Tracking Student Achievement in Mathematics Over Time in English-Language Schools

Grade 3 (2006) to Grade 6 (2009) to Grade 9 (2012) Cohort

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About the Education Quality and Accountability Office

The Education Quality and Accountability Office (EQAO) is an independent provincial agency funded by the Government of Ontario. EQAO’s mandate is to conduct province-wide tests at key points in every student’s primary, junior and secondary education and report the results to educators, parents and the public.

EQAO acts as a catalyst for increasing the success of Ontario students by measuring their achievement in reading, writing and mathematics in relation to Ontario Curriculum expectations. The resulting data provide a gauge of quality and accountability in the Ontario education system.

The objective and reliable assessment results are evidence that adds to current knowledge about student learning and serves as an important tool for improvement at all levels: for individual students, schools, boards and the province.

About EQAO Research

EQAO undertakes research for two main purposes:

• to maintain best-of-class practices and to ensure that the agency remains at the forefront of large-scale assessment and
• to promote the use of EQAO data for improved student achievement through the investigation of means to inform policy directions and decisions made by educators, parents and the government.

EQAO research projects delve into the factors that influence student achievement and education quality, and examine the statistical and psychometric processes that result in high-quality assessment data.
Acknowledgements

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Introduction

The Education Quality and Accountability Office (EQAO) is responsible for the development, administration, scoring and reporting of individual student results and aggregate school, board and provincial census assessment results in Ontario. EQAO administers curriculum-based assessments of reading, writing and mathematics to students at the end of the primary (Grade 3) and junior (Grade 6) divisions and mathematics in Grade 9 for both academic and applied courses. EQAO also administers the Ontario Secondary School Literacy Test (OSSLT), which is a secondary school graduation requirement that is typically taken by students when they are in Grade 10.

EQAO regularly tracks the achievement of students as they progress from one provincial assessment to the next (e.g., Grade 3 to Grade 6, three years later, and then to Grade 9, six years later). EQAO began tracking students from Grade 3 to 6 in 2008 and from Grade 3 to 6 to 9 in 2011.

The purpose of this study was to examine mathematics achievement, contextual and attitudinal data for a cohort of students from Grade 3 to Grade 9 (academic and applied courses). The results can be used to examine the impact of achievement early in a student’s journey through elementary school on achievement in the higher grades. Longitudinal analysis of student performance provides principals and teachers, district policy makers and staff, Ministry of Education staff, researchers and the public with important insights into students’ progress at key points during their schooling. In addition, this study includes information on the special education needs status of students and their attitudes toward mathematics (whether they like mathematics and their ability in mathematics). Since gender differences in mathematics were small, these data are not included in this report. In Grade 9, gender differences in achievement results in the two courses are confounded by the observation that a larger portion of male students than female students were enrolled in the applied mathematics course. Gender data are presented in the tables in the appendix.

This study examined the progress of students from Grade 3 in 2006, to Grade 6 in 2009, to Grade 9 in 2012, using the results from the mathematics component of the primary and junior assessments and the Grade 9 Assessment of Mathematics. The specific questions addressed were:

- Are the pathways of achievement over time for students who were in the Grade 9 academic mathematics course in 2012 the same as for those who were in the Grade 9 applied course in 2012?
- Are there differences between the academic and applied achievement pathways for students with special education needs?
- Are there differences in attitudes and perceptions between students in the academic achievement pathways and those in the applied achievement pathways?

Following presentation of the data and analyses procedures, each of the three questions will be addressed in separate sections.
Data

Using the unique Ontario Education Number (OEN), the mathematics achievement results on the EQAO assessments were first linked for students in Grade 3 in 2006 and in Grade 6 in 2009. The final matched sample included students from this matching who also had Grade 9 mathematics achievement results for either the academic or the applied course. The resulting matched sample was used for all analyses.

Table 1 shows the numbers of tracked students for the Grade 9 academic and applied courses. For example, of the 98,819 students enrolled in the Grade 9 academic course in 2012, 80,270 (81%) were matched across the three grades. The corresponding numbers for the applied course were 43,174 and 30,119 (70%).

