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Using data to support educational improvement

Carol Campbell · Ben Levin

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Abstract Data on student achievement are increasingly being used to support effective policy and practice, and to move education systems towards more evidence-informed approaches to large-scale improvement. In this paper, we outline strategies used in Ontario, Canada to create, enhance and apply a range of data to support educational improvement. These strategies were intended to integrate the collection of data and its use at the three levels of school, district, and province. The strategy also included improving educator capacity to use data and the development of better analytic tools to understand data in context.

Keywords Assessment · School improvement · Data use · planning · Ontario · Literacy

1 Introduction

In this paper, we outline strategies used in Ontario, Canada to create, enhance and apply data—in a range of forms—to support educational improvement. We are concerned with the development of evidence-based practices, and in particular the use of assessment of and for learning, as a system quality in a coherent way at multiple levels—the province or state, district and school.

Three main drivers for the use of data to improve student achievement underpin the approaches described in this paper. First is the importance of data, particularly

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C. Campbell
Ontario Ministry of Education, 900 Bay St., Toronto, Ontario, Canada
e-mail: Carol.campbell@ontario.ca

B. Levin (✉)
OISE University of Toronto, 252 Bloor St. West, Toronto, Ontario, Canada
e-mail: blevin@oise.utoronto.ca

relating to student assessment and learning, to inform school and classroom practices as well as system level policies. Second is the wider movement both within and beyond education to advance the use of evidence-based decision making. Third is the effort across many countries to bring about rapid and sustained large-scale educational reform with real gains in student outcomes.

1.1 Using data to improve student achievement: Assessment of and for learning at system and school levels

Using information about student learning and progress to inform school and classroom practices is widely recognized as an important component of strategies to support improvement (e.g. Earl and Katz 2006; Fullan et al. 2006). Writing in 1989, Sadler indicated:

> The learner has to (a) possess a concept of the *standard* (or goal, or reference level) being aimed for, (b) compare the *actual* (or current) *level of performance* with the standard, and (c) engage in appropriate *action* which leads to some closure of the gap. (Sadler 1989: 121, italics in the original).

Sadler's (1989) research pointed to the importance of developing appropriate approaches to 'feedback' within formative assessments. A decade later, these ideas were echoed and re-enforced in the research providing momentum for 'assessment for learning' (Assessment Reform Group 1999). Partly in a response to the perceived limitations of summative assessments, such as large-scale tests, researchers pointed to the importance not just of 'assessment *of* learning' but also to the development of 'assessment *for* learning', in which formative evaluation and classroom assessments are an essential part of teaching and learning, involve students in learning goals, self-assessment and identifying progress, provide feedback to benefit students and teachers, and are grounded in a belief that all students can improve (Black and William 1998a, b).

Research about 'assessment for learning' has indicated that it can be a powerful strategy both to support teachers' practices and to engage and empower students in their learning and progress (Black and Wiliam 1998a, b). Studies have suggested that using data to inform instruction and learning goals has the potential to increase student performance (Doyle 2003; Lafee 2002; McIntire 2002).

The move to an emphasis on the use of student assessment data is supported by a wider movement to evidence-based or evidence-informed policy and practice, both in education and in other fields (Nutley et al. 2007; OECD 2007; Levin 2005, 2006; Sebba 2004). The public, professionals and policy-makers want to know that their decisions, investments and actions are based on evidence. In education, this requires balancing schools' needs for data with external requirements and reporting, a balance reflected in Rolheiser and Ross's (2001) definition of assessment literacy as the:

- capacity to examine student data and make sense of it
- ability to make changes in teaching and schools derived from those data
- commitment to engaging in external assessment discussions.

While the primary focus remains on improving school practices to support student learning, it is important to consider how this work in schools can be supported by

district and state systems. A tri-level approach (Fullan 2007) would mean that state systems provide the context, resources and overarching framework for data availability and use, while districts support schools in developing the appropriate practices to make a difference in their daily work.

Effective use of assessment and data to support positive outcomes for educators and students requires careful attention to building capacity to access, understand and apply data. Without this, the result can be "a sorry mixture of confusion, technical naivety and misleading advice" (Goldstein 1999). Research indicates that assessment for learning and evidence-based practices are both areas where educators require support to develop their 'assessment literacy' (Stiggins 2001) through their capacity and confidence in the use of data. Fullan et al. (2006: 20) comment:

> In our experience, even those who think they are well into assessment for learning soon realize that they have a way to go.... The rhetoric of assessment for learning is abundant, but the knowledge in reality is very thin on the ground.

There can be both a lack of will towards using data and a lack of capacity. Earl and Katz (2006: 3–4) discuss a perceived scepticism towards data amongst educators based on mistrust or fear of data and evaluation, and lack of training on how to use data. Individual schools may lack capacity to understand and use data effectively to inform instructional improvement and student learning (Diamond and Spillane 2004; Earl 2003; Ingram et al. 2004; Mason 2001).

If assessment for learning is perceived as primarily a school responsibility, there will continue to be variable capacity to implement this strategy for the benefit of all students. The importance of building capacity to use data applies therefore at both the school and system levels (Datnow et al. 2007).

