Quality of UBC students relative to other BC and major US Universities (update January 2008 using PISA comparisons)

Carl Wieman and Walter Sudmant

Institutions must set educational standards and expectations that are appropriate to the quality of their students. It is appropriate for institutions that attract a higher quality of students to set higher standards, but it is also reasonable to expect that a correspondingly higher proportion of these high quality students should be successful in their studies. In other words, the better the students initially, the greater the expectations should be for both the achievement of those students and the fraction of the students who meet the standards of the institution. The CWSEI and Dean of the Faculty of Science were interested in finding out how the quality of UBC students, particularly in science, compared to that of other Universities, in order to have some benchmarks by which such standards could be established.

This study provides the answer to that question. Since there are no common measures of student quality across North America, we chose as a proxy the selectivity of the admissions of the institution. We were able to get data on this from essentially all BC and US universities, although not for non-BC Canadian universities. We carried out and circulated an initial comparison based strictly on selectivity of admissions. However, since that time the results of the 2006 Performance for International Student Assessment (PISA) which looked particularly at science achievement have been released by Statistics Canada (http://www.pisa.gc.ca/81-590-E.pdf). PISA uses very carefully designed tests to measure multiple aspects of science mastery by students near completion of their secondary education. The results from the 2006 study show that Canada, in scoring by country, is second in the world and the students in BC score slightly above the average for Canada as a whole. Of particular relevance to this report, BC students score on average 50 points higher than US students in the overall science score.

Below, we examine the middle 50% of the entering first year class at numerous Universities and see where that 50% ranked in their high school graduating cohort. We then see where UBC students would rank relative to a cohort of US students, based on the PISA data showing superiority of BC students relative to US students.

As documented in table 1 below, UBC is considerably more selective than other BC institutions. As shown in table 2, where the ranking of UBC students has been scaled by the PISA results to show where they would rank compared to US students, the quality of UBC science students is comparable to those at the most elite private universities in the US, and above all US public universities.

High School Percentile Rank of the middle 50% at US & BC Universities

The percentile ranks of the middle 50% of the 1st year class for the following major US universities were calculated combining the posted ACT scores for their students with various data as to HS class rankings. Yale is a private university that is among the most selective research Universities in the US, Columbia is a private research university in the Ivy League that is just a notch lower but still considered highly elite, while the other institutions listed are reputed to be the strongest and most selective public universities in the US. We did not do an exhaustive examination of all public universities, only those reputed to be the most selective plus Univ. of Colorado, which is known as a high quality but less selective public university that is rated equal to UBC in international comparisons of universities.

In a number of cases, there was data directly for the HS class rank for the 25th and 75th percentile at the institution, which made things simple. In other cases, there was a mix of data available so this involved piecing together different things, and in some cases extrapolating somewhat from similar institutions, as noted. For all but UC Berkeley, we had ACT scores for 25% and 75% levels. We also had the tabulation of ACT score vs. percentile for all students who took the ACT. Where one or another piece of data was missing, we used the combination to estimate the missing components. Since the system was often over-determined, this allowed us to check in a number of cases that the calculational procedure worked to within one per cent. So we believe the numbers below are probably good to within a per cent in most cases. They might be off by 2-3% for those numbers noted as less certain, but there is reasonable probability that even those are within one per cent.

The ACT score data in the table came from a website called www.collegetoolkit.com which lists all US universities providing information on admissions criteria and selectivity, GPA/Class ranks, and ACT and SAT test scores of entering freshmen. (Registration as a student or counselor is required in order to view this information.) The translation between student percentile ACT scores and high school class percentile is not always consistent. It is possible that this is due to errors in the data (schools are known to manipulate these numbers to artificially improve their apparent selectivity), but another explanation is that the average ACT scores of the respective populations from which the respective schools draw their students is different.

The values for UBC and other BC schools are obtained in a quite different but fairly direct way using data from the Ministry of Education, as discussed below. To take the PISA results into account in comparing the UBC science ratings with US institutions, we made the adjustment described in the footnote below the table. It is unlikely this scaling is precisely true, because the distributions may well not preserve a normal character so far into the tails, but it is a reasonable first approximation.

UNIVERSITY	ACT scores mid 50%	Percentiles for ACT composite scores	HS Class Rank (percentile) (mid 50%)	"average" HS rank
UBC overall			83 - 95	89
UBC science			90- 98	94
Simon Fr. U. overall			74-90	82
U. Victoria overall			78-93	85.5

UNIVERSITY	ACT scores middle 50%	Percentiles for ACT composite scores	HS Class Rank (percentile) (middle 50%)	"average" HS rank
Yale	29-34	95 - 99+ percentile	95 - 99+	97.5
Columbia	28-33	92 - 99+	92 - 99	95.5
U of Virginia	26-31	86 - 98 percentile	92.5 - 98	95
U. of Michigan *	27-31	89 - 98 percentile	89± - 97	93
U. of North Carolina – Chapel Hill	25-30 (mean 27)	81 - 97 percentile	90 - 97	93.5
U. of Wisconsin - Madison	26-30	86- 97 percentile	86 - 96	91
U. Cal Berkeley	mean 28	92 percentile (=mean 28)	likely similar to U. Wisc. based on ACT mean	91±
U. of Colorado - Boulder	23-28	70 - 92 percentile	70± -89	79.5
UBC science corrected by PISA score to US equivalent**			**93.5 - 98.5**	**96**

± indicates value required somewhat more extrapolation than other values, and hence has greater uncertainty

"average" HS rank is not a true average, it is the midpoint of the two numbers in column to the left.