Table 1:
Number of Tracked Students in the Cohort, by Grade 9 Course Selection

<table>
<thead>
<tr>
<th>Grade 9 Mathematics course enrolment</th>
<th>Students included in results for Grade 9 Assessment of Mathematics in 2012</th>
<th>Students with results for all three assessments</th>
<th>Percentage of all tracked students in Grade 9 mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Mathematics</td>
<td>98,819</td>
<td>80,270</td>
<td>81%</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>43,174</td>
<td>30,119</td>
<td>70%</td>
</tr>
</tbody>
</table>

The following data were analyzed for all matched students:
- student outcomes on each assessment;
- student background data; and
- student responses to two questionnaire items that asked about attitude toward mathematics and ability in mathematics.

Analyses

The first analysis involved comparing the percentage of tracked students in each achievement category for each grade to the corresponding percentage of students in the provincial population to determine how well the sample of tracked students represented the full population.

The second analysis involved creating four student pathways to represent students’ progress through Grades 3 to 6 according to whether or not they met the provincial standard for each assessment. The four student pathways represented students who
- met the provincial mathematics standard in both Grade 3 and Grade 6 (maintained the standard);
- did not meet the standard in Grade 3 but did in Grade 6 (rose to the standard);
- met the standard in Grade 3 but did not in Grade 6 (dropped from the standard); and
- did not meet the standard in either Grade 3 or Grade 6 (never met the standard).

A parallel set of pathways were used to describe progress from Grade 6 to Grade 9. Tracking progress from Grade 3 to Grade 6 to Grade 9 requires eight pathways; students in each of the four pathways above for Grade 3 to Grade 6 who then did or did not meet the standard in Grade 9. The percentages of students
were calculated for these pathways for pairs of consecutive assessment grades (i.e., Grade 3 to Grade 6 and Grade 6 to Grade 9), and across the three grades. Separate analyses were conducted for the academic and applied courses in Grade 9. Percentages were determined separately for students with special education needs. In addition, distributions of student responses to two questionnaire items were compared for the different pathways.

Results

The results are presented in four parts. Part 1 deals with the representativeness of the matched sample in relation to the full provincial population of students. Part 2 deals with the distribution of students across the different pathways (percentage of students represented by each pathway). The results for pairs of successive assessment grades are presented first, followed by the results for the eight pathways for tracking assessment results for students from Grade 3 to Grade 6 to Grade 9. Part 3 presents results parallel to those presented in Part 2 by special education needs and English language learner status. Since the gender differences in mathematics achievement results were small, these data are not included in this report. In Grade 9, gender differences in results in the two courses are confounded by the observation that more male students than female students were enrolled in the applied mathematics course. Results by gender are included in the appendix. Part 4 presents the results for the two attitude questionnaire items.
PART 1

Representativeness of Tracked Samples

Tables 2 and 3 present, respectively, the distribution of students in the tracked sample and in the provincial population in each grade in each achievement category for the three assessments. The EQAO achievement categories are as follows:

- **Level 4**: The student has demonstrated the required knowledge and skills. Achievement surpasses the provincial standard.
- **Level 3**: The student has demonstrated most of the required knowledge and skills. Achievement is at the provincial standard.
- **Level 2**: The student has demonstrated some of the required knowledge and skills. Achievement approaches the provincial standard.
- **Level 1**: The student has demonstrated some of the required knowledge and skills in limited ways. Achievement falls much below the provincial standard.
- **Below Level 1**: The student did not demonstrate enough evidence of knowledge and understanding to be assigned Level 1.
- **No data**: Non-exempt students for whom EQAO did not receive completed assessment booklets.
- **Exempt**: Students who were formally exempted from participation in one or more components of the assessment.

The results suggest that the sample of tracked students at each grade is representative of the provincial population. The greatest difference between the sample and the population is in achievement category 3—1% to 5% more students are in the Level 3 category for the tracked samples than for the populations across the three assessments. For the remaining categories, the percentages are equal or within two percentage points of each other. For the main reporting variable used in the present study (percentage of students who met the provincial standard—at or above Level 3), the percentages for the matched samples are 5% higher for Grade 3 and Grade 6, 2% lower for the Grade 9 academic course and 4% higher for the Grade 9 applied course. This is not unexpected because students in the matched sample would have been in Ontario schools at least from Grades 3 to 9. Less mobile students tend to have slightly higher achievement results.
### Table 2:
**Distribution of Students in Tracked Samples by Achievement Category and Grade: Percentage of Students**