In school districts in Ontario that were showing improved student outcomes (Campbell and Fullan 2006), the use of data and development of assessment literacy at both the school and district levels were identified as important activities. Alongside supporting classroom and school practices, the districts developed consistent approaches through the use of district-wide assessment and evaluation guides, purchase and provision of common assessment and diagnostic tools for all schools, and district-wide collection, storage, analysis and reporting of student data to inform system and school improvement planning and practices. The Ontario districts also supported schools in using and understanding data. Professional development on data analysis and assessment literacy was provided for principals and teachers and there were clear expectations about the use of student assessment information. The districts used data at the system level to inform improvement planning, set targets and goals, and build in monitoring, review, feedback and accountability for progress.

Alongside supporting a dynamic use of data to inform school-level practices, reflections and actions, it is important as well to develop "mutual accountability in system-school relationships" (Datnow et al. 2007: 29), involving shared responsibility between schools and system leaders, developing "a trusting relationship…a two-way communication flow between schools and central offices".

Datnow et al.'s (2007) study of US district practices in using data places student performance at the centre of data-driven decision making, with the school approach including decisions and actions relating to data systems, structural supports, knowledge and skills, and relationships and behaviours. The schools are, in turn,

supported and influenced by structural supports (including achievement goals, resources, curricular and instructional guidance), data systems (including assessment and evaluation systems and data-sharing practices) and supports for developing knowledge, skills and collaboration at the district level. And all of this is influenced by the wider context of educational policies and accountability frameworks at the state, provincial or national level.

Developing 'assessment for learning' and use of data as a systemic strategy requires also balancing capacity building and developmental processes with accountability requirements, sometimes referred to as balancing 'pressure' and 'support' (Barber and Fullan 2005). Assessment data can be used for a range of accountability purposes. Requirements around standardized testing and reporting in many jurisdictions place an emphasis on external accountability for results achieved and identification of school success or otherwise. At the same time, assessment for learning strategies (e.g. Black and William 1998a, b; Assessment Reform Group 1999), are about moving away from an emphasis on externally imposed assessments to the importance of student and teacher responsibility for formative assessment to inform teaching and learning. In part, these developments are a counterpoint to the movement in large-scale assessment and testing "from being an instrument for decision making about students to being the lever for holding schools accountable for results" (Firestone et al. 1998). However, rather than a polarising debate between 'internal accountability' (Elmore 2004) or external accountability, the need increasingly is to find ways to balance these expectations. Fullan (2007: 60) identifies building "internal accountability linked to external accountability" as a key element in successful educational change strategies. In particular, he identifies assessment for learning as a "powerful, high-yield strategy" for identifying improvement goals and informing actions to achieve these, arguing that:

> As educators become more assessment literate, they not only become more comfortable with specific data, they also seek and use assessment data. It is at this point that external accountability becomes more accepted, more transparently available, and more readily used for summative conclusions and judgements. (Fullan 2007: 60)

Earl and Katz (2006) suggest that by developing appropriate use of data in a wide range of forms, including from large-scale testing and from formative classroom assessments, professional accountability will be enhanced:

> Professional accountability is based on data, not as a final judgement but as part of the toolkit for understanding current performance and formulating plans for reasonable action…. Educational leaders and school staffs who are committed to professional accountability and making informed professional judgements think of accountability not as a static numerical accounting but as a conversation, using data to stimulate discussion, challenge ideas, rethink directions, and monitor progress, providing an ongoing image of their school as it changes, progresses, stalls, regroups, and moves forward again. (Earl and Katz 2006: 13).

While assessment for learning places a strong emphasis on classroom assessment data, many other kinds of information are now available in many places relating to

classrooms, schools and the contexts in which they operate, including community demographics. Since the origins of the school effectiveness studies, recognition of the interplay between students' socio-economic and demographic factors with school performance has required consideration of a range of indicators to examine students' outcomes and progress (Edmonds and Frederiksen 1979; Scheerens 1997; Teddlie et al. 2000). Evidence about the differential performance of groups of students, including consideration of social, ethnic and gender groups (Willms and Kerr 1987; Nuttall et al. 1989; Gillborn and Gipps 1996; MacBeath 1999) and criticisms about narrow interpretations of school effectiveness (Slee et al. 1998; Thrupp 1999) have contributed to growing attention to a wider range of contextual factors and how these effect and interact with school-level factors. The coming together of school effectiveness and school improvement traditions has placed an emphasis on the use of data both to understand the balance between school, student and contextual data and to look at the school processes that appear to support improved achievements.

The debate has moved also from a focus only on outcomes achieved to the value added by schools for groups of students, for example Sammons et al. (1995a: 3) suggested that an 'effective school' is one which:

> Adds extra value to its students' outcomes in comparison with schools serving similar intakes.

Measures of value added have proved to be complex and contested. There are technical and methodological debates about the best measures and challenges about having reliable student-level data over time (e.g. Goldstein and Spiegelhalter 1996). At the same time, the concept of 'value added' with an implicit assumption that all schools can achieve "year-on-year improvements in the outcomes of successive cohorts of 'similar' pupils" (Gray et al. 1999: 11) has been contested in light of evidence that sustained continuous improvement is difficult to achieve and that a focus on overall achievement may not address persisting gaps in performance sufficiently (Mortimore and Whitty 1997).

