



C.D. Howe Institute *Backgrounder*

www.cdhowe.org

No. 104, September 2007

Education Papers

School Grades:

Identifying Alberta's Best Public Schools

David Johnson

The Backgrounder in Brief

The study identifies which Alberta elementary schools are worthy of emulation, as well as those where large improvements are possible, by removing the influence of local socio-economic factors on a school's performance.

About the Author

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\$5.00; ISBN 0-88806-720-8;
ISSN 1499-7983 (print); ISSN 1499-7991 (online)

The performance of Alberta's elementary schools in imparting knowledge and skills to children is of vital importance to parents, teachers, taxpayers, and school administrators. But how much do they really know? Is there more information than that which parents can glean from occasional parent-teacher nights or traditional school performance measures and rankings? This *Backgrounder* compares Alberta's elementary schools, identifying those worthy of emulation and praise as well as those where the evidence suggests large improvements are possible. This information should help Albertans increase their understanding of how well specific schools are doing.

Standardized test results in reading, writing, and mathematics offer one way of measuring school performance. The provincial education ministry, Alberta Education, conducts achievement tests for elementary school students in grades 3 and 6. Controversy surrounds the use of these tests when the raw results are used to rank the effectiveness of each school. Critics argue that such rankings reflect, not the school's performance itself, but the socio-economic characteristics of the school's community, unfairly giving lower rankings to schools in disadvantaged neighbourhoods.

In a book published two years ago (Johnson 2005), I developed a method to measure the influence of socio-economic factors on standardized test results at schools in Ontario. That effort showed that the critics are partly right: 40 to 50 percent of the variation in schools' average test scores (averaged over many tests over many years) is explained by variation in measures of schools' socio-economic environments. It is reasonable to infer that much of the remaining variation reflects factors at the schools themselves, including principals, teachers, and other staff. Adjusting tests scores to remove the influence of socio-economic factors thus yields measures of relative school performance that are much more representative of a school's actual effectiveness than traditional rankings. In this *Backgrounder* and the associated database, I apply this analysis to Alberta elementary schools, drawing on the achievement test results from the last three available academic years, 2003/04, 2004/05, and 2005/06.

The analysis required to make a fair comparison of Alberta's schools proceeds in three steps. Step one uses achievement test results to create a multi-year measure of school-wide achievement that is comparable across schools. Step two measures the social and economic characteristics of the student body at each school. Step three identifies which of these social and economic characteristics have the strongest relationship to the achievement test results; it then uses these relationships to predict how well each school should perform on the achievement score created in step one, given the socio-economic characteristics of that school as measured in step two. Thus, by removing variation in achievement associated with socio-economic factors, and looking at the difference between the school's predicted and actual achievement scores, one can obtain a fair measure of each school's relative performance.

I should emphasize that the purpose of this analysis is not to rank Alberta's elementary schools from best to worst but, rather, to seek out useful indicators of superior performance. The next step is to examine what the best-performing schools do differently that other schools could emulate, so that all Alberta students

have an opportunity for better learning. In the rest of this *Backgrounder*, I explain the methodology in more detail.

Step One: Measuring School Performance

All elementary school students in grades 3 and 6 undergo standardized achievement tests conducted by Alberta Education. Students who perform particularly well on a given test are said to have achieved the “standard of excellence.” Although the tests are designed to be comparable from year to year, the cut-off scores that define the standard of excellence are adjusted every year so that roughly 15 percent of students in the province reach it. Attaining the standard of excellence corresponds roughly to a grade of 80 percent on a given test.

The measure of school achievement used in this study is the percentage of all students enrolled at a grade in a school who are awarded the standard of excellence on the tests taken in that grade. I performed separate analyses for grade 3 and grade 6. For grade 3, I calculated the average percentage using results of the English language and mathematics tests; for grade 6, I used results from the English, mathematics, science, and social studies tests. For schools with immersion programs, I calculated the average percentage from the test scores of all students who wrote in both English and French.¹

Teachers frequently and correctly point out that, on a year-to-year basis, the composition of a single class at a single school can vary greatly. Thus, averaging results over several years and over a large number of students is critical for a fair and reliable comparison across schools. Accordingly, I obtained the school achievement measure using test results from three academic years, 2003/04, 2004/05, and 2005/06. Most schools in the analysis were in operation over these three years; for schools that were in operation for only one or two of the three years, I calculated an equivalent percentage using the results from the available years as long as the school had at least 40 students. With this methodology, one avoids comparing a small group of students to a large group.