<table>
<thead>
<tr>
<th></th>
<th>Grade 3 2006 (n = 110 389)</th>
<th>Grade 6 2009 (n = 110 389)</th>
<th>Grade 9 2012 Academic (n = 30 119)</th>
<th>Grade 9 2012 Applied (n = 80 270)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 4</td>
<td>12%</td>
<td>14%</td>
<td>12%</td>
<td>8%</td>
</tr>
<tr>
<td>Level 3</td>
<td>61%</td>
<td>54%</td>
<td>72%</td>
<td>40%</td>
</tr>
<tr>
<td>At or Above the Provincial Standard of Level 3</td>
<td>73%</td>
<td>68%</td>
<td>82%</td>
<td>48%</td>
</tr>
<tr>
<td>Level 2</td>
<td>22%</td>
<td>27%</td>
<td>11%</td>
<td>34%</td>
</tr>
<tr>
<td>Level 1</td>
<td>2%</td>
<td>4%</td>
<td>4%</td>
<td>12%</td>
</tr>
<tr>
<td>Below Level 1</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
</tr>
<tr>
<td>No Data</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Exempt</td>
<td>2%</td>
<td>1%</td>
<td>N/A*</td>
<td>N/A*</td>
</tr>
</tbody>
</table>

*N/A: Exemptions not permitted in Grade 9.*

### Table 3:
**Distribution of Students in the Population by Achievement Category and Grade: Percentage of Students**

<table>
<thead>
<tr>
<th></th>
<th>Grade 3 2006 (n = 132 782)</th>
<th>Grade 6 2009 (n = 136 075)</th>
<th>Grade 9 2012 Academic (n = 97 741)</th>
<th>Grade 9 2012 Applied (n = 41 799)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 4</td>
<td>11%</td>
<td>13%</td>
<td>13%</td>
<td>7%</td>
</tr>
<tr>
<td>Level 3</td>
<td>57%</td>
<td>49%</td>
<td>71%</td>
<td>37%</td>
</tr>
<tr>
<td>At or Above the Provincial Standard of Level 3</td>
<td>68%</td>
<td>63%</td>
<td>84%</td>
<td>44%</td>
</tr>
<tr>
<td>Level 2</td>
<td>23%</td>
<td>27%</td>
<td>11%</td>
<td>34%</td>
</tr>
<tr>
<td>Level 1</td>
<td>3%</td>
<td>6%</td>
<td>4%</td>
<td>13%</td>
</tr>
<tr>
<td>Below Level 1</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>4%</td>
</tr>
<tr>
<td>No Data</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>5%</td>
</tr>
<tr>
<td>Exempt</td>
<td>4%</td>
<td>3%</td>
<td>N/A*</td>
<td>N/A*</td>
</tr>
</tbody>
</table>

*N/A: Exemptions not permitted in Grade 9.*
PART 2

Progression in Mathematics Achievement along Pathways

The numbers and percentages of tracked students who met the provincial standard are presented first for the pathways between pairs of consecutive assessments and then for the pathways with all three assessments in Part 2.

**Pathway Results from Grade 3 to Grade 6 Mathematics Assessments**

Figure 1 shows the percentage of students in each pathway as they progressed from Grade 3 to Grade 6.\(^1\)

As shown in Figure 1, of the tracked students:
- nearly three in five (59%) met the standard in both Grade 3 and Grade 6 (maintained the standard);
- nearly one in 10 (9%) did not meet the standard in Grade 3 but did in Grade 6 (rose to the standard);
- 14% met the standard in Grade 3 but did not in Grade 6 (dropped from the standard); and
- slightly less than one in five (18%) did not meet the standard in either Grade 3 or Grade 6 (never met the standard).

Another analysis of these data\(^2\) showed that 20% of the students who had not met the standard in Grade 3 did rise to meet the standard in Grade 6, which is encouraging. EQAO also provides data for cohort tracking at the school level. Since many students are in the same school for both grades, the results provide principals and teachers with information about the progression of their students through elementary school as measured by the EQAO assessments.

**Pathway Results from Grade 6 to Grade 9 Mathematics Assessments and Grade 9 Course Selection**

Of the tracked students in the cohort, 73% enrolled in the Grade 9 academic mathematics course and 27% enrolled in applied mathematics course. Figure 1 shows the course selections in terms of the four pathways.

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\(^1\) Detailed tables of results for student achievement, characteristics and attitudes can be found in the appendix.

