Toronto District School Board

THE TRAJECTORIES OF GRADE 9 MATHEMATICS ACHIEVEMENT 2008-2013

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TITLE: The Trajectories of Grade 9 Mathematics Achievement 2008-2013

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EXECUTIVE SUMMARY

Purpose of the Study: An earlier Toronto District School Board (TDSB) Grade 9 Cohort study found that the majority of students who:

- completed eight or more credits by the end of Grade 9 had graduated and were attending an Ontario university by the end of five years, and
- students who completed seven credits had graduated but were not attending a post-secondary education (PSE) institution.

Post-secondary education has become the main pathway for the majority of TDSB students. However, the lack of one Grade 9 credit appeared to greatly reduce PSE options for students. This analysis of the TDSB's 2008-13 Grade 9 Cohort focuses on 15,981 students taking Mathematics in Grade 9. This report examines the different student trajectories over five years (from October 31, 2008 to October 31, 2013) according to Grade 9 achievement. Data was linked to the following achievement categories:

- high school graduation and PSE attainment
- Grades 6 and 9 Education Quality and Accountability Office (EQAO) results
- Ontario Secondary School Literacy Test (OSSLT) results, and
- Grade 7 Elementary Report Card (ERC) information.

Overall Mathematics Achievement in Grade 9: Of the students in the TDSB's 2008-13 Grade 9 Cohort there were 15,981 students taking Grade 9 Mathematics with 3% that did not take a Mathematics credit at all and 12% who failed a Mathematics course. There were three lower achieving groups with marks falling below 50% in their Grade 9 Mathematics course: 40% to 49%, 39% to 30%, and 29% or lower. These three groups had pronounced differences in future achievement outcomes, for example:

- achieving between 30% and 49% led to high school graduation, and
- achieving between 40% and 49% meant going to PSE for nearly half of these students.

Thus, it is not necessarily whether a student fails Mathematics, but rather, the *extent* of the failure, which is related to long-term outcomes.

Mark Distribution According to Program of Study: Assuming a valid separation of students into different Programs of Study (POS) according to varying student abilities, the distribution of Mathematics should be similar in each POS. That is, it would be assumed that a certain number of students would show achievement at different levels between 0% and 100%, regardless of POS. However, this is definitely not the case.

Students outside the Academic POS did not have marks representing a normal distribution - rather, marks were much more concentrated in the lower range of achievement. In contrast, students in the Academic POS were much more likely to be concentrated in the higher range. For example, 34% of students taking Academic Mathematics had a mark of 80% or higher,

compared to 18% of those taking Locally Developed, and 13% of those taking Applied Mathematics. In contrast, 9% of students taking Academic Mathematics had a failing mark, compared to 18% of those taking Locally Developed, and 21% of those taking Applied Mathematics.

Streaming: The streaming process of the old Ontario Schools: Intermediate and Senior (OS:IS) system still exists to an extent in Ontario through Grade 9 POS courses. That is, students take a majority of their Grade 9 courses in only one POS including Academic, Applied, or Locally Developed. The distribution of the POS levels closely resembles the old Advanced (Academic), General (Applied), and Basic (Locally Developed) system.

For 91% of students in this cohort (14,508 students of 15,981 taking Grade 9 Mathematics), the POS level for their Grade 9 Mathematics course was *also* the same POS level for the majority of their other courses. For example, 97% of students taking Academic Mathematics also took the majority of their other Grade 9 courses within an Academic POS. Differences in this pattern were in three hybrid categories where students were taking a majority of their courses:

1. in Academic, while taking an Applied Mathematics course (N=779, two-thirds of whom were female)
2. in Applied, while taking an Academic Mathematics course (N=371, almost three-quarters of whom were male)
3. in Applied, while taking a Locally Developed Mathematics course (N=288, a majority being students with Special Education Needs).

Remediation of Failing Courses: There are several options for students to recover a Grade 9 Mathematics credit following a failing mark: Summer School (registration in Summer School immediately after failing the course); repeating the course the following school year; Credit Recovery (taken at the end of the school semester or immediately at the end of the course); and other options. These recovery options are available to students who fail their Grade 9 Mathematics course, and often they will later be successful in repeating the course. However, their long-term academic outlook is not positive.

Summer School Outcomes for Students who Failed Grade 9 Mathematics: Around three-quarters of students taking Summer School, after failing their Grade 9 Mathematics course, had graduated by the end of five years. Over half of this group continued into PSE; slightly below the TDSB average. However, most of the students taking Summer School also started with marks only moderately below failing (i.e., 40% to 49%) and were students taking their other Grade 9 courses in an Academic POS.

Other Options (not Summer School) for Students who Failed Grade 9 Mathematics:
In comparison, students who failed Grade 9 Mathematics and used other options to repeat their Grade 9 Mathematics (i.e., not Summer School) had much lower marks (39% and lower) upon entering remediation. This group also were taking their other Grade 9 courses in a non-Academic POS. Students who did not choose Summer School but pursued other options for

repeating their Grade 9 Mathematics had not graduated by the end of five years, and comparatively few were attending PSE.

It is difficult to tell if the Summer School students (who had failed Grade 9 Mathematics during the regular school year) had experienced greater success on their second attempt of the course because:

a) their failing marks were at the higher end of the spectrum (40% to 49%), or
b) their other Grade 9 courses were a majority of Academic POS.

