a majority of institutions will experience unchanged scores).

At current national average engagement levels, there exists relatively little intrinsic institutional variation in engagement, after student composition, program mix and institutional size controls: this is the implication of the high R^2 values generated by the institution-level models. But this is not to say that institutional effort can affect only the small amount of unexplained variation. Institutions that address engagement on multiple academic program and student subgroup fronts have the potential to increase their engagement to a substantial degree by distancing themselves from the sector average.

The results of the NSSE National Data Project analysis are encouraging but can be expanded upon. The detailed NSSE reports provide program-level results by institution, and (generally because of sample size limitations at the institution-level) student subgroup-level results either nationally or for groups of institutions. They do not present, for example, side-by-side comparisons of international students within Science programs. Modification of the detailed reports to present “double cut” rather than two “single cut” presentations would, where numbers permitted, provide a further basis for program-specific student subgroup analysis and more focused program assessment. The sample sizes necessary to achieve meaningful reports could be increased through the pooling of multiple years of NSSE data (e.g., adding the 2011 results to the existing 2008 and 2009 results).

The regression analyses could also be similarly expanded. The models were constructed to explain benchmark variation only, at the institutional level only (with academic program, student

subgroup and institutional size controls). While the models were successful in identifying student, program and institutional engagement predictors across the entire institutional population, they do not address the relative importance of the individual items within each of the benchmarks or the possibility/likelihood that each academic program will differ with respect to significant engagement predictors. Construction of item (not benchmark) models at the program- and student subgroup-level (rather than institutional level) would generate results that link more closely to implementation requirements, since many engagement improvement activities are program-specific and item-based. In combination with similarly expanded detailed NSSE reports, such models would provide greater insight into differences across similar programs at different universities and different programs within each university, and promising and effective implementation strategies.

Appendix 1: Program Definitions

General Program Cluster	Specific Programs within Cluster	Associated CIP Codes	Hierarchical Program Code
None	n/a	n/a	099
Business & Commerce	General or Unspecified	520101	100
	Accounting	520301 - 520399	101
	Communications	520501	102
	Finance	520801 - 520899	103
	Hospitality Mgmt	520901 - 520999	104
	Human Resources & Indus. Relations	521001 - 521099	105
	International Business	521101	106
	Management & Management Science	520201 - 520299, 520601, 521301 - 521399	107
	Marketing	521401 - 521499	108
	Mgmt. Info. Systems & Services	521201 - 521299	109
	Retail Management	521801 - 521899, 521901 - 521999	110
	Small Business/Entrepreneurial	520701 - 520799	111
	Other Business	520101 - 529999 not already coded	199
Education	Teacher Training (first entry)	130101	200
	Early Childhood Education	131210	201
	Other Education	130101 - 139999 not already coded	299
Engineering	General or Unspecified	140101	300
	Agricultural, Biological, Biomedical	140301, 140501	301
	Chemical	140701	302
	Civil	140801 - 140899	303
	Computer/Software	140901 - 140999	304
	Electrical, Electronics, Communications	141001	305
	Environmental	141401	306
	Mechanical, Industrial	141101, 141901, 143501	307
	Metallurgical & Materials Science	140601, 141801, 142001, 143101, 143201	308
	Mining, Petroleum, Geological, Ocean	142101, 142401, 142501	309
	Other Engineering	140101 - 149999 not already coded	399
Social Sciences, Liberal Arts & Humanities (General)	n/a	240101 - 240199, 300101 - 302101, 302401 - 309999, 450101	400
Humanities	Area Studies	050101 - 050114, 050116 - 050206, 050299 - 059999, 302101, 302201, 302202, 302301	501
	Canadian Studies	050115	502
	English Language, Literature	230101 - 239999	503
	Foreign/Comparative Lang, Lit	160101 - 160900, 160902 - 169999	504
	French Language, Literature	160901	505
	Gender Studies	050207, 050208	506
	Gerontology	301101	507
	History	540101 - 540199	508
	Philosophy & Religious Studies	380101 - 389999	509
	Other Humanities	to be assigned if required	599

continued ...