Step Two: Creating a Socio-Economic Picture of the School’s Student Body

The details of how one can measure the socio-economic characteristics of an elementary school’s students are found in Johnson (2005, chap 3). In summary, however, the process is as follows.

Each student at a school lives in what the 2001 census calls a Dissemination Area (DA), the smallest geographic unit of the census, containing an average of 618 people. At the time of the 2001 census, Alberta had 4,800 DAs. For each school with a total enrolment greater than six students, Alberta Education provides information on how many of its 2005/06 students lived in each DA (the data are not broken down by grade). With this information, the process of constructing a

1 Students at schools operated by French-language school districts are not included, as there are too few such schools.

school profile is straightforward. The easiest way to understand how this works is through an example.

Suppose a school has 10 students, six of whom live in DA 1 and four in DA 2. In DA 1, 80 percent of families are headed by a single parent, but in DA 2, only 20 percent are single-parent families. The percentage of lone parents at this school is calculated as $(0.6 \times 80 \text{ percent}) + (0.4 \times 20 \text{ percent}) = 56 \text{ percent}$. The example makes clear that the larger the school, the more accurately the school profile will resemble the profile of students who wrote the achievement tests over the three years studied. This is another reason to restrict the analysis to comparing schools with 40 or more students in a grade over the period.

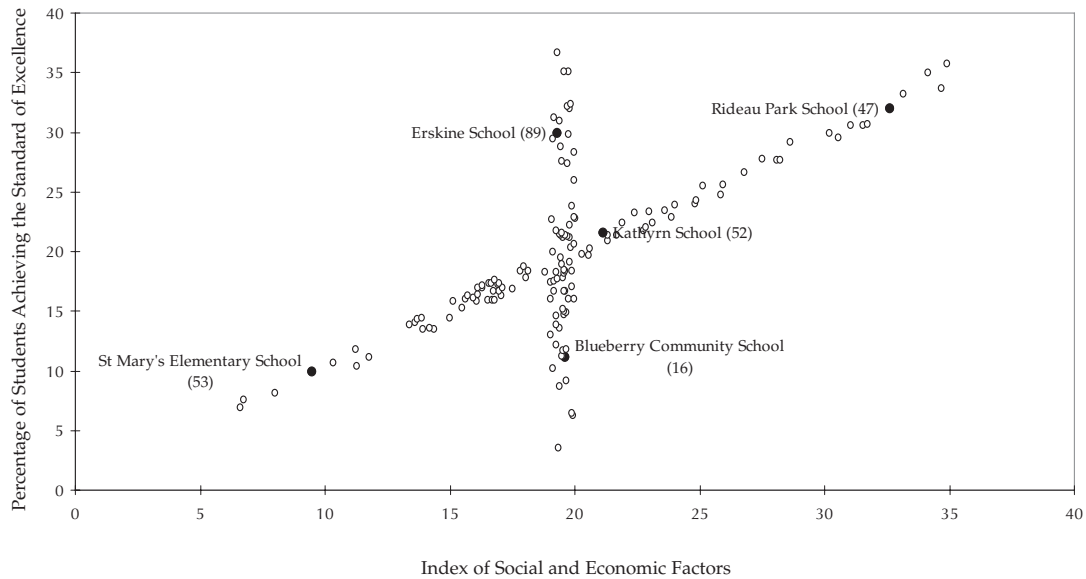
I repeated this process for all schools and for a series of variables:

- the percentage of lone parents;
- the percentage of persons living in detached dwellings;
- the percentage of persons who had immigrated to Canada in the past five years;
- the percentage of persons who speak an official language as their mother tongue;
- the percentage of persons who speak an official language at home;
- the percentage of persons who are Aboriginal;
- the unemployment rate of adults with children;
- the unemployment rate of all adults;
- the percentage of those over 20 years of age without a high-school diploma;
- the percentage of those over 20 years of age who have some university education;
- the percentage of those over 20 years of age with a university degree;
- the percentage of persons who moved in the most recent calendar year;
- the percentage of persons who moved in the past five calendar years; and
- two measures of income: average household income and average family income.