Certainly it appears that within the five years of this 2008-13 Cohort study, Grade 9 Mathematics recovery appears very difficult if the student had failed with a very low mark (39% or below) and/or was not in the Academic Program of Study.

Previous Elementary Achievement Not a Strong Predictor for Grade 9 Mathematics: Previous academic achievement has consistently been a strong predictor of future achievement. However, when considering students who fail Grade 9 Mathematics neither EQAO nor Elementary Report Card (ERC) information are particularly good at predicting who later will be *highly at-risk* in Mathematics. For example, of students who achieved Levels 1 or Below in Grade 6 EQAO Mathematics, only a third (657 of 1,912 or 34%) did not pass Grade 9 Mathematics (three years later); similar results are found from Grade 7 ERC information. This means that great caution should be exercised in using Grade 6 EQAO scores or ERC information for high school Mathematics interventions, since the majority of students selected with lower achievement according to EQAO or ERC will *not fail* Grade 9 Mathematics.

Relationship of Grade 9 Mathematics Achievement to Other Subjects: Generally, students with the very highest achievement in Mathematics (i.e., a mark of 80% or higher) also had very high achievement in their other subjects. Most students with generally low achievement in one subject (i.e., Level 2 or Below) also had generally low achievement in other subjects. However, the relationship of very low achievement in Mathematics (i.e., 0% to 29%) compared to achievement in other subjects is more complex.

Most students failing Grade 9 Mathematics with a very low mark (or not taking the course) likewise did not pass their other subjects. When comparing failing Mathematics marks, most students who failed with a mark between 30% and 49% did pass their other subjects, albeit with lower marks. As previously stated, this failure cannot be predicted from earlier Mathematics achievement in elementary school; likewise, concurrent achievement in other subjects is a weak predictor of Grade 9 Mathematics failure. Therefore, it is difficult to explain from current available information why students with lower achievement usually pass Grade 9 Mathematics, while others with similar patterns will fail their course.

Relationship to Grade 9 EQAO Mathematics: The relationship of Grade 9 Mathematics courses to Grade 9 EQAO test results is similar to that of weak predictive ability using Grade 6 EQAO Mathematics results - that is, there is a general relationship to Levels 3 and 4 (common

provincial achievement levels), but not a clear fit with either very high or very low achievement. Specifically, most of the students with the lowest achievement (Level 1 or Below) on Grade 9 EQAO Mathematics had received a passing Grade 9 Mathematics course mark between 50% and 69%. As well, close to 1,500 students in the 2008-09 Grade 9 Cohort did not have a Grade 9 EQAO Mathematics mark because they had dropped the course, or had not taken Grade 9 Mathematics, or were in Locally Developed. Over 2,000 students who completed the Grade 9 EQAO Mathematics test were not in Grade 9 at all but in Grades 10 to 12. Consequently, EQAO test results should be used as part of a broad strategy of assessment, rather than by itself.

Relationship to Grade 10 OSSLT: Students who did not take a Grade 9 Mathematics course at all are the most at-risk according to OSSLT results, but failure in the other categories of Mathematics also show noticeable gaps in literacy success. It is clear in this case that we are not dealing with Mathematics achievement in any pure sense, but rather aspects of achievement - which have elements of numeracy and also elements of literacy.

INTRODUCTION: PURPOSE OF THE ANALYSIS

An earlier Grade 9 Cohort study found that the majority of Toronto District School Board (TDSB) students who completed eight or more credits (considered low risk) by the end of Grade 9 had graduated and were attending an Ontario university by the end of five years. However, the majority of students who completed seven credits (considered medium risk) had graduated, but were not attending post-secondary education (PSE). Post-secondary education has become the majority pathway for TDSB students, yet the lack of one Grade 9 credit appeared to greatly reduce that option (see Table 1). This analysis focuses on one subject area, Grade 9 Mathematics, and student outcome trajectories over five years according to other Grade 9 achievement.

Table 1: Grade 9 Credit Accumulation and Post-secondary Confirmations, Grade 9 Cohort 2006-11

Grade 9 Credit Accumulation	Confirmed University in Ontario	Confirmed College in Ontario	Applied to Post-secondary in Ontario with no Confirmation	Did not Apply to Post-secondary
6 or fewer credits (high risk)	2.7%	8.2%	4.5%	**84.6%**
7 credits (medium risk)	13.2%	20.6%	11.5%	**54.7%**
8 or more credits (low risk)	**58.6%**	13.8%	10.9%	16.8%

OVERALL FINDINGS

Mathematics Achievement in the 2008-09 Grade 9 Cohort: Table 2 shows Mathematics achievement in the 2008-09 Grade 9 Cohort where 3% did not take a Mathematics credit at all and 12% failed a Mathematics course.

Table 2: Grade 9 Mathematics Mark Distribution

Mathematics Mark	Percent	Cumulative Percent
No Mathematics Taken in 2008-09 (N=423)	2.6%	2.6%
0% to 29% (N=538)	3.3%	11.9%
30% to 39% (N=733)	4.5%	
40% to 49% (N=665)	4.1%	
50% to 59% (N=3,127)	19.1%	85.7%
60% to 69% (N=3,017)	18.4%	
70% to 79% (N=3,352)	20.4%	
80% and over (N=4,554)	27.8%	
Total (N=16,409)	100%	100%

Students who did not take a Mathematics credit (N=423) were divided into two groups: students with Special Education Needs (SEN) (presumably taking non-credit courses) and students who appear to have dropped the Mathematics course at some point during the Grade 9 school year.