While measures of value added continue to develop, these approaches do take understanding of school and student performance data beyond achievement results only. The movement to value added measures in the UK, for example, was strongly associated with concerns about the inappropriateness of 'league tables' where schools were ranked based solely on current achievement results with no consideration of the very different intakes and circumstances of schools. Similarly, in Ontario, while the Ministry of Education does not produce school by school comparisons, the Fraser Institute, a non-profit policy organization, does publish annual rankings based on achievement results, as it does in several other provinces as well. Another think-tank, the CD Howe Institute, has developed an alternative methodology which includes performance and contextual data, as Johnson explains:

> Using the data made available by EQAO (provincial assessment agency), Ontario's elementary schools can be ranked according to two methods. One method, called an "absolute" ranking, simply ranks schools according to the percentage of their students performing at level 3 or level 4 on the (provincial) assessments.
>
> A more useful and relevant methodology, however, is a "relative" ranking system that identifies schools that perform better than *similar schools* on the same

> assessments—in other words, a ranking that compares schools that serve communities with similar socio-economic characteristics. (Johnson 2005: 132–133).

Consistent with some previous analysis of student contextual data in Ontario (Tremblay and Lemarguand 2001; Harris and Mercier 2000)—and indeed school effectiveness research internationally—Johnson's (2005) analysis shows the importance of household income and parental education as influences on students' performance. As will be discussed further below, the Ontario Ministry of Education has developed an approach that integrates the importance of contextual and performance data, while rejecting the use of 'ranking'. Further, approaches to understand *school* performance overall, as well as individual student performance, need to take into account the possibility of the "collective effect of 'social' mix" (Thrupp 1999) which includes consideration not only of individual student data but the concentrations and distributions of demographic characteristics across schools—particularly for schools with high proportions of students living in poverty or other difficult circumstances (Muijs et al. 2004).

While important, the development of assessment for learning and use of other contextual and school data is not an end in itself. To inform educational improvement, the use of such data requires a system commitment to advancing goals and policies for educational improvement, and actions to implement this improvement, particularly in classroom practices. Any serious attempt to build capacity to use data, therefore, must be aligned with the wider educational strategies being implemented and intended outcomes to be achieved. Although there are technical factors connected to advancing the use of assessment and data, the larger questions are essentially educational and political about the intended purpose, changes desired and results to be delivered. We explore this further in the case of Ontario, Canada.

1.2 Ontario's education strategy

Ontario is Canada's most populous province, containing some 40% of Canada's 33 million people. It covers an area of 1 million square kilometres. Public elementary and secondary education is a provincial responsibility in Canada's federated system of governance. The Ontario public education system encompasses four governance systems (all publicly funded): English public system, English Catholic system, French public system, and French Catholic system. There are over two millions students (1.4 M elementary and 0.7 M secondary) in over 5,000 schools in these four systems. The schools are administered through 72 school boards and smaller school authorities, which employ in total 115,000 teachers and about 75,000 other staff. Ontario's teachers and most of its support staff are unionized. Although the Ontario population is highly urbanized, there are large rural and northern areas with many small and isolated schools. The average elementary school has about 350 students and the average secondary school fewer than 1,000. Ontario has a very diverse population as well, with 27% born outside of Canada and 20% visible minorities.

For student achievement data, Ontario has a system of provincial testing in reading, writing and mathematics in grades 3 and 6, in mathematics at grade 9, and a high school literacy test in grade 10 that is a requirement for graduation. All of these

tests are created and administered by an arm's length agency, the Educational Quality and Accountability Office (EQAO). EQAO was established by the government through the Education Quality and Accountability (EQAO) Act, 1996, following the recommendations of a Royal Commission on Learning. EQAO was created to ensure enhanced accountability and quality across the Ontario education system, the responsibilities include:

- evaluating the quality and effectiveness of elementary and secondary school education (primarily through provincial testing);
- implementing provincial student assessments within the parameters established by the government;
- supporting Ontario's participation in national and international assessment initiatives;
- recommending improvement strategies and promoting educational practices, including assessment for learning;
- supporting research and data analysis on strategies for improving learning;
- reporting to the Minister of Education, public and education community on assessment results and related factors.

Ontario does not have high school exit exams; high school graduation requires earning 30 course credits including 18 prescribed courses. In addition to provincial testing data, schools and districts are encouraged to gather and use other forms of student and school performance data, including classroom assessments. Districts also provide operational school and district data to the Ministry of Education, concerning teacher supply, finances, student enrolment and class sizes.

In 2003, following years of significant political conflict over education, a new government was elected (and re-elected in 2007) with education as its priority mandate. Subsequently, a large-scale reform of K-12 education in Ontario is in process. The Ontario Ministry of Education is focusing on three key strategic goals:

- Increased student achievement;
- Reduced gaps in performance;
- Increased public confidence in public education.

Aligned with these strategic areas, specific targets were established for the implementation of a primary class size maximum of 20 students, for at least 75% of elementary school students to be achieving at the provincial standard in reading, writing and mathematics (compared with approximately 54% in 2003), and for a high school graduation rate of 85% (compared with 68% in 2003). In addition, the conditions for improved student outcomes have been supported by collective agreements with teachers and support staff to bring a climate of 'peace and stability' and an ongoing commitment to professional capacity, mutual respect and trust as central elements of reform. Many ancillary strategies, such as support for safe schools, student health and character education, have been implemented to support stronger public education. However the two most important elements in the Ontario approach are the Literacy and Numeracy Strategy for elementary schools and Student Success Strategy for secondary schools.