General Program Cluster	Specific Programs within Cluster	Associated CIP Codes	Hierarchical Program Code
Fine Arts	General or Unspecified	500101	600
	Art History	500703	601
	Dance	500301 - 500399	602
	Design	500201, 500401 - 500499	603
	Drama, Theatre	500501 - 500599	604
	Film, Photography	500601 - 500699	605
	Music	500901 - 500999	606
	Visual Art	500701, 500702, 500704 - 500799	607
	Other Fine Arts	500101 - 509999 not already coded	699
Social Sciences	Anthropology	450201 - 450301	701
	Economics	450601 - 450699	702
	Environmental Studies/Nat. Resources	030101, 030103, 030199 - 030205, 030299, 030301, 039999	703
	Geography	310101, 310301, 319999, 450701 - 450799	704
	Legal Studies (non-professional)	220000	705
	Political Science	451001 - 451099	706
	Psychology	420101 - 429999	707
	Sociology	451101	708
	Other Social Sciences	450101 - 459999 not already coded	799
First-Entry Professional (Non-Health)	Architecture Related	040201, 040401, 040601, 040801 - 049999	801
	Criminology	430102 - 439999, 450401	802
	Environmental & Public Health	512201, 512202, 519999	803
	Interior Design	040501	804
	Journalism	090401 - 090499	805
	Library and Information Studies	250101 - 259999	806
	Other Media and Communications	090101 - 090903, 090701 - 099999	807
	Public Administration	440401, 440501	808
	Social Work	440000 - 440201, 440701 - 440799	809
Sciences	Urban and Regional Planning	030206, 040301, 451201	810
	Other Professional	449999	899
	General or Unspecified	300101, 400101	900
	Agriculture/Food Science & Operations	010101 - 019999	901
	Biology & Botany	260101, 260301 - 260504, 260701, 260702, 260709, 260799, 261304 - 269999	902
	Chemistry	400501 - 400599	903
	Computer Science	110101 - 119999	904
	Consumer Science	190000 - 199999	905
	Environmental Science/Nat. Resources	030104, 030601	906
Health Sciences	Forestry	030501 - 030599	907
	Geology, Earth/Ocean/Atmos Scie	400401 - 400499, 400601 - 400699	908
	Mathematics	270101 - 279999	909
	Physics & Astronomy	400201 - 400299, 400801 - 400999	910
	Other Sciences	409999	999
	General or Unspecified		950
	Physical Education/Kinesiology	310501, 310504 - 310600	951
	Nursing	511601 - 511699	952
	Biochemistry, Microbiology and Other Basic Medical Sciences	260102, 260202 - 260299, 260401 - 260599, 302401, 260901 - 261001, 260707, 260708, 260801 - 261299	953
	Life Sciences/Pre-Medicine & Dental	511101 - 511104, 511199	954

Appendix 2: Student Subgroup Definitions

Most student characteristics were determined on the basis of direct NSSE responses or student records system fields. Those requiring additional calculations or subject to varying definitions are listed below.

Admission Type	Direct vs. indirect entry from secondary school/CEGEP based on ADMTYPE submitted by universities (see also “CEGEP” report description below).
Region	Essentially defined by province, with pooling for the Atlantic and Prairie provinces and a breakdown of the Quebec institutions into UQ and non-UQ.
Attrition of First-Year Students	First-year students as defined by the institution-provided CLASSRAN variable in the original NSSE population file and corroborated with the institution-provided ATTRIT variable. Only those records having consistent CLASSRAN and ATTRIT values were included.
Citizenship	Domestic vs. international status as defined by the INTRN_CA variable in the NSSE survey.
Ethnic Declaration	Non-Caucasian (visible minority) status was defined by a checked response to one or more of the ETH_CA5 – ETH_CA15 variables in the NSSE survey excluding respondents who checked one or more of the ETH_CA2 – ETH_CA4 variables (indicating First Nation status).
First Generation	<p>Students were defined as <u>non-first generation</u> if either parent had completed university.</p> <p>Missing data for the maternal attainment or paternal attainment questions did not necessarily result in the response being excluded from the analysis, depending on the response that was available.</p>
First Nation	First Nation status was defined by a checked response on one or more of the ETH_CA2 – ETH_CA4 variables in the NSSE survey regardless of responses to the ETH_CA5 – ETH_CA15 variables.
Admission Grade	4-point GPA scales, 4.33-point GPA scales and Quebec R-scores were normalized to the Percentile distribution constructed for all universities reporting percentage-based entry grades. For example, records at the 25 th percentile of the 4-point GPA scale for all institutions reporting on this scale were set equal to the percentage-based entry grade occurring at the 25 th percentile for all universities reporting percentage-based admission grades. Once normalized, <u>within each institution</u> , the grade cut-offs for the 25 th and 75 th percentile were located.
Housing	Housing/commuting status was defined using responses to the