There are pronounced differences between those who failed Mathematics with a mark of 29% or lower, failed with 30% to 39%, and failed with a mark of 40% to 49% (see Table 3). Most students who had a mark of 30% or more graduated with a high school diploma, while nearly half of those who failed with a mark of 40% to 49% eventually went to post-secondary. Thus, it is not necessarily whether a student fails Mathematics, but rather, the *extent* of the failure, which is related to long-term outcomes.

Table 3: Grade 9 Mathematics Mark Distribution, Graduation, and Post-secondary Confirmations

Mathematics Mark	Graduation	University	College
No Mathematics Taken in 2008-09 (N=423)	29.6%	9.9%	7.8%
0% to 29% (N=538)	28.6%	5.6%	9.1%
30% to 39% (N=733)	52.9%	14.3%	20.3%
40% to 49% (N=665)	66.2%	20.8%	26.0%
50% to 59% (N=3,127)	78.3%	32.5%	24.7%
60% to 69% (N=3,017)	86.6%	45.5%	21.1%
70% to 79% (N=3,352)	91.2%	59.7%	14.3%
80% and over (N=4,554)	96.1%	77.1%	6.7%
Total (N=16,409)	82.9%	50.1%	15.8%

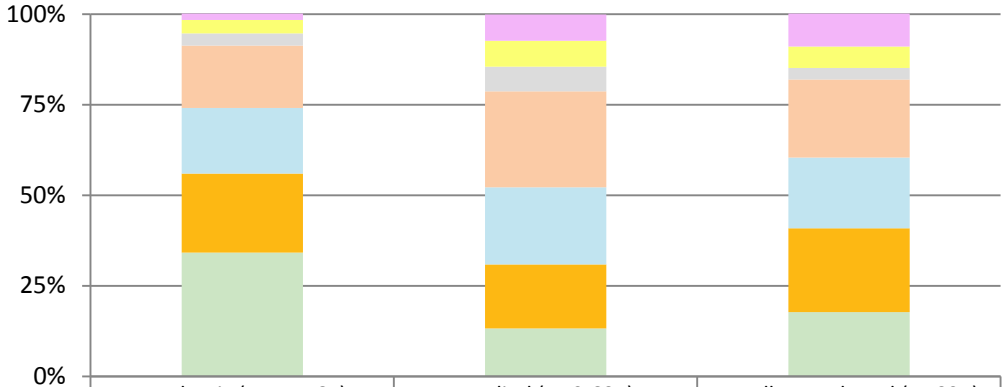
As well, students who did not take a Grade 9 Mathematics course at all had outcomes similar to those with the lowest Mathematics mark. This may indicate that those students - often 'under the radar' using such measures as Grade 9 EQAO Mathematics - are amongst the most needing assistance.

PROGRAM OF STUDY AND GRADE 9 MATHEMATICS

Program of Study and Student Marks: Figure 1 shows the mark distribution according to Program of Study (POS) for the Grade 9 Mathematics course. The efficacy of differentiation according to Mathematics POS is unclear. The theory of differentiation according to POS is that students are completing courses in different levels based on best-fit curriculum options according to student ability. Therefore, it is expected that more students will have greater achievement and assuming a valid separation of students according to POS the mark distributions within courses will be similar regardless of Program of Study. This is definitely not the case.

Students not enrolled in the Academic POS did not have marks representing a normal distribution - rather marks were much more concentrated in the lower range. In contrast, marks in the Academic POS were much more likely to be concentrated in the higher range. For example, 34% of students taking Academic Mathematics had a mark of 80% or higher, compared to 13% of those taking Applied and 18% of those taking Locally Developed Mathematics. In contrast, 9% of students taking Academic Mathematics had a failing mark, compared to 21% of those taking Applied and 18% of those taking Locally Developed Mathematics.

Figure 1: Program of Study Grade 9 Mathematics Course and Grade 9 Mathematics Mark Distribution



	Academic (N=11,465)	Applied (N=3,684)	Locally Developed (N=837)
0% to 29%	1.7%	7.3%	9.1%
30% to 39%	3.7%	7.1%	5.9%
40% to 49%	3.4%	6.8%	3.2%
50% to 59%	17.2%	26.5%	21.5%
60% to 69%	18.1%	21.3%	19.5%
70% to 79%	21.8%	17.7%	23.2%
80% and over	34.2%	13.2%	17.7%

Program of Study and Streaming: As noted in other reports (e.g. Brown, 2010) the streaming process of the old Ontario Schools: Intermediate and Senior (OS:IS) system still exists to an extent in Ontario through Grade 9 Program of Study courses. That is, the majority of students take a majority of their Grade 9 courses in one Program of Study (Academic, Applied, Locally Developed) and the distribution of those courses closely resembles the old Advanced (Academic), General (Applied) and Basic (Locally Developed) courses (see Table 4).

For 91% of students in this cohort (14,508 of 15,981 students taking Mathematics in Grade 9), the Program of Study taken in Mathematics in Grade 9 was *also* the Program of Study of the majority of courses taken. For example, 97% of students taking Academic Mathematics, likewise their other courses were in Academic. Therefore, it is clear that streaming exists through the Ontario Secondary Schools, Grades 9 to 12: Program and Diploma Requirements (OSS) curriculum.