The Province's Literacy and Numeracy strategy is extensive, comprehensive and well-resourced. A new special purpose Secretariat, headed by a Chief Student Achievement Officer, was created to lead this initiative provincially. Among the key

components for improving student outcomes are setting clear improvement targets, ensuring a school and district focus on improvement, providing better instructional resources, decreasing primary class sizes, strengthening instructional leadership, and supporting effective instructional strategies and classroom practices. In all these areas substantial efforts have been made to strengthen the capacity of teachers, support staff and school and district leaders through various forms of training and networking. A fuller description of the Strategy can be found in Levin 2008.

An analogous Student Success Strategy has been created and implemented to support increased high school graduation rates. Like the Literacy and Numeracy approach, this strategy emphasizes setting targets for improvement, creating school and district improvement plans and leadership teams, improving teaching skills, some reductions in class size in high priority areas, new curricula, and strengthening instructional leadership. To recognize the particular nature of high schools, the Student Success Strategy also involves strengthening transitions from elementary schools into high schools, and related policy changes such as changing some graduation requirements. Unlike the Literacy and Numeracy Strategy, the main leadership capacity for Student Success is located in school districts, each of which has a specially funded position for a Student Success leader. More recently, Student Success Teachers at the school level have been added to the strategy to align implementation. The Strategy was also supported by legislation passed in 2006.

Both strategies have led to significant improvements in student outcomes even within 2–3 years. In elementary schools about 15,000 more students per year (an additional 10% of each cohort), are now reaching the provincial standards in reading, writing and mathematics. Progress has been made in reducing the achievement gaps for some target groups, most notably English Language Learners. The number of very low performing schools has dropped by three-quarters. In secondary schools, the percentage of students at risk entering high schools has declined while the proportion of students acquiring 16 credits or more by the end of grade 10—that is, students on track with no failed credits—has increased from 61% to 66% between 2004–05 and 2005–06. The high school graduation rate has increased from 68% in 2003–04 to 75% in 2006–07.

Effective use of data to guide improvement has been a critical component of both strategies. Schools and districts increasingly use a variety of data to support their improvement plans and for instructional planning, in large part because there has been at all levels of the system so much support for, as well as emphasis on, effective use of data. The process has become mutually re-enforcing as data have been a driver in identifying areas requiring strategic attention. As strategies are implemented further data are used to increase precision in implementation and monitoring. Some of the main strategies and supports are described next.

1.3 Developing and implementing data-informed strategies: Establishing, accessing and using quality data

At the provincial level, two vital initiatives have taken place—the phased implementation of a new web-enabled system to collect data from schools and school boards, and the development of a data warehouse to provide quicker and better access to the data. Prior to this new system, Ontario schools and districts used

a variety of data collection systems with different definitions and rules, resulting in lack of consistent and timely information about students, teachers and schools.

The Ontario School Information System (ONSIS) has been implemented over the past 6 years. This system collects data on students, teachers, courses, classes and school and board administration. Data are collected at an elemental level in each school, and unique identifiers have been provided for students and educators. ONSIS incorporates consistent and clear business rules, resulting in a much higher level of data integrity. With the implementation of ONSIS and the development of a data warehouse, the capacity now exists to conduct longitudinal cohort analysis and to bring together contextual, school, student achievement and survey data to inform important research and policy questions and to enrich the dialogue at all levels on strategies for improved student achievement.

Such developments are connected also to the need for robust and timely data to support policy goals. For example, the Student Success strategy is informed by twelve indicators that schools and districts gather and use on a regular basis. Developed by a committee of district representatives and Ministry staff, they include measure of student progress and achievement, such as appropriate credit accumulation in grades 9 and 10 and passing of the compulsory Literacy Test, as well as indicators to determine whether students were making use of course offerings thought to be more appealing to non-university bound students, such as co-op and workplace-oriented courses. There are additional indicators to measure retention of students in the French-language system, another important Ministry goal. In addition, the French-language education system in Ontario has developed its own accountability framework based on identified outcomes and related indicators.

The Ministry created, through dialogue with districts, a set of eight public indicators for school districts in priority areas such as literacy and numeracy results, high school credit accumulation and effective budget management. These indicators are reported annually for all 72 school districts on a publicly-available web site. However boards are not ranked on these indicators.

Building and supporting the systematic use of data at the provincial and district levels has been challenging. One challenge has been common definitions of the indicators, particularly where there may be local differences on issues such as defining ‘at risk’ students. There have also been a range of technical and business rule barriers, as school districts have differing capacities to collect the data and schools having different data codes and approaches. Developing a province-wide approach to measuring high school graduation rates has been particularly challenging, as initially not all districts collected such information or had the capacity to do so, and there was debate about how best to measure graduation. Hence, the move to indicators has, in turn, been a driver of the provincial development of systematic capacity to collect data in a consistent manner and for greater consistency in defining such key variables as graduation rates.