LIVENOW question on the NSSE survey. University residence, on-campus housing or fraternity/sorority accommodation was defined as “on campus”; walking distance commute and driving distance commute were retained as is from the LIVENOW question.

Out of Province

Postal Code for Canadian origin students provided by institutions as PCODE, compared to the postal code for the institution they were attending. Students were coded as originating in the same province as, or in a different province from, the university they were now attending.

Traditional/Non-Traditional Age

Using AGEBASE as reported by NSSE respondents, traditional-age students were defined as those in first-year with a reported age or 21 or less, and those in senior-year with a reported age of 25 or less. These cut-offs define approximately 15% of both the first- and senior-year populations as non-traditional.

University Size

Full-time undergraduate enrolment for each university. The data indicated no participants between 6,500 and 12,000 full-time students, and none between 21,000 and 24,500. As such, institutions were defined as small (less than 6,500), medium (12,000 to 21,000) and large (24,500 plus).

Language

For Francophone and bilingual institutions, the primary language spoken by each student. Student language and language of instruction were combined to identify French-speaking students at Francophone institutions, French-speaking students at Anglophone institutions, and English-speaking students at Anglophone institutions. Analysis within and across these categories provides a basis for exploring both dimensions of the language issue.

Appendix 3: “Best” Regression Models

Appendix 3(a): First-Year Institution-Level Regression Model					
Independent Variables	Dependent Variable (Benchmark)				
	LAC	ACL	SFI	EEE	SCE
Percent of Students in Category:					
Traditional Age		-0.0551 [0.0408]	-0.130*** [0.0402]		
Male	-0.107* [0.0597]	-0.251** [0.0931]	-0.129 [0.0769]	-0.136** [0.0552]	-0.217* [0.123]
French-speaking			-0.108*** [0.0158]	-0.0327*** [0.00830]	-0.0558* [0.0313]
First Generation	-0.224*** [0.0412]	-0.186** [0.0727]	-0.193*** [0.0501]	-0.148*** [0.0340]	-0.241*** [0.0765]
First Nation	-0.378** [0.162]	-0.561** [0.250]	-0.364* [0.209]	-0.272* [0.138]	-0.49 [0.329]
Visible Minority					-0.133* [0.0676]
International	-0.328*** [0.0852]	-0.281** [0.132]	-0.189* [0.0993]		
Short Commute (Walk)					
Long Commute (Drive)		0.0414 [0.0273]	0.0510* [0.0252]	-0.0240* [0.0140]	
Out-of-Province	-0.0948** [0.0368]	-0.143** [0.0522]		-0.106*** [0.0289]	-0.125 [0.0758]
HS Grade in Lowest Quartile	-0.132*** [0.0453]		-0.114** [0.0485]	-0.0713** [0.0333]	-0.214*** [0.0739]
HS Grade in Highest Quartile	-0.0788** [0.0380]			-0.0413 [0.0271]	
Studying Full-Time		-0.138** [0.0528]			
Previous University			-0.154 [0.0955]		-0.331** [0.148]
Business/Commerce		0.154** [0.0564]			
Education Program		0.0808 [0.0588]	0.134** [0.0535]		0.176** [0.0818]
Engineering Program	0.0842* [0.0450]	0.283*** [0.0727]	0.104* [0.0606]	0.120*** [0.0429]	0.240** [0.0913]
Humanities Program	0.0619 [0.0368]				
Fine Arts Program		0.0881*** [0.0269]		-0.0373** [0.0144]	
First-Entry Prof'l Program	0.183*** [0.0359]	0.250*** [0.0533]	0.154*** [0.0423]	0.112*** [0.0292]	0.157** [0.0657]
Science Program	0.0621** [0.0293]	0.107** [0.0396]			
Health Sciences Program	-0.0566* [0.0303]			0.0387 [0.0233]	0.130** [0.0530]
Dummy Variable (0/1)					
University Size (small=1)	3.029*** [0.690]	5.807*** [0.924]	4.734*** [0.704]	2.029*** [0.559]	3.476*** [1.154]
University Size (large=1)			-1.674* [0.878]		-4.304** [1.693]
Intercept	69.19*** [3.325]	63.76*** [7.123]	48.29*** [5.376]	38.20*** [2.491]	82.44*** [5.422]
Number of Universities	42	42	42	42	42
R-Squared	0.776	0.918	0.876	0.785	0.781
Standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1					