Table 4: Relation of Program of Study for Grade 9 Mathematics Course and Program of Study for Student's Other Grade 9 Courses

		POS of the Majority of Other Grade 9 Courses		
		Academic	Applied	Essentials
Grade 9 Mathematics Course	Academic Mathematics (N=11,463)	96.7%	3.2%	0.0%
	Applied Mathematics (N=3,682)	21.2%	78.2%	0.6%
	Locally Developed Mathematics (N=836)	1.2%	34.4%	64.4%

Percentage of Students

Three Key Findings

1. There were 779 students who took a majority of their courses in Academic, but took an Applied Mathematics course. Interestingly, almost two thirds (62%) were female. Of this group, 78% graduated and 57% attended post-secondary, but only 29% confirmed an offer of admission to a university. Thus, outcome measures of these students are something of a hybrid, with overall post-secondary access higher than most students taking Applied, but lower than most students taking Academic.
2. There were 371 students who took a majority of their courses in Applied, but took an Academic Mathematics course. Almost three quarters (73%) were male. Graduation rates were 82% and post-secondary access was 63%, but only 34% attained university. Thus, in this case as well, outcome measures of these students are a hybrid of Academic and Applied.
3. There were 288 students who took a majority of their courses in Applied, but took a Locally Developed Mathematics course. The majority (55%) were male and also a majority (59%) were students with Special Education Needs. Graduation rates were 55% and post-secondary access was 30% (almost all college), again, showing achievement patterns between Applied and Locally Developed levels.

REMEDIATION (REPEATING) A FAILED MATHEMATICS COURSE

There are several ways to repeat a failed Mathematics credit: taking Summer School immediately after failing the course; retaking the course in the next school year; through Credit Recovery; and other options. There are noticeable differences between these groups and their remediation choices. The single largest group were students taking Summer School immediately after failing. Around three-quarters of these Summer School students had graduated by the end of five years and over half were in post-secondary; outcomes only slightly below the overall TDSB results. In comparison, most other students who failed Grade 9 Mathematics had not graduated by the end of five years and comparatively few were attending PSE (see Table 5).

However, there are other clear differences between students taking Summer School and other students who failed Grade 9 Mathematics. Over three-quarters of the students who failed their Grade 9 Mathematics course and who chose to recover their credit through Summer School were also in the Academic Program of Study. Most students who pursued other forms of remediation had taken the majority of their courses in Applied or Locally Developed.

In addition, the majority of students who took Summer School had a failing mark only moderately below 50% (40% to 49%). In comparison, students that pursued other forms of remediation generally failed with much lower marks.

Therefore, a more detailed statistical analysis is required to determine:

- if, given students' Program of Study and Mathematics mark, there are no real differences between different types of remediation, or
- if the different types of remediation have weak, but significant differences on students' future achievement levels after repeating their Grade 9 Mathematics.

In any case, it would appear that student recovery from failing Grade 9 Mathematics is difficult, especially if the student had a very low mark and/or was not in the Academic POS.

Table 5: Grade 9 Mathematics Remediation and Long-term Outcomes

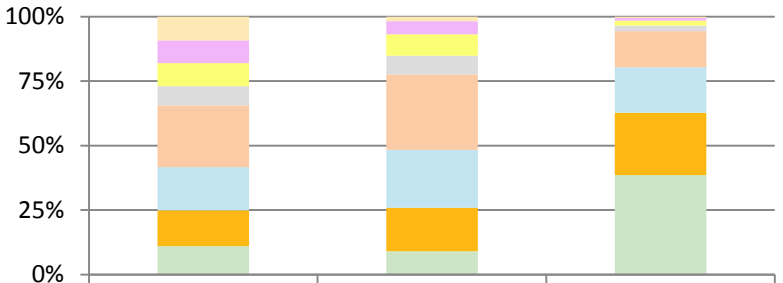
Type of Remediation	Failed Grade 9 Mathematics: Mark of 40% to 49%	Taking Academic Mathematics	Graduation	University	College
Summer School 2008-09 (N=702)	54.8%	74.9%	74.2%	24.6%	27.5%
Credit Recovery (N=257)	35.0%	32.3%	34.2%	6.2%	14.0%
Regular Day School 2009-10 or later (N=626)	21.4%	45.8%	47.1%	10.5%	17.9%
Other Pathway (N=351)	16.0%	29.9%	22.2%	5.1%	8.5%

PREVIOUS MATHEMATICS ACHIEVEMENT

Previous academic achievement is typically a strong predictor of future achievement. However, the information available from the elementary school panel is somewhat limited. Grade 6 EQAO and Grade 7 elementary report card (ERC) information is useful for predicting broad categories - at Levels 3 or 4 in course achievement, or below Levels 3 or 4. It is more difficult to accurately predict either *very high* or *very low* achievement.

In particular, neither EQAO nor ERC information are good at predicting students who will be *highly at-risk* in Mathematics. For example, Figure 2 shows the weak predictive abilities of Grade 6 EQAO Mathematics (2005-06) in relation to high school Grade 9 Mathematics results (2008-09). The lower achieving students at Levels 1 or Below in Grade 6 EQAO Mathematics, only about a third (657 of 1,912 or 34%) did not pass Grade 9 Mathematics. Therefore, Grade 6 EQAO Mathematics did not predict the outcome for students highly at-risk for failing their Grade 9 Mathematics; a similar pattern was found using Grade 7 ERC information. This means that great caution should be exercised in using Grade 6 EQAO results or ERC information for high school Mathematics interventions, since the majority of students who would be selected using these forms of elementary school achievement would not fail Grade 9 Mathematics.