* extrapolated from ACT scores and Univ. Wisc. class rank.

** BC students scored an average of 50 points higher than US students in the PISA Combined Science score. The standard deviation for BC students was $\sigma_{BC} = 96.3$ and for the US students was $\sigma_{US} = 114.8$. Thus the 50 point difference corresponds to $0.44\sigma_{US}$. A BC student at the 94th percentile is $1.56\sigma_{BC}$ above the mean, which corresponds to $1.31\sigma_{US}$. Adding $0.44\sigma_{US}$ to this yields $1.75\sigma_{US}$, which corresponds to a student in the 96th percentile.

GPA and HS rank calculation for US universities

US universities require their applicants to have taken a certain number of courses in English, Math, Foreign Language, Social science, and Science to be eligible for admission. Since most successful applicants exceed these requirements, other academic elements considered are the number of and performance in Advancement Placement, Honors and International Baccalaureate courses.

HS GPAs are usually based only on a select set of courses. For example, the UC system (UC Berkeley and UCLA) calculates academic GPA based on the grades earned in the UC-approved courses taken in 10th and 11th grades only. These course requirements include 2 years of History, 4 years of English, 3-4 years of Math, 2-3 years of Science, 2-3 years of foreign language, 1 year of visual/performing art, and 1 year of college preparatory elective. All other Advancement Placement, Honors and IB courses are counted as bonus. Other universities have similar criteria on courses accepted for HS GPA, so it appears that how these schools calculate the HS GPA of their

students is not very different from how UBC calculates GPA based on a specific set of fairly rigorous courses. In contrast to UBC, most US universities have admission requirements that are not Faculty dependent and depend on more than just high school GPA.

GPA and HS rank calculation for BC universities.

Canadian universities typically do not collect information on ACT scores, or the ranking of students relative to the graduating cohort, so selectivity must be computed by collecting grade information for all high school graduates and converting these grades into a percentile. We were able to do this only for British Columbia. This was possible thanks to the Student Transitions Project, which provides a reliable data set on BC High School Graduates. This data set provides a GPA for each student based on a set of academic courses (Eng 12 plus the top 3 Academic subjects). Not all students have such a set of courses. We have made the assumption that in terms of "class ranking", a student who does not have enough courses for entry to a BC university would have a class ranking below any student who is admissible to university. This seems reasonable, since a great majority of the students who enter university have GPAs of greater than 75%, so it is unlikely that these students would have a class ranking on some other measure (e.g. ACT or SAT) that is below those who did not have enough academic courses for admissions.

We have been able to map GPA for courses used in UBC admissions to rank in high school class. These are tabulated below for variety of BC tertiary institutions.

Grade Range	UBC Vancouver	SFU	U Vic	UNIV. COLL.	URBAN COLLEGE	SMALL COLLEGE	INSTITUTE	All Grads
0-50*	0.0%	0.0%	0.0%	59.1%	55.0%	72.8%	67.0%	54.8%
50-54	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
55-60	0.0%	0.0%	0.0%	1.1%	1.3%	0.8%	1.0%	0.8%
60-65	0.0%	0.3%	0.2%	3.6%	4.8%	2.6%	3.2%	2.5%
65-70	0.4%	2.0%	0.8%	7.1%	9.2%	4.3%	6.1%	4.7%
70-75	2.0%	9.3%	4.3%	9.0%	11.2%	5.8%	7.5%	6.6%
75-80	8.1%	23.8%	17.6%	8.8%	9.6%	5.4%	6.8%	8.0%
80-85	25.5%	29.6%	31.7%	6.4%	5.3%	4.1%	4.5%	9.0%
85-90	35.4%	23.3%	26.4%	3.4%	2.7%	2.9%	2.5%	8.1%
90-95	24.4%	10.1%	15.5%	1.2%	0.7%	1.0%	1.1%	4.6%
95-100	4.1%	1.6%	3.5%	0.1%	0.1%	0.1%	0.1%	0.8%

*0-50 includes all students whose high school record did not contain enough academic courses to compute a GPA for university admission.
(assuming percentiles of everyone in grade range are at the mid-point of each interval)

The provincial HS graduating class percentile rating for a given GPA are plotted against the UBC percentile below, for UBC entering students overall, and UBC entering science students. This allows one to find where the 25 and 75 percentile students stand in the BC HS graduating class.

This is 83rd and 95th percentiles for UBC overall, and for science students, it is 90th and 98th percentile. We thank Grace Wood for obtaining the data on US institutions contained in this report.

Provincial percentile versus UBC percentile (all % divided by 100)

Provincial percentile versus UBC Science percentile