This is a large number of socio-economic dimensions along which to compare the characteristics of the families in each DA that are sending children to school. How can all this information be used to evaluate the relative performance of Alberta's elementary schools?

Step Three: Creating Fair Indicators of Performance by Alberta's Elementary Schools

The methodology for comparing elementary schools is described in detail in Johnson (2005, chaps 4, 6), but it can be summarized here with the help of Figure 1. The vertical axis measures the percentage of grade 3 students who achieved the standard of excellence over the three-year period studied (step one). The horizontal axis shows a composite socio-economic factor — for instance, the average educational attainment of parents. The dots on Figure 1 show the results from a sample of 141 Alberta elementary schools.

Figure 1: *Relative Performance of a Sample of Alberta Schools*

Source: Author's calculations.

Some of the dots form an upward-sloping line that represents the statistical relationship between each school's composite socio-economic factor and the percentage of students achieving the standard of excellence across schools (the estimation of this statistical relationship is explained in more detail in the Appendix). The line establishes a predicted standard of excellence rate for a given school and grade, given the socio-economic environment in which that school operates. The predicted pass rate allows a comparison of the pass rate each school actually achieves and that of schools that operate in similar social and economic environments. If a school falls along the upward-sloping line, then its performance is the same as other schools with students coming from similar socio-economic backgrounds. In other words, the school's performance is exactly as predicted by the statistical relationship estimated between the socio-economic environment and assessment results at all other schools.

In one such school, St. Mary's Elementary School in Fort Vermilion School Division 52, 10 percent of grade 3 students attained the standard of excellence over the three academic years in the comparison. This is well below the provincial average, but does it mean St. Mary's is a poor school? According to the relative performance measure, the answer is no: based on the mix of those who attend, 9.4 percent of St. Mary's students would be expected to attain the standard of excellence.

Travelling up the sloping line past its intersection with the vertical line, one arrives at the results for Rideau Park School in Calgary School District 19. At this school, 32 percent of students achieved the standard of excellence, twice the provincial average. Is Rideau Park a better school than St. Mary's? In this analysis,

the answer is again no: Rideau Park and St. Mary's do not draw from the same group of students. At Rideau Park, the characteristics of the student body predict that a much higher proportion will achieve the standard of excellence, and this is exactly what happened.

In this sense, St. Mary's and Rideau Park are both average schools in Alberta, as is Kathryn School in Rocky View School Division 41. At all three schools and at all other schools along the upward sloping line, the respective percentages of their students who achieve the standard of excellence are exactly as predicted by the composition of their student body. St. Mary's, Kathryn and Rideau Park are neither good nor bad schools, they are ordinary schools. In this analysis, then, what determines whether a school is good or bad?

For the answer to this question, consider the 70 schools along the vertical line in Figure 1. All of these schools operate in comparable socio-economic conditions — which is why they lie mainly along a vertical line in the figure — and have a mix of students whose socio-economic backgrounds predict that between 19 and 20 percent of them will achieve the standard of excellence. Yet, the actual percentage of students achieving the standard of excellence in this group of schools varies widely, from 3 percent to 36.7 percent. Thus, it is fair to compare the performance of the students at these schools and to interpret the results as an indicator of the relative performance of their staff.

It is reasonable to say, for example, that Erskine School in Clearview School Division No. 71, where 30 percent of students attained the standard of excellence over the three study years, is a better school than Blueberry Community School in Parkland School Division No. 70, where only 11.1 percent of a similar mix of students attained the standard of excellence. With a gap of 23.1 percentage points between the two schools, it seems reasonable to ask what happens at Erskine School that allows its students to do better, and what happens or does not happen at Blueberry Community School to explain its poorer performance?