Figure 2: Grade 6 EQAO Mathematics Level and Grade 9 Mathematics Mark Distributions



	EQAO Level 0 or 1 (N=1,912)	EQAO Level 2 (N=3,266)	EQAO Level 3 or 4 (N=8,575)
No Mathematics Taken in 2008-09	9.1%	1.8%	0.5%
Final Mark 0% to 29%	8.8%	5.1%	1.0%
Final Mark 30% to 39%	9.0%	8.3%	1.9%
Final Mark 40% to 49%	7.4%	7.2%	2.2%
Final Mark 50% to 59%	24.0%	29.3%	14.0%
Final Mark 60% to 69%	16.7%	22.4%	17.5%
Final Mark 70% to 79%	13.9%	16.8%	24.2%
Final Mark 80% and over	11.0%	9.1%	38.6%

Percentage of Students

KEY RELATIONSHIPS BETWEEN GRADE 9 MATHEMATICS AND OTHER ACHIEVEMENT INDICATORS

Relationship of Grade 9 Mathematics to Grade 9 Success Indicators with Geography, Science, and English: The Success Indicators look at student achievement over the full school year (including Summer School). At the end of the school year, students are classified according to five achievement categories: not passing the compulsory credit, passing with a mark of 50% to 59%, passing with a mark of 60% to 69%, passing with a mark of 70% to 79%, and passing with a mark of 80% or higher (very high achievement).

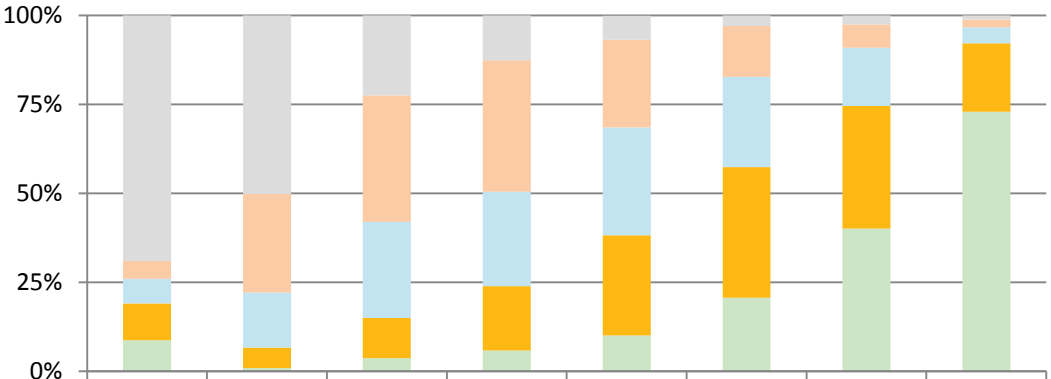
Generally, those with the very highest achievement in Mathematics also have the very highest achievement in other subjects resulting in a consistent relationship of achievement across different courses. For example, nearly three-quarters of students achieving Level 4 (80% or higher) in Mathematics also had a Level 4 in Geography (73%), and Science (71%); slightly under two-thirds had Level 4 in English (61%) (see Figures 3, 4 and 5).

The relationship in achievement for very low achieving students was more complex across different courses. For example, less than three-quarters (69%-70%) of students without a Mathematics credit also failed to achieve credits in Geography, Science, and English. However, around half of the students with a very low Mathematics mark (0% to 29%) did not achieve a credit in other compulsory credits, while the majority of students who failed Mathematics passed other Grade 9 courses - albeit with a comparatively low mark.

To summarize, most students with *low* achievement in one subject (i.e., Level 2 or Below) also had *low* achievement in other compulsory subjects; this general level of 'low' achievement can be predicted from earlier Grade 6 EQAO and ERC results. However, *very low* achievement in Grade 9 Mathematics (i.e., failing their first high school Mathematics course) cannot be predicted by students' earlier EQAO or ERC achievement information. Nor do most of the students with low achievement levels tend to fail other subjects - except for many with the *very lowest* marks and in this case, they do not take a Mathematics course at all.

These lower achievement trends are important points to consider for at-risk students because of the detriment to successful high school graduation and PSE pathways. In fact, the impacts of failing a single Grade 9 course limits students' graduation and post-secondary pathways to a much greater degree than simply overall low achievement results. Yet, while overall low achievement can be somewhat predicted with earlier achievement levels in elementary school grades, there is not a consistent nor strong ability to accurately predict the key step of failing a compulsory Grade 9 course - at least with current information from EQAO or ERC data.