1.3.1 1. Building capacity to use data in districts, schools and classrooms

Having more and better data available reinforces the need to build capacity to collect and use data at the district and school levels as well as in the Ministry of Education. The Managing Information for Student Achievement (MISA) initiative by the

Ontario Ministry of Education is increasing the capacity of educators at all levels to work with data in support of strategies for improved student achievement. A 2004 Ministry survey of the technology, data management and human resource capacities of school districts found that these varied widely across the province. These findings set the stage for the development of common guidelines and tools as well as funding to help develop the sector toward a higher level of skill in working with data to support effective instructional practice and strategies for improved student achievement. The MISA initiative has been developed concurrently with the implementation of ONSIS to take advantage of the capacities of the new information system.

Ontario's approach to MISA is consistent with research on effective data practices, requiring attention to data access, validity, collection, storage, integrity, analysis and reporting (Kerr et al. 2006) and of evolving a data culture, research-informed practices, leadership and learning communities (Heritage and Yeagley 2005; Lachat and Smith 2005). Consistent with a tri-level improvement process (Fullan 2007), a nested approach has been developed of supporting districts to support schools, and providing enabling approaches at the provincial level.

MISA has been developed in collaboration with partners across the education sector. Since 2005, the MISA Advisory Committee has brought together teachers, principals, board administrators, researchers and Ministry staff to provide strategic advice on the initiative and insights into issues related to the large scale change necessary to move to an evidence-informed environment. The Ministry identified technology, data management and human resource capacities as three core areas critical to the use of data and information to support student achievement. In 2005, the Ministry began funding three year plans for growing capacity in each of the core areas in all Ontario school districts.

In addition, there was a need to facilitate collaboration amongst districts concerning the challenges that they faced relative to implementing the MISA initiative. In response, the Ministry funded seven Professional Network Centres across the province with the objective of promoting collaborative approaches to building capacity to work with data and to increase links to the research community. The Centres have assumed ownership of the MISA goals and have contributed to the success of local capacity building by facilitating the sharing of effective practices and promoting joint endeavours across districts concerning technology acquisition and training on data management and use. Aided by the efforts of the Centres, districts have taken a variety of approaches to increasing the availability of quality evidence at the local level. They have enhanced student management systems, acquired decision support tools, established business practices that promote data integrity and conducted training sessions for teachers and principals on the collection and use of data. These efforts have been guided at each school board by a MISA Leader, a position funded by the Ministry.

The Ministry is also encouraging schools and districts to review their assessment data with a focus on improvement planning and actions. Associated with the provincial literacy and numeracy goals, a process of district and school target setting has been built into the improvement planning processes. Districts identify their own targets for improvement, working closely with the staff of the provincial Literacy and Numeracy Secretariat in doing so. The specific strategy for generating targets varies with local districts, some starting with school targets and then establishing the overall district strategy and others setting their overall target first and then working to identify individual school targets.

An early learning was that setting appropriate targets required professional dialogue and development to balance ambition with realism. In the first round of target-setting, some districts set very low or even negative targets. A process of discussion with The Secretariat's Student Achievement Officers led to more ambitious but still realistic targets embedded in district and school improvement plans with actions linked to priorities. This process includes improving the use of data to inform decisions at district and school levels, and providing a resource document to inform effective improvement planning processes (Ontario Ministry of Education 2006a). The process assumes that districts and schools will review a wide variety of data in setting targets, for example data on past performance, trends over time, achievement of specific student populations, student characteristics, and resource allocation (human and financial). Target setting involves improvement teams at both district and school levels setting targets that will move performance to higher levels and improvement plans with specific goals, strategies, resources, and monitoring to implement actions to achieve targets set.

There are also strategies in place to support assessment of and for learning. The Education Quality and Accountability Office has increased its support for schools in the use of provincial assessment data connected to curriculum expectations, for example by providing schools with profiles of performance connected to the main strands of the curriculum and assessment questions. Student Achievement Officers from The Literacy and Numeracy Secretariat and Student Success Leaders support the use of classroom assessments to inform instruction. Training to support differentiated instruction has been provided to teams of teachers and principals across the province. Building on research about differentiated instruction (e.g. Tomlinson and Allan 2000; Tomlinson and Eidson 2003; Tomlinson and McTighe 2006), the Literacy and Numeracy Secretariat's definition used in training materials is:

> Teachers use assessment data to identify students' learning strengths and needs in order to plan effective, meaningful learning experiences. Such assessment data can be gathered through observations of the students, formal assessments and through conversations with the student, family members and other educators. (Ontario Ministry of Education 2006b)

Districts and schools are encouraged to use a range of approaches to formative assessment within classrooms, including diagnostic tools, running records and data walls (visual displays of the status and progress of all students in a school). The approach to differentiation places an emphasis on using assessment data, in a range of forms, to a repertoire of teaching strategies intended to support all students and encourage their further development.

Differentiated instruction has become a central element of educational practice in elementary and secondary schools.

1.3.2 Developing a systemic approach to assessment, context and program data

The Literacy and Numeracy Secretariat needed to develop the capacity to analyze data for all elementary schools in Ontario quickly and effectively in order to inform the strategy for improvement. At the same time, the use of results from large-scale assessments such as EQAO was controversial in Ontario, as in other places. Teachers

and their organizations disliked the EQAO tests, which had become closely connected with the former government's agenda focusing on competition and accountability as main drivers of improvement. The new government, while maintaining the EQAO testing program, wanted to avoid unfair rankings of schools and was also committed to working closely with stakeholders to build commitment to the larger reform agenda. Reports from think-tanks in Ontario that calculated school rankings made it clear that the Ministry could not avoid this issue.