\(^2\) See *Highlights of the Provincial Results: Assessments of Reading, Writing and Mathematics, Primary Division (Grades 1–3) and Junior Division (Grades 4–6), and Grade 9 Assessment of Mathematics English Language Students, 2011–2012*.

The vast majority (91%) of students who maintained the standard for both the Grade 3 and the Grade 6 assessments enrolled in academic mathematics in Grade 9. Successively smaller percentages of students enrolled in the academic course for the other three pathways. Of these students, 70% rose to the standard between the Grade 3 and 6 assessments, just over half (52%) dropped from the standard between the Grade 3 and 6 assessments and one-third (32%) did not meet the standard for either the Grade 3 or the Grade 6 mathematics assessments.

A total of 9% of the students who maintained the standard for both the Grade 3 and the Grade 6 assessments enrolled in the applied course in Grade 9, and successively larger percentages of students enrolled in the applied course for the other three pathways. Specifically, 30% rose to the standard between the Grade 3 and 6 assessments, just under half (48%) dropped from the standard between the Grade 3 and 6 assessments and slightly more than two-thirds (68%) did not meet the standard for either the Grade 3 or Grade 6 mathematics assessments.
Pathway Results for Junior to Grade 9 Mathematics Assessments

Figure 2: Academic Course (n = 80 270)

Academic Course

Figure 2 shows the results of tracked students enrolled in the academic mathematics course as they progressed from Grade 6 to Grade 9.

As shown, of the tracked students:

- nearly three-quarters (74%) maintained the standard on both the junior mathematics assessment and the Grade 9 academic mathematics assessment;
- one in 10 (10%) rose to the standard between the junior and Grade 9 academic mathematics assessments;
- 8% dropped from the standard between the junior and Grade 9 academic mathematics assessments; and
- 8% did not meet the standard for either assessment.

Figure 3: Applied Course (n = 30 119)

Applied Course

Figure 3 shows the results of tracked students enrolled in the applied mathematics course as they progressed from junior to Grade 9.

As shown, of the tracked students:

- slightly more than one in five (22%) enrolled in applied mathematics maintained the standard on both the Grade 6 assessment and the Grade 9 applied assessments;
- approximately one-quarter (26%) rose to the standard between the Grade 6 assessment and the Grade 9 applied assessments;
- slightly less than one in 10 (8%) dropped from the standard between the Grade 6 assessment and the Grade 9 applied assessments; and
- 43% did not meet the standard for either assessment.
Comparison of the percentages for the Grade 9 academic and applied pathways reveals that the percentage of students in the “maintained the standard” pathway is substantially larger for the academic assessment than for the applied assessment (74% versus 22%). Correspondingly, a substantially greater percentage of students in the applied course than in the academic course did not meet the standard in either Grade 6 or Grade 9 (43% versus 8%). Further, one in four (26%) of the students enrolled in the academic course rose to the standard from Grade 6 to Grade 9, compared to one in 10 (10%) of the students enrolled in the applied course.

Pathway Results from Primary to Junior to Grade 9 Mathematics Assessments

The pathway achievement results for the tracked students as they moved from Grade 3 to Grade 6 to Grade 9 are presented in Figure 4 for the academic course and in Figure 5 for the applied course.

Figure 4:
Pathway Results for Tracked Students from Grade 3 (2006) to Grade 6 (2009) to Grade 9 (2012) Academic Mathematics (n = 80 270)

<table>
<thead>
<tr>
<th>Relationship to the Standard from Grade 3 to Grade 6</th>
<th>Percentage of Students Meeting/Not Meeting the Standard in Grade 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintained Standard</td>
<td>Met Standard 92%</td>
</tr>
<tr>
<td>Rose to Standard</td>
<td>Met Standard 77%</td>
</tr>
<tr>
<td>Dropped from Standard</td>
<td>Met Standard 65%</td>
</tr>
<tr>
<td>Never Met Standard</td>
<td>Met Standard 47%</td>
</tr>
</tbody>
</table>

The bars on the left of the graph show the percentage of students in each pathway for tracking achievement from Grade 3 to Grade 6. The bars on the right of the graph show the percentage of students meeting and not meeting the provincial standard in Grade 9 for students in each of these pathways. Of the tracked students in the academic course (Figure 4):

- nearly three-quarters (73%) maintained the standard from Grade 3 to Grade 6, and approximately nine in 10 (92%) of these students met the standard for the Grade 9 assessment;
- nearly one in 10 (9%) rose to the standard between Grade 3 and Grade 6, and just over three-quarters (77%) of these students met the standard for the Grade 9 assessment;
- one in 10 (10%) dropped from the standard between Grade 3 and Grade 6, and nearly two-thirds of these students (65%) met the standard for the Grade 9 assessment; and
- slightly less than one in 10 (8%) never met the standard in Grades 3 or 6, and 47% of these students met the standard for the Grade 9 assessment.