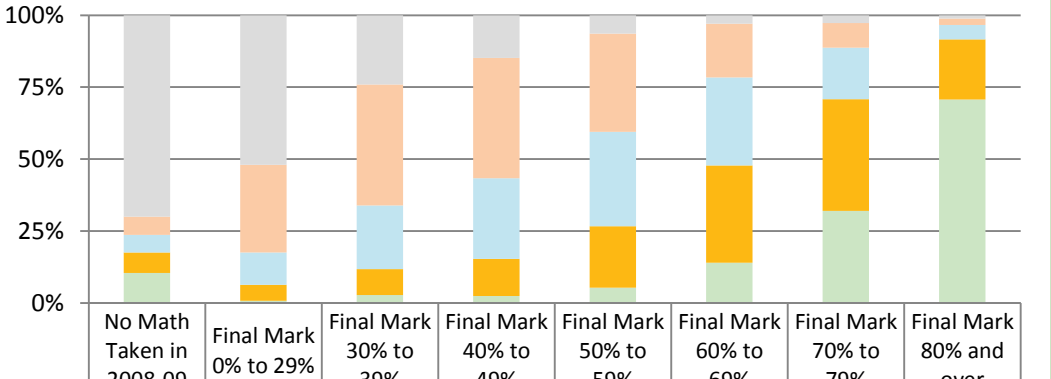
Figure 3: Grade 9 Mathematics Mark and Grade 9 Geography Level Distributions



	No Math Taken in 2008-09 (N=423)	Final Mark 0% to 29% (N=538)	Final Mark 30% to 39% (N=733)	Final Mark 40% to 49% (N=665)	Final Mark 50% to 59% (N=3,127)	Final Mark 60% to 69% (N=3,017)	Final Mark 70% to 79% (N=3,352)	Final Mark 80% and over (N=4,554)
Geog. Level 0	69.0%	50.2%	22.5%	12.6%	6.8%	3.0%	2.6%	1.2%
Geog. Level 1	5.0%	27.7%	35.5%	37.0%	24.6%	14.3%	6.5%	2.2%
Geog. Level 2	6.9%	15.4%	27.0%	26.5%	30.3%	25.3%	16.4%	4.5%
Geog. Level 3	10.4%	5.8%	11.3%	18.0%	28.1%	36.7%	34.4%	19.2%
Geog. Level 4	8.7%	0.9%	3.7%	5.9%	10.1%	20.7%	40.1%	72.9%

Percentage of Students

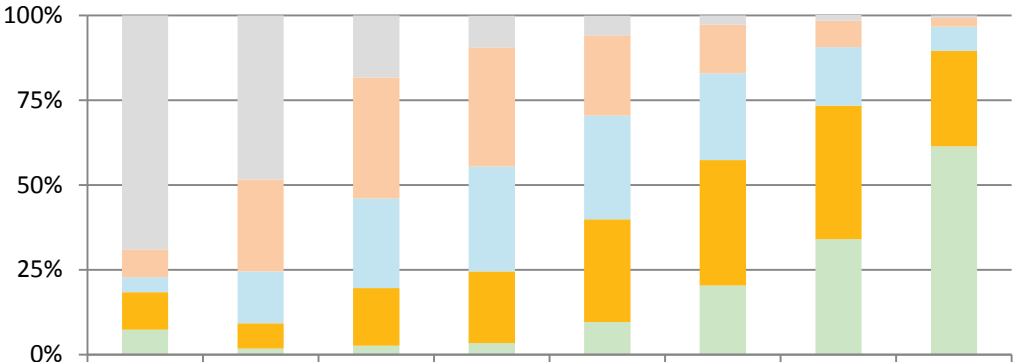
Figure 4: Grade 9 Mathematics Mark and Grade 9 Science Level Distributions



	No Math Taken in 2008-09 (N=423)	Final Mark 0% to 29% (N=538)	Final Mark 30% to 39% (N=733)	Final Mark 40% to 49% (N=665)	Final Mark 50% to 59% (N=3,127)	Final Mark 60% to 69% (N=3,017)	Final Mark 70% to 79% (N=3,352)	Final Mark 80% and over (N=4,554)
Sci. Level 0	70.0%	52.0%	24.0%	14.9%	6.4%	2.9%	2.7%	1.2%
Sci. Level 1	6.4%	30.5%	42.0%	41.8%	34.1%	18.7%	8.6%	2.2%
Sci. Level 2	6.1%	11.2%	22.2%	28.0%	32.8%	30.6%	17.9%	5.0%
Sci. Level 3	7.1%	5.6%	9.0%	12.9%	21.4%	33.8%	38.8%	20.9%
Sci. Level 4	10.4%	0.7%	2.7%	2.4%	5.3%	14.0%	32.0%	70.7%

Percentage of Students

Figure 5: Grade 9 Mathematics Mark and Grade 9 English Level Distributions



	No Math Taken in 2008-09 (N=365)	Final Mark 0% to 29% (N=506)	Final Mark 30% to 39% (N=694)	Final Mark 40% to 49% (N=625)	Final Mark 50% to 59% (N=2,999)	Final Mark 60% to 69% (N=2,881)	Final Mark 70% to 79% (N=3,186)	Final Mark 80% and over (N=4,350)
Eng. Level 0	69.0%	48.4%	18.3%	9.4%	5.8%	2.8%	1.7%	0.8%
Eng. Level 1	8.2%	27.1%	35.7%	35.0%	23.7%	14.3%	7.8%	2.5%
Eng. Level 2	4.4%	15.2%	26.4%	31.0%	30.5%	25.6%	17.2%	7.2%
Eng. Level 3	11.0%	7.5%	16.9%	21.1%	30.3%	36.9%	39.3%	28.1%
Eng. Level 4	7.4%	1.8%	2.7%	3.4%	9.6%	20.4%	34.1%	61.4%

Percentage of Students

Relationship of Grade 9 Mathematics to the Grade 9 EQAO Mathematics Test: Of the students in the 2008-09 Grade 9 Cohort, 1,477 or 8% did not have Grade 9 EQAO Mathematics results[1] (see Table 6). These students did not show EQAO results because their POS was Locally Developed (898 students) or they did not take a Grade 9 Mathematics course (439 students).