In response to these conflicting pressures, the Literacy and Numeracy Secretariat and Information Management Branch of the Ministry of Education developed the Ontario Statistical Neighbours system, a dynamic tool for analysis of elementary school performance, characteristics, and contexts. A driving purpose in the development of the Statistical Neighbours analysis has been to provide decision-support to the Secretariat that looks at student achievement in all elementary schools while taking careful account of socio-economic factors that influence achievement. A detailed analysis was carried out on a range of data sources, including Ministry data, data from EQAO, and Statistics Canada demographic data, to determine which factors were most meaningful. The approach was further refined through prototype development and in consultation with stakeholders across the education system. Decisions were taken to include only data that had educational relevance and not to include multiple data sources that were essentially measuring the same factor, for example selecting one indicator for low income which had the strongest correlation with student achievement. The most powerful predictors of school achievement results identified in Ontario are low income households, parental education and student mobility.

Using Canadian census data, a model was developed to ascribe socio-economic characteristics to a school based on the actual household characteristics of students in each school based on postal codes. This is more precise than using general data about communities or neighbourhoods.

The data included currently in the Statistical Neighbours analytical tool includes:

- Performance typologies: EQAO performance in reading, writing and mathematics at both Grade 3 and 6 with a one-year typology for most recent achievement results and a three-year typology for performance over time;
- Socio-economic/demographic indicators: proportion of children living in low income households, level of parental education, whether the language spoken at home is the same or different from the language of instruction in the school;
- School characteristics: enrolment, location (predominantly urban to predominantly rural), English or French language school, proportion of students identified as having special educational needs, proportion of students identified as having English as an Additional Language, student mobility.
- Ministry program data: participation in particular program initiatives

Statistical Neighbours performance analysis is based on analyses of each school's results for the most recent year and over the last 3 years.

The one year analysis includes categories based on current achievement results, with lowest achievement being 0–33% of students achieving at or above provincial standards, through to high achievement schools where at least 75 percent of students are achieving at or above the provincial standard. These categories were selected to

map onto the provincial goals—with the overarching goal being to increase the number of students (and therefore schools) where 75% or more students are achieving the provincial standard in reading, writing and mathematics. A parallel goal has been to reduce the number of schools where less than a third of Grade 3 students are achieving at provincial standard in reading—hence the lowest results category. This information can be analyzed and reported at the provincial, regional, district and school levels. One major finding from this analysis was that the majority of schools provincially are in the mid to higher performing ranges, rather than the lowest achieving groups.

The focus, however, is not just on current achievement results but also performance over time. The Ontario strategy is concerned with improvement at all levels of achievement. The three-year performance typology was developed to indicate the direction of improvement (or otherwise) of a school over the past 3 years, with several categories to indicate declining, static, or improving at either a higher (above 65%) or lower (below 65%) level of performance, plus categories for schools that are consistently very low achieving or high achieving. The selection of a three-year trend approach is consistent with other analyses indicating that 3 years is generally the appropriate period to identify consistent trends or patterns in school performance (Gray et al. 1999, 2001). One major finding from this analysis is that the number of consistently low-achieving schools has become relatively small; however, the number of schools in the mid-range of performance that are showing limited improvement over time—that are essentially static—is of concern, leading the Literacy and Numeracy Secretariat to shift more attention to schools in this category.

By combining assessment data with contextual and program data, the Statistical Neighbours analysis allows identification of schools that are demonstrating substantial improvement in different contexts, including those "beating the odds", and schools that are showing limited or declining improvement, particularly in less disadvantaged contexts. For example, the charts below show the distribution of elementary schools in Ontario categorized by proportion of students living in low socio-economic households and their performance in the 2005–06 Grade 6 assessments. Those on the left of the chart are more affluent and, not surprisingly, have higher achievement results—"above provincial target", indicating the school has 75% or more students achieving standard. However more than 100 schools with fewer than 5% of students living in low income have consistent achievement results where less than 33% of students are achieving the provincial standard ("extremely far from provincial target"). At the other end of the socio-economic categories (right side of chart), the majority of schools where 25% or more students are living in low income households also tend to have lower achievement results. Nevertheless, there are almost 50 schools in this category that had 75% or more students achieving the provincial standard. The full range of achievement results are present in each of the socio-economic categories connected to the schools. Through this analysis, assumptions about achievement and socio-economic status can be tested and challenged—particularly through identifying schools performing well in challenging circumstances and pinpointing schools with few socio-economic challenges that remain low performing (Fig. 1).