Of the tracked students in the applied course (Figure 5):
- one in five (20%) met the standard in both Grade 3 and Grade 6, and over three-quarters (79%) of these students met the standard for the Grade 9 assessment;
- one in 10 (10%) rose to the standard between Grade 3 and Grade 6, and just over three in five (61%) of these students met the standard for the Grade 9 assessment;
- one-quarter (25%) dropped from the standard between Grade 3 and Grade 6, and just over half (51%) of these students met the standard for the Grade 9 assessment; and
- 44% never met the standard in Grades 3 or 6, and less than one-third (30%) of these students met the standard for the Grade 9 assessment.

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**Figure 5:**
Pathway Results for Tracked Students from Grade 3 (2006) to Grade 6 (2009) to Grade 9 (2012)  
Applied Mathematics (n = 30 119)

<table>
<thead>
<tr>
<th>Relationship to the Standard from Grade 3 to Grade 6</th>
<th>Percentage of Students Meeting/Not Meeting the Standard in Grade 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintained Standard 20%</td>
<td>Met Standard: 79% Did Not Meet Standard: 21%</td>
</tr>
<tr>
<td>Rose to Standard 10%</td>
<td>Met Standard: 61% Did Not Meet Standard: 39%</td>
</tr>
<tr>
<td>Dropped from Standard 25%</td>
<td>Met Standard: 51% Did Not Meet Standard: 49%</td>
</tr>
<tr>
<td>Never Met Standard 44%</td>
<td>Met Standard: 30% Did Not Meet Standard: 70%</td>
</tr>
</tbody>
</table>
Discussion of the Academic and Applied Pathways
A comparison of the pathway percentages for students in the academic and applied courses showed a number of differences. First, as mentioned, there is a difference between the percentage of students who maintained the standard in Grades 3 and 6 and who enrolled in Grade 9 academic mathematics compared to those who enrolled in Grade 9 applied mathematics—91% versus 9%. Second, of the students enrolled in academic mathematics in Grade 9 who maintained the standard from Grade 3 to Grade 6, 92% met the standard in Grade 9 as opposed to 79% for the Grade 9 applied course. Third, of the students who rose to the standard from Grade 3 to Grade 6, 77% met the standard for the academic assessment and 61% met the standard for the applied course. Fourth, of the students who dropped from the standard between Grades 3 and 6, nearly two-thirds met the standard for the academic course, and just over 50% met the standard for the applied course.

In addition, 30% of the students who did not meet the standard in either Grade 3 or in Grade 6 met the standard for the Grade 9 applied assessment, and 47% met it in the academic course. It is interesting to note that these students were more likely to meet the standard in the academic course than in the applied course. A different analysis showed that some of these students did achieve high grades in their Grade 8 mathematics course, with a larger portion of them enrolling in the academic course.

Taken together, these results reveal that larger percentages of students met the standard for the Grade 9 academic course than met the standard for the applied course for all four pathways. The importance of some success, or better still, continuing success at meeting the standards in Grades 3 and 6, is evident for meeting the standards in both Grade 9 courses.
PART 3
Students with Special Education Needs and English language Learners

The pathways for students with special educational needs and English language learners are presented and discussed in Part 3. These particular groups of students were selected because of potential performance differences between the academic and applied pathways.

Students with Special Education Needs

The pathways for students with special educational needs are presented and discussed in this section. This group of students was selected for analysis because of the difference in the proportion of students with special education needs in the two Grade 9 courses (5% in the academic course and 36% in the applied course). Students may be identified with a special educational need in any grade, and generally the number of students identified with special educational needs increases through the elementary grades. Since the percentage of students identified with special educational needs is larger in Grade 6 than in Grade 3, the achievement pathways were generated for two groups of students—students identified with special education needs by the end of Grade 3, and students identified with special education needs by the end of Grade 6. Most of the students in the first group were also in the second group.