Interpreting the Relative School Performance Measures

Showing the relative performance measures for about 900 Alberta elementary schools in a single display such as Figure 1 would result in an unreadable mass of dots. Accordingly, I present results for each school in a large table entitled *Alberta School Grades 2007* and available at the C.D. Howe Institute's website at <http://www.cdhowe.org/pdf/AlbertaScores.pdf>. The table contains results for both grade 3 and grade 6. Some schools have both sets of results, others have them for only one grade and some have no result depending on whether there was enough information to allow the calculation of valid performance measures. A separate table available from the same webpage, entitled *Alberta School Community Profiles 2007*, contains the data used to construct the schools' socio-economic profiles.

The precise definitions for each of the numbers in these tables are given in the legends at the top of the tables. The most important numbers are the percentiles associated with each school and grade. A percentile score of 50 indicates that, compared with schools whose students have similar socio-economic

characteristics, a school is average: half of other schools in the province are better and half are worse. A percentile score of 90 indicates that a school is better than 90 percent of schools with students from similar social and economic backgrounds. This would be a good, indeed a great, school.

In Figure 1, percentile scores are shown in parentheses for the schools included as examples. Notice that St. Mary's, Kathryn, and Rideau Park all have a percentile score at or near 50, meaning that the same percentage of their students attain the standard of excellence as in other schools that operate in similar socio-economic contexts. Erskine, however, has a percentile rating of 89, while Blueberry, with a similar student body, registers a percentile of 16.

Comparing schools now becomes an exercise in the interpretation of these percentile numbers. There is no real sense in saying that a school with a percentile rating of 98 is better than a school with a percentile rating of 97 — these values are more or less the same in the same sense that, on a hot day, it is 29.5 degrees or 30 degrees Celsius. But if one school has a percentile rating of 90 and another school has a rating of 10, it is very likely that the staff at the 90th percentile school is doing a lot better job than the staff at the 10th percentile school. Differences of this magnitude, which occur both among grade 3 and grade 6 results, are worth investigating to uncover their source.

Conclusion

The methodology presented in this *Backgrounder* presents a way to solve, to a very large degree, the problem of using achievement test results to make a fair comparison of the performance of elementary schools whose students come from different social and economic backgrounds. Using data from several academic years (to remove year-to-year fluctuations) and a large sample of students, the methodology, applied to Alberta's elementary schools, allows excellent schools in any neighbourhood to stand out. The next task is to discover what these excellent schools are doing that produces excellent results, and how these best practices can be transferred to other schools.

Reference

Johnson, David. 2005. *Signposts of Success: Interpreting Ontario's Elementary School Test Scores*. Policy Study 40. Toronto: C.D. Howe Institute.

Appendix: The Creation of the Index of Social and Economic Indicators

The predicted school performance measures (the values on the horizontal axis of Figure 1) are the fitted values from a regression equation that relates the social and economic indicators to the actual school performance measures (the vertical axis of Figure 1). Two equations are estimated, one for grade 3 and one for grade 6. Table A-1 presents the main results from these regressions. Of the numerous variables taken from the census that were considered as potential explanatory variables for differences in achievement scores across Alberta schools, those listed in the table are most strongly associated with school achievement results.

The values in Table A-1 have a clear interpretation. The coefficient value -0.21 under the coefficient in grade 3 regression column says that, everything else being equal, if school A has one percentage point more children from lone-parent families than school B (for example, 21 percent compared with 20 percent), the proportion of students who attain the standard of excellence would be predicted to be 0.21 of a percentage point lower at school A than at school B. The standard error, 0.05, is small relative to the coefficient value, meaning that the coefficient value is quite precisely estimated.

The next coefficient in the table says that, everything else being equal, if school A has one percentage point more students who speak an official language at home than does school B, then 0.20 of a percentage point more students are predicted to achieve the standard of excellence at school A than at school B. The remainder of the values in both columns, except for the last two rows, has a similar interpretation.