Figure 2 shows the performance of elementary schools in Ontario comparing proportion of students living in low income households and performance over the

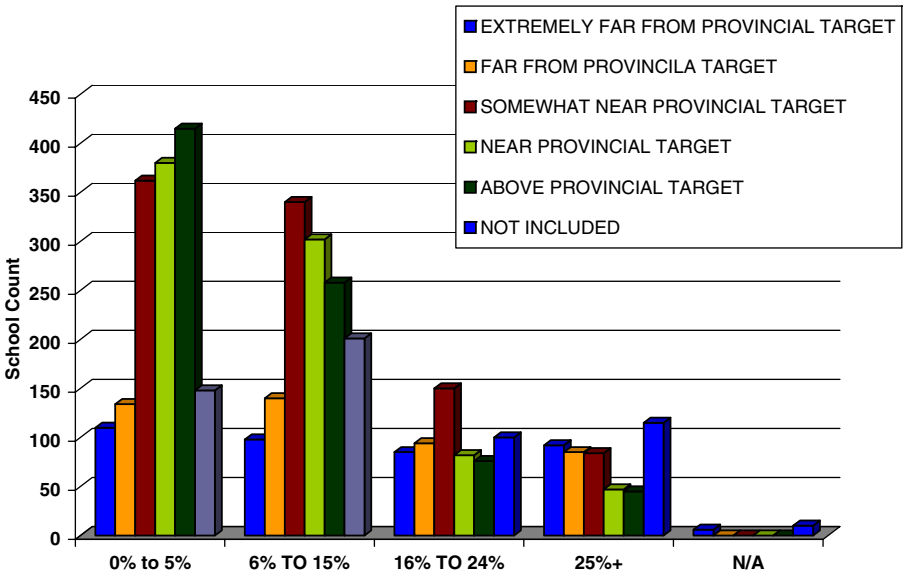

Fig. 1 Grade 6 reading, low income cut off (LICO) by 1 year performance

past 3 years (from 2005–06 to 2003–04). Encouragingly, the numbers of schools that are 'always lowest range'—that is 3 years consistently with 33% or less students achieving provincial standard—is small. At the same time, there are a substantial number of schools 'improving' (by at least ten percentage points over the past 3 years). However, as mentioned earlier, this trend analysis shows a large group of schools with limited improvement over time—'static' (defined as the achievement

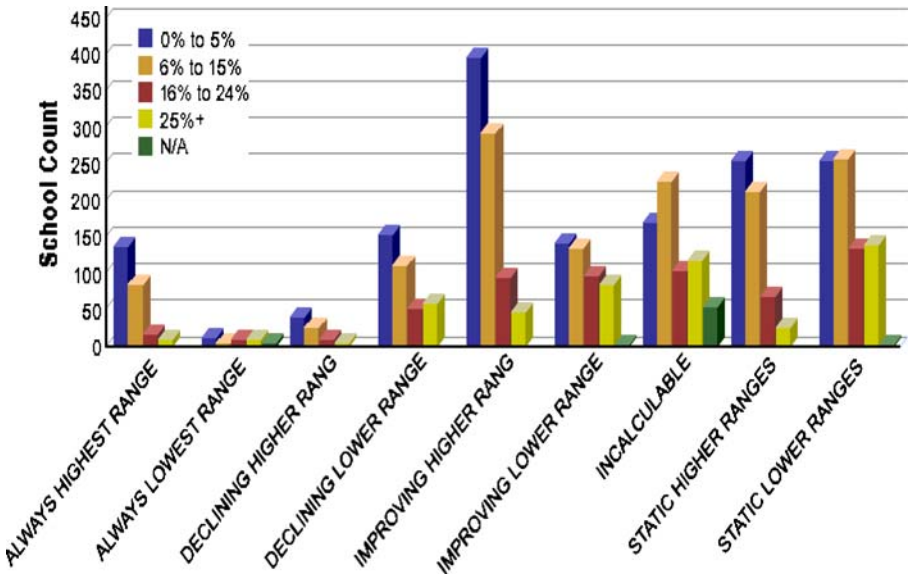

Fig. 2 Grade 6 reading—3 year typology by LICO

results remaining within a nine percentage point or less range over the past 3 years). The chart indicates that the majority of schools that are static also tend to have a smaller proportion of students living in low income. These are sometimes referred to as 'coasting schools' which have social capital but are not improving sufficiently.

Making data accessible requires user-friendly approaches (Datnow et al. 2007). The Statistical Neighbours tool is usable by non-experts, as the main focus is on accessing and using data for educational improvement. A major emphasis in the design of the system was placed on allowing users to do their own inquiries, as opposed to pre-defined report design, in order to accommodate the need to get quick answers to a wide variety of ad hoc questions. Although the system can produce reports such as those illustrated above, the main strength is its dynamic and flexible nature. The "schools like ours" module enables a user to search based on an individual school and identify similar or dissimilar schools using any combination of the available indicators—for example, similar demographics but higher achievements. This is a key element of the system, developed at the request of teacher and principal groups, as it enables flexible comparisons based on user needs. Moreover, the tool works against ranking of schools or predetermined clusters, as the approach recognises the multiple features that influence schools.

The Ontario Statistical Neighbours information system encountered some challenges along the way. As The Secretariat's remit is for all elementary schools, it was imperative to use data that were available provincially for all schools and appropriate to the demographic, geographical, and linguistic diversity of Ontario. Elementary schools have a range of organizational forms, with some schools including Grade 3 but not Grade 6 and vice versa. The approach developed recognizes that schools can have differential performance across grade levels and subjects, so the system can analyze a single assessment or a combination to give a whole school picture.