Pathway Results from Primary to Junior Mathematics Assessments

Figure 6 shows the results for students with special education needs who were tracked from the Grade 3 to Grade 6 assessments. The percentage of students identified with special education needs increased from 7% in Grade 3 to 13% in Grade 6.

As shown in Figure 6, of the students with special education needs:

- nearly equal percentages met the standard for the Grade 3 and Grade 6 assessments (23% and 22%), which are much smaller than for the overall tracked sample (59%) presented in Figure 1;
- equal percentages rose to the standard between the Grade 3 and Grade 6 assessments (11%), which is similar to the overall tracked sample (9%);
- nearly equal percentages dropped from the standard between the Grade 3 and Grade 6 assessments (21% and 20%), which are higher than for the overall tracked sample (14%); and
- a greater percentage of Grade 6 than Grade 3 students did not meet the standard on either assessment (47% and 44%), which are much larger than for the overall tracked sample (18%).
Pathway Results from Junior to Grade 9 Mathematics Assessments

The mathematics achievement pathways for tracked students from Grade 6 to Grade 9 are provided in Figures 7 and 8 for the academic and applied courses, respectively. There is a slight increase in the number of students with special education needs who wrote the Grade 9 academic assessment compared to the number of students with special education needs who wrote the Grade 6 assessment (4282 versus 4383; see Figure 7). In contrast, there was a significant increase in the number of students with special education needs who wrote the Grade 9 applied mathematics assessment compared to those who wrote the assessment in Grade 6 (9913 versus 10 744; see Figure 8). Further study is needed to determine why there is such a large difference between the two Grade 9 mathematics courses.

Academic Course

Figure 7: Pathway Results for Tracked Students from Grade 6 (2006) to Grade 9 (2012), Academic Mathematics Assessments by Students with Special Education Needs

As shown in Figure 7, nearly equal percentages of students with special education needs:
- met the standard for the Grade 6 assessment and the Grade 9 academic assessment (51% and 53%);
- rose to the standard between the Grade 6 assessment and the Grade 9 academic assessment (20% and 21%);
- dropped from the standard between the Grade 6 assessment and the Grade 9 academic assessment (10% and 9%); and
- did not meet the standard on either assessment (19% and 18%).

Applied Course

Figure 8: Pathway Results for Tracked Students from Grade 6 (2006) to Grade 9 (2012), Applied Mathematics Assessments by Students with Special Education Needs

As shown in Figure 8, equal or nearly equal percentages of students with special education needs:
- met the standard for the Grade 6 assessment (14%) and the Grade 9 applied assessment (13%);
- rose to the standard between the Grade 6 assessment and the Grade 9 applied assessment (23% and 24%);
- dropped from the standard between the Grade 6 assessment and the Grade 9 applied assessment (8%); and
- did not meet the standard on either assessment (55%).
Pathway Results from Primary to Junior to Grade 9 Mathematics Assessments

The mathematics achievement pathways for tracking students from Grade 3 to Grade 6 to Grade 9 are provided in Figures 9 and 10 for the academic and applied courses, respectively. Of the students in the tracked sample in the academic course, 5% were students with special education needs compared with 36% of the students in the tracked sample for the applied course.

Academic Course

As shown in Figure 9, of the tracked students with special education needs in the academic mathematics course:

- half (50%) met the standard for both Grade 3 and Grade 6, and nearly nine in 10 (88%) of these students met the standard for the Grade 9 assessment;
- 13% rose to the standard between Grades 3 and 6, and 72% of these students met the standard for the Grade 9 assessment;
- 17% dropped from the standard between Grades 3 and 6, and 63% met the standard for the Grade 9 assessment; and
- one in five (20%) did not meet the provincial standard in either Grade 3 or Grade 6, while 44% of these students met the standard for the Grade 9 assessment.