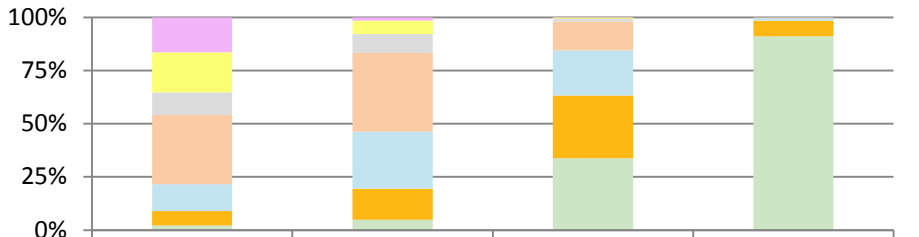
Table 6: Grade 9 EQAO Mathematics Program of Study

EQAO Mathematics Program of Study	Percent
Academic	68.7%
Applied	23.1%
No EQAO Math Results	8.2%
Total (N=18,073)	100%

The relationship between Grade 9 EQAO Mathematics results and secondary school students' Grade 9 Mathematics course marks was reasonable, but by no means absolute. For example, a majority of lower achieving students on EQAO (i.e., Level 1 or below) passed their high school Grade 9 Mathematics course; most students had a Grade 9 Mathematics course mark between 50% and 69% (see Figure 6).

[1] Of the students who participated in the Grade 9 EQAO Mathematics test in 2008-09, over two thousand (2,355) were in Grades 10 to 12 and, hence were **not** in the Grade 9 cohort; they therefore were not included in this analysis.

Figure 6: Grade 9 EQAO Mathematics Level and High School Grade 9 Mathematics Mark Distributions



	EQAO Level 0 or 1 (N=2,376)	EQAO Level 2 (N=2,822)	EQAO Level 3 (N=8,362)	EQAO Level 4 (N=1,532)
Final Mark 0% to 29%	16.4%	1.5%	0.1%	0.0%
Final Mark 30% to 39%	18.8%	6.4%	0.6%	0.0%
Final Mark 40% to 49%	10.7%	8.9%	1.5%	0.0%
Final Mark 50% to 59%	32.5%	36.9%	13.4%	0.3%
Final Mark 60% to 69%	12.6%	26.8%	21.2%	1.2%
Final Mark 70% to 79%	6.7%	14.6%	29.5%	7.4%
Final Mark 80% and over	2.3%	4.9%	33.8%	91.1%

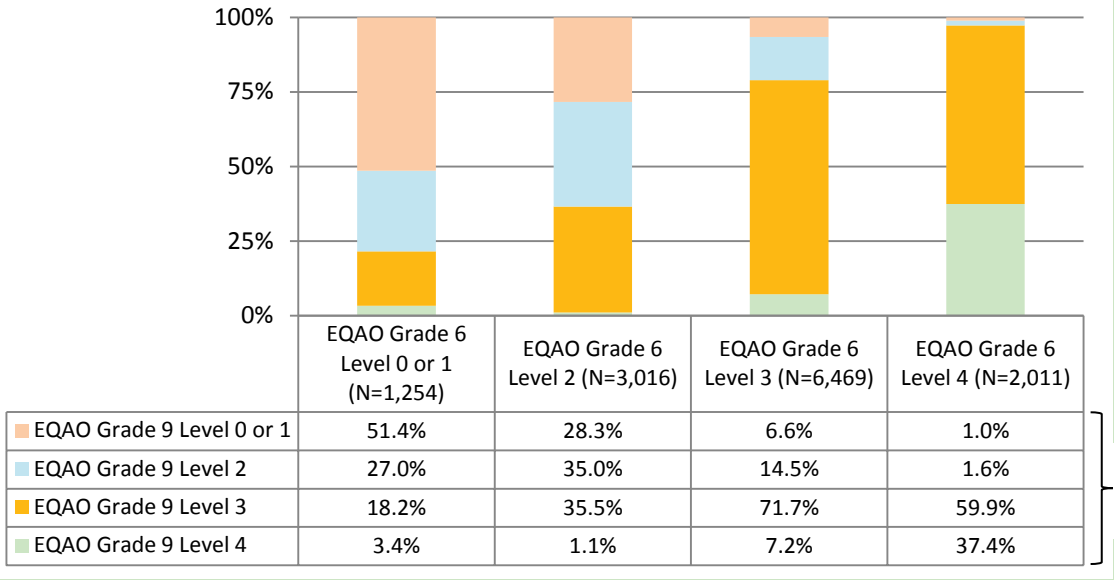
Percentage of Students

At the higher end, around two-thirds (64%) of students with a mark of 80% or higher in their secondary school Grade 9 Mathematics course achieved Level 3 in EQAO (see Table 7). It is interesting that a little over a third (37%) of students who achieved Level 4 in Grade 6 EQAO Mathematics also had Level 4 in Grade 9 EQAO Mathematics. This seems to reduce its long-term predictability other than as a more general indicator of future performance (see Figure 7). In addition, a large number of at-risk students in the cohort were missed in the EQAO administration and this lack of strong fit means we should be cautious around the use of EQAO test results as a stand-alone assessment; rather it would be more useful as a component of a broader assessment strategy.