Table A-1 has a number of other noteworthy aspects. First, the values of the coefficients on the socio-economic descriptors are not the same in the grade 3 and grade 6 regressions. This means that a socio-economic factor that relates strongly to the grade 3 results might relate more or less strongly to the grade 6 results. Notice, for example, that the association of lone parenting is substantially weaker with the grade 6 results than with the grade 3 results.

Second, the role of educational variables in predicting achievement test results is particularly interesting. All else being equal, if one percentage point more of the parents of students in school A lack a high-school diploma than those of students in school B, then 0.15 of a percentage point more of school A's students are predicted to attain the standard of excellence in grade 3 than school B's. This is not a relationship one would expect, but it is there in the data. The relationship between school results and the other parental education variable is quite different, however, and exactly as expected. The association between the percentage of adults who have attended university and the percentage of students at a school who attain the standard of excellence is very strong, and it is much stronger in grade 6 than in grade 3. In grade 3, if the percentage of university-educated adults in the school community rises by one percentage point, the percentage of students predicted to attain the standard of excellence rises by 0.52 of a percentage point. The corresponding effect in grade 6 is 0.67 of a percentage point.

The final comment concerns the last two rows in Table A-1. The first, "number of schools in the regression," is self-explanatory: it is the total number of schools with at least 40 students in the grade and years studied. The second row,

Table A-1: *The Relationships between Socioeconomic Variables and School Results in Grades 3 and 6*

Census Variable	Coefficient in Grade 3 Regression (Standard Error)	Coefficient in Grade 6 Regression (Standard Error)
The percentage of lone parents	-0.21 (0.05)	-0.09 (0.04)
The percentage of persons who speak an official language at home	0.20 (0.06)	0.11 (0.05)
The percentage of persons who are aboriginal	-0.19 (0.03)	-0.23 (0.02)
The percentage of persons who immigrated to Canada in the past five years	-0.71 (0.25)	-1.11 (0.21)
The percentage of persons living in detached dwellings	0.04 (0.02)	0.06 (0.03)
The percentage of persons who moved in the last calendar year	-0.09 (0.05)	-0.14 (0.06)
The percentage of those over 20 years of age who do not have a high school diploma	0.15 (0.05)	0.16 (0.06)
The percentage of those over 20 years of age who have some university education	0.52 (0.05)	0.67 (0.06)
Number of schools in the regression	919	880
Explanatory power of the regression	0.39	0.44

Note: Most schools have two sets of numbers, one for grade 3 and one for grade 6. Blank entries mean that the school lacks either a grade 3 or a grade 6 or that fewer than 40 of the school's students wrote a grade 3 or grade 6 achievement test over the three study years, and so the school was not included in the comparisons.

“explanatory power of the regression,” is a number, which must fall between 0 and 1, that indicates the strength of the overall relationship between socio-economic factors and school achievement results. A value of 1.0 would mean that all the dots representing schools would fall along the upward sloping line in Figure 1 — in other words, all of the variation in the percentage of students attaining the standard of excellence at various schools would be associated with students’ socio-economic backgrounds. If, instead, the “explanatory power of the regression” were zero, then differences in the socio-economic backgrounds of students at various schools would not be associated at all with variation in achievement test results, a result that would surprise everyone. In fact, as Table A-1 shows, the values of 0.39 for grade 3 and 0.44 for grade 6 indicate that 39 percent and 44 percent, respectively, of the variation in the percentage of grade 3 and grade 6 students achieving the standard of excellence in Alberta elementary schools is associated with variation in socio-economic conditions across schools. The remaining 60 percent of the variation in grade 3 (55 percent in grade 6) is associated with other, unobserved factors that, it is reasonable to infer, reflect differences in the quality of the teaching methods and the teaching environment to which students are exposed; it is on this “residual” that the school performance measures are based. There is substantial evidence, therefore, that how schools do their job really matters for student outcomes. With this evidence in hand, one can then identify and celebrate excellence.

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