Figure 9:
Pathway Results for Tracked Students from Grade 3 (2006) to Grade 6 (2009) to Grade 9 (2012), Academic Mathematics Assessments by Special Education Needs (SEN n = 4383 (5%))
Applied Course

As shown in Figure 10, of the tracked students with special education needs in the applied mathematics course:

- 12% met the standard in both Grades 3 and 6, and 72% of these students met the standard for the Grade 9 assessment;
- nearly one in 10 (9%) rose to the standard between Grades 3 and 6, and 53% of these students met the standard in the Grade 9 assessment; and
- 23% dropped from the standard between Grades 3 and 6, and 43% of these students met the standard for the Grade 9 assessment; and
- 56% did not meet the standard in Grade 3 or in Grade 6, while just over one in four (26%) of these students met the standard for the Grade 9 assessment.

Figure 10:
Pathway Results for Tracked Students from Grade 3 (2006) to Grade 6 (2009) to Grade 9 (2012), Applied Mathematics Assessments by Special Education Needs (SEN n = 10 744 (36%))

Discussion of Academic and Applied Pathways for Students with Special Education Needs

Clearly, the four pathways for students with special needs in the academic course are quite different from those for students with special education needs in the applied course. First, the percentage of students with special education needs in the matched sample for the applied course is about seven times as large as that for the academic course (36% versus 5%). Second, the percentage of students with special educational needs in the matched sample for the academic course who maintained the standard between Grades 3 and 6 is four times as large as that for the applied course (50% versus 12%). Conversely, the percentage of
students with special education needs in the matched sample for the academic course who did not meet the standard in Grade 3 or in Grade 6 is approximately one-third of that for the applied course (20% versus 56%). Third, the percentages of students with special education needs meeting the standard for the academic course are larger than the corresponding percentages for the applied course for all of the pathways (88% versus 72%, 72% versus 53%, 63% versus 43% and 44% versus 26%). It appears that students with special education needs enrolled in the academic course may have been able to accommodate their needs more effectively than those in the applied course or may have had less academically challenging needs than those students in the applied course.

**English language Learners**

The pathways for English language learners are presented and discussed in this section. The expectation is that as English language learners progress through school, their English will improve to the point where they no longer have this designation. At the same time, however, newly arrived immigrants for whom English is not their first language enter school at different grade levels.

**Pathway Results from Primary to Junior Mathematics Assessments**

Figure 11 shows results for English language learners who were tracked from the Grade 3 to Grade 6 assessments. The percentage of English language learners declined from 7% (n = 7558) in Grade 3 to 4% (n = 3872) in Grade 6. As mentioned, it seems likely that as English language learners progress through school, they acquire sufficient English so that they no longer have this designation. The number shown here for Grade 6 would probably be smaller if newly arrived English language learners were not included.

As shown in Figure 11, for English language learners:

- a larger percentage met the standard for the assessment in Grade 3 than in Grade 6 (52% and 44%), and these percentages are smaller than for the overall tracked sample (59%) presented in Figure 1;
- a smaller percentage rose to the standard between Grade 3 and Grade 6 (14% and 17%), and these percentages are larger than for the overall tracked sample (9%);
- equal percentages dropped from the standard between Grades 3 and 6 (11%), which is slightly less than for the overall tracked sample (14%); and
- a larger percentage did not meet the standard in either Grade 3 or Grade 6 (22% and 28%), somewhat more than for the overall tracked sample (18%).
Pathway Results from Junior to Grade 9 Mathematics Assessments

Academic Course

Figure 12 shows results for English language learners who were tracked from the Grade 6 assessment to the Grade 9 academic assessment. The percentage of English language learners declined slightly from 4% (n = 2907) in Grade 6 to 2% (n = 1627) in Grade 9.

As shown in Figure 12, the percentages of students in each of the four pathways are identical for students in Grades 6 and 9 or are different by only one percentage point. These percentages were compared with those for the overall tracked sample presented in Figure 2, indicating that:

- 69% and 70% respectively met the standard for both assessments, compared with 74% for the overall tracked sample;
- 15% rose to the standard between Grade 6 and the Grade 9 academic course, compared with 10% for the overall tracked sample;
- 6% and 5% dropped from the standard between Grade 6 and the Grade 9 academic course, compared with 8% for the overall tracked sample; and
- 11% and 10% never met the standard for either assessment, compared with 8% for the overall tracked sample.

Applied Course

The percentage of the tracked sample who were English language learners and who completed the Grade 6 mathematics assessment and the Grade 9 applied mathematics assessment were 3% (n = 965) and 2% (n = 508), respectively.