It is important also to recognise that the data can only take you so far. Careful consideration of the purpose of data analysis and how it related to educational improvement have therefore become key considerations. Analysis from Statistical Neighbours informs The Secretariat's planning processes to identify areas for improvement and target interventions and resources. It contributed directly to the establishment and development of the Ontario Focused Intervention Partnership (OFIP), which provides targeted support and resources to lower performing schools. Much attention has been focused on schools in the mid-range of performance that are not improving over time, particularly in light of contextual analysis indicating that these schools tend to have slightly more advantaged demographics than the majority of schools provincially. Statistical Neighbours analysis has informed the 'Schools on the Move' program, profiling schools that have demonstrated considerable improvement over time, particularly in more challenging circumstances, and supporting them to share their practices and build professional networks with other schools. Recently, a Statistical Neighbours information service has been established to support a leadership network between the highest and lowest performing districts in Ontario. Districts either directly or through the Secretariat's Student Achievement Officers can use data from Statistical Neighbours to inform improvement planning and target setting processes.

Interwoven with all of the above purposes, the analytical function of Statistical Neighbours is also being extended through research and evaluation activities to explore the factors affecting more and less successful schools by analyzing contextual and school information. The emphasis on combining data, research and evaluation is part of the wider strategy for Ontario policies, programs and practices in education to be evidence-based and research-informed). The Ontario approach is to bring together data, with local and international research and other forms of evidence, to inform strategy decisions at the provincial level, to support implementation of successful practices at district and school levels, and to monitor and evaluate progress and outcomes achieved in order to feedback into future strategic decisions and practices at province, district and school levels.

2 Conclusions

In this article, we have explored the use of assessment for learning and other forms of data to support educational improvement. Assessment for learning is an important strategy for connecting instructional strategies and classroom practices to the individual needs, progress and learning outcomes of students. To be fully effective, however, assessment for learning needs to be conceived of not only as a classroom and school level strategy, but just as importantly as a systemic strategy in which the schools, districts, and state are working together towards shared goals for student learning outcomes. This requires attention to the range of data required to inform improvement strategies, plus other student, school, and contextual data to provide a fuller picture of performance and outcomes at all levels of the system. It is necessary to build the collective will, skill, and capacity to access, understand, and apply data to inform improved practices, which in turn involves both technical considerations around data access and analysis, as well as cultural, political, and educational considerations about which data to use, for what purpose, and by whom.

In our view, progress in this field requires balancing the use of data for external accountability with the purposeful and professional use of data for internal accountability and improvement processes. These uses cannot be seen as either/or polarisations; both uses are needed. Nevertheless, as educators continue to improve their capacity to use data, their professional internal accountability will also grow as successful practices bring about improved outcomes. While the phrase of ‘data-driven decision-making’ (Datnow et al. 2007) is becoming increasingly common, it is apparent that while data may trigger the identification of an area for focused attention, as educational practices and programs develop they, in turn, generate new demands for timely, appropriate, and accurate data. Over time, as capacity grows, educator-driven data requirements will continue to build.

Assessment for learning should be considered as a system quality, alongside a range of ‘evidence-based’ sources of information to combine with professional expertise in daily practices to support improved outcomes. Below (Table 1) we adapt the principles of assessment for learning as a school and classroom level activity to develop systemic principles for data-informed decision making.

Table 1 Assessment for learning as a system practice

Assessment for learning: school and classroom (Assessment Reform Group 1999)	Assessment for learning and data-informed decision making: systemic
Assessment for learning should be part of effective planning of teaching and learning.	Assessment of and for learning, plus relevant contextual, student and school data, is part of effective strategic and operational planning for state/province, district, school and classroom actions for improved teaching and learning.
Assessment for learning should focus on how schools learn.	Assessment for learning focuses on how systems, schools and students improve their progress, achievements, and outcomes.
Assessment for learning should be recognised as central to classroom practice.	Data-informed decision making, including assessment for learning, is recognised as central to educational practices at all levels of the system—province/state, district, school, and classroom.
Assessment for learning should be regarded as a key professional skill for teachers.	Skill and capacity to use, understand and apply data to inform improved actions and outcomes are regarded as a key professional skills for all educators, including teachers, principals, district staff and state/provincial officials.
Assessment for learning should be sensitive and constructive because any assessment has an emotional impact.	Careful consideration of which data to use, by whom and for what purpose is required to ensure the sensitive and constructive use of data, including assessment, to support improvement for all not to rank or judge unfairly.
Assessment for learning should take account of the importance of learner motivation.	The use of data, including assessment for learning, to generate motivation to improve includes an emphasis on developing respectful partnerships to engage educators at all levels of the system to work together.
Assessment for learning should promote commitment to learning goals and a shared understanding of the criteria by which they are assessed.	Shared goals for improvement, and indicators of success towards these goals, are developed and understood to generate a common commitment to improvement targets and learning outcomes.
Learners should receive constructive guidance about how to improve.	Building capacity for improvement involves providing feedback, strategies, resources, and supports to enhance both professional learning and student learning.
Assessment for learning develops learners' capacity for self-assessment so that they can become reflective and self-managing.	Data-informed approaches involve combining assessment of and for learning to balance external and internal accountability, while building the professional capacity for educators to implement self-evaluation, improvement planning, and monitoring strategies.
Assessment for learning should recognise the full range of achievements of all learners.	Assessment for learning, and the use of related data, recognises the full range of achievements of all learners and schools, including not only achievement results but also progress over time and equity of outcomes for closing gaps in performance while raising the bar overall.

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