Table 7: Grade 9 Mathematics Mark Distribution and Grade 9 EQAO Mathematics

High School Grade 9 Mathematics Mark	EQAO Grade 9 Math Level 0 or 1	EQAO Grade 9 Math Level 2	EQAO Grade 9 Math Level 3	EQAO Grade 9 Math Level 4
0% to 29% (N=443)	88%	9.7%	2.3%	0.0%
30% to 39% (N=678)	65.8%	26.8%	7.4%	0.0%
40% to 49% (N=630)	40.5%	39.8%	19.7%	0.0%
50% to 59% (N=2,935)	26.3%	35.5%	38.1%	0.2%
60% to 69% (N=2,844)	10.5%	26.6%	62.2%	0.6%
70% to 79% (N=3,152)	5.0%	13.0%	78.3%	3.6%
80% and over (N=4,410)	1.2%	3.1%	64.0%	31.6%

Figure 7: Grade 6 EQAO Mathematics Level and Grade 9 EQAO Mathematics Level Distributions



	EQAO Grade 6 Level 0 or 1 (N=1,254)	EQAO Grade 6 Level 2 (N=3,016)	EQAO Grade 6 Level 3 (N=6,469)	EQAO Grade 6 Level 4 (N=2,011)
EQAO Grade 9 Level 0 or 1	51.4%	28.3%	6.6%	1.0%
EQAO Grade 9 Level 2	27.0%	35.0%	14.5%	1.6%
EQAO Grade 9 Level 3	18.2%	35.5%	71.7%	59.9%
EQAO Grade 9 Level 4	3.4%	1.1%	7.2%	37.4%

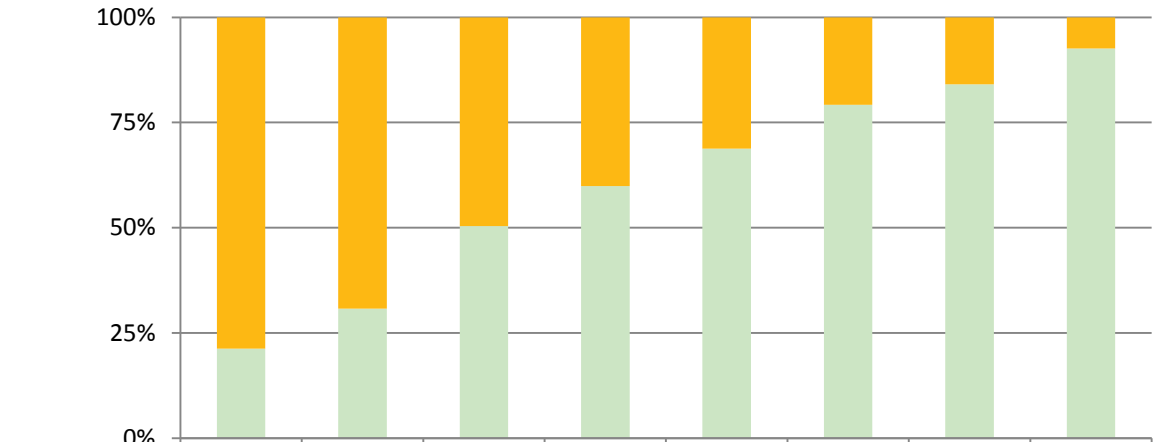
Percentage of Students

Relationship of Grade 9 Mathematics to the Grade 10 Literacy Test: In Figure 8, the 2008-09 mark distribution for the Grade 9 Mathematics course is compared to Grade 10 Ontario Secondary School Literacy Test (OSSLT) results using the *same group of students* one school year later (2009-10). There is a differentiation between first-time eligible students who were successful in passing the OSSLT test, versus all other first-time eligible students including students who failed, or were exempted, or absent, or deferred from writing the OSSLT test on this first administration.

There are very strong differences for the four student subgroups that did not pass their Grade 9 Mathematics course as follows:

- only 21% of students who did not take a Mathematics course in Grade 9 passed the OSSLT the following year (in Grade 10)
- 31% of students who failed their Grade 9 Mathematics course with a *very low* mark (between 0% and 29%) passed the OSSLT the following year
- 50% of the students who failed Grade 9 Mathematics with a *low* mark (between 30% and 39%) passed the OSSLT the following year, and
- 60% of the students who failed Grade 9 Mathematics with a mark between 40% and 49% passed the OSSLT the following year (see Figure 8).

Figure 8: Grade 9 Mark Distribution and Grade 10 OSSLT[2]



	No Math Taken in 2008-09 (N=334)	0% to 29% (N=468)	30% to 39% (N=681)	40% to 49% (N=636)	50% to 59% (N=3,002)	60% to 69% (N=2,908)	70% to 79% (N=3,263)	80% and over (N=4,463)
Not Successful	78.7%	69.2%	49.6%	40.1%	31.2%	20.8%	15.9%	7.4%
Successful	21.3%	30.8%	50.4%	59.9%	68.8%	79.2%	84.1%	92.6%

Percentage of Students

In other words, students who did not take Mathematics at all are the most at-risk according to their OSSLT result, but failure in the other categories of Mathematics also show noticeable gaps in literacy success. It is clear in this case that we are not dealing with Mathematics achievement in any pure sense, but rather aspects of achievement - which have elements of numeracy and also elements of literacy.

[2] Not successful refers to students who failed, were exempt, were absent, or deferred.

REFERENCES

Brown, R. S. (2010). *The grade 9 cohort of fall 2004*. (Research Report No. 09/10-15). Toronto, Ontario, Canada: Toronto District School Board