Appendix 3(b): Senior-Year Institution-Level Regression Model					
Independent Variables	Dependent Variable (Benchmark)				
	LAC	ACL	SFI	EEE	SCE
Percent of Students in Category:					
Traditional Age			-0.0908*		
			[0.0475]		
Male	-0.127**	-0.419***			
	[0.0498]	[0.0779]			
French-speaking	-0.0332***	-0.0536***	-0.153***	-0.0498***	-0.0671***
	[0.00733]	[0.0140]	[0.0153]	[0.0146]	[0.0161]
First Generation	-0.101***	-0.0961	-0.137***	-0.321***	-0.201**
	[0.0346]	[0.0614]	[0.0450]	[0.0682]	[0.0842]
First Nation			-1.116***	-0.633***	-1.214***
			[0.202]	[0.200]	[0.269]
Visible Minority		-0.0925*	-0.151***	-0.120**	-0.264***
		[0.0449]	[0.0318]	[0.0436]	[0.0561]
International	0.132				
	[0.0932]				
Short Commute (Walk)	0.0631	-0.108***		-0.0498*	-0.0599
	[0.0466]	[0.0310]		[0.0289]	[0.0355]
Long Commute (Drive)	0.0884**		0.0505**		
	[0.0425]		[0.0204]		
Out-of-Province	-0.0727**			-0.125**	
	[0.0340]			[0.0472]	
HS Grade in Lowest Quartile		-0.0722**			-0.0925**
		[0.0336]			[0.0375]
HS Grade in Highest Quartile	0.112***	0.234***			
	[0.0344]	[0.0529]			
Studying Full-Time					-0.0814*
					[0.0423]
Previous University			-0.168**	-0.152*	-0.451***
			[0.0698]	[0.0795]	[0.0987]
Business/Commerce		0.240***		0.151**	
		[0.0525]		[0.0696]	
Education Program			0.158***	0.146***	
			[0.0346]	[0.0510]	
Engineering Program	0.117***	0.336***		0.147***	-0.113***
	[0.0411]	[0.0629]		[0.0501]	[0.0310]
General Program			0.0317	0.158***	
			[0.0239]	[0.0525]	
Humanities Program	0.0840**			0.182*	-0.207***
	[0.0321]			[0.104]	[0.0670]
Fine Arts Program		0.0663**		0.104*	-0.0855***
		[0.0248]		[0.0529]	[0.0285]
First-Entry Prof'l Program	0.119***	0.178***	0.128***	0.190***	
	[0.0300]	[0.0525]	[0.0440]	[0.0617]	
Science Program				0.132*	
				[0.0684]	
Health Sciences Program	0.108***	0.119***	0.180***	0.265***	
	[0.0298]	[0.0414]	[0.0370]	[0.0647]	
Dummy Variable (0/1)					
University Size (small=1)	2.372***	3.246***	5.203***	1.892*	5.719***
	[0.592]	[0.858]	[0.698]	[0.933]	[1.110]
University Size (large=1)	-2.350***	-2.584**	-2.681***	-1.928*	-3.485***
	[0.656]	[1.030]	[0.848]	[0.935]	[1.193]
Intercept	51.96***	59.35***	49.05***	44.08***	91.32***
	[4.472]	[4.613]	[5.304]	[7.113]	[9.269]
Number of Universities	39	39	39	39	39
R-Squared	0.822	0.889	0.936	0.870	0.865
Standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1					