As shown in Figure 13, of the tracked English language learners who enrolled in applied mathematics courses:

- a slightly larger percentage maintained the standard in Grade 9 (19%) than in Grade 6 (16%), compared with 22% for the overall tracked sample (see Figure 3);
- 29% and 31% rose to the standard between Grade 6 and the Grade 9 applied course, compared with 26% for the overall tracked sample;
- 6% dropped from the standard between Grade 6 and the Grade 9 applied course, compared with 8% for the overall tracked sample; and
- a greater percentage (49% and 45%) never met the standard, compared with 43% for the overall tracked sample.
Pathway Results from Primary to Junior to Grade 9 Mathematics Assessments

The mathematics achievement pathways for tracking students from Grade 3 to Grade 6 to Grade 9 are provided in Figures 14 and 15 for the academic and applied courses, respectively. As might be expected from the results presented, the sample sizes are small (academic course n = 1627 and applied course n = 508) for the pathways from Grade 3 to Grade 6 to Grade 9. Therefore, caution must be exercised when interpreting these results.

Academic Course

As shown in Figure 14, of the tracked English language learners in the academic mathematics course:

- three in five (60%) maintained the standard in both Grade 3 and Grade 6, and nine in 10 (90%) of these students met the standard for the Grade 9 assessment;
- 6% rose to the standard between Grades 3 and 6, and 47% of these students met the standard for the Grade 9 assessment;
- approximately one in six (17%) dropped from the standard between Grades 3 and 6, and 64% of these students met the standard for the Grade 9 assessment; and
- nearly one in 10 (9%) did not meet the provincial standard in Grade 3 or in Grade 6, while 23% of these students met the standard for the Grade 9 assessment.

Figure 14:
Pathway Results for Tracked Students from Grade 3 (2006) to Grade 6 (2009) to Grade 9 (2012), Academic Mathematics by English Language Learners (ELL n = 1 627 (2%))
Applied Course

As shown in Figure 15, of the tracked English language learners in the applied mathematics course:

- one in five (20%) met the standard in both Grade 3 and Grade 6, and 45% of these students met the standard for the Grade 9 assessment;
- one in 10 (10%) rose to the standard between Grades 3 and 6, while slightly more than one in five (22%) of these students met the standard for the Grade 9 assessment;
- 30% dropped from the standard between Grades 3 and 6, and 33% of these students met the standard for the Grade 9 assessment; and
- 41% did not meet the standard in Grade 3 or in Grade 6, while 8% of these students met the standard for the Grade 9 assessment.

Discussion of Academic and Applied Pathways for English Language Learners

Compared to results for gender and students with special education needs, the number of English language learners is small, particularly at the Grade 9 level:

- The number of tracked English language learners from Grade 3 to Grade 6 was 7558 and 3872, respectively.
- The number dropped to approximately 1600 students for the Grade 9 academic assessment and 500 students for the Grade 9 applied assessment.
Nevertheless, there are discernible differences between the pathways for students in the academic and applied courses. First, the percentage of English language learners who wrote the Grade 9 academic assessment and maintained the standard between Grades 3 and 6 is approximately three times greater than the percentage of English language learners who wrote the Grade 9 applied assessment. Consequently, the percentage of English language learners who did not meet the standard for either the Grade 3 or the Grade 6 assessment and who wrote the academic assessment is about one-quarter of the percentage of English language learners who did not meet the standards for the Grades 3 and 6 assessments and who wrote the applied assessment. Second, the percentages of English language learners in each of the four pathways who met the standard for the Grade 9 academic assessment are larger than the corresponding percentages for English language learners who met the standard for the Grade 9 applied assessment (90% versus 45%, 47% versus 22%, 64% versus 33% and 23% versus 8%). It appears that English language learners who enrolled in the academic course may have been able to accommodate their needs more effectively than those in the applied course, or they may have had less academically challenging needs than those students in the applied course.
PART 4

Student Attitudes and Mathematics Achievement

Responses to the following two questions included in the student questionnaires administered to students in Grades 3, 6 and 9 at the time of the assessments were analyzed as part of this study:

1. I like mathematics.
2. I am good at mathematics.

The options were “no,” “sometimes” and “yes” for Grades 3 and 6 students, and a five-point Likert scale from “strongly disagree” to “strongly agree” for Grade 9. The percentages presented in the graphs in this section represent the percentage of students who answered “yes” in Grades 3 and 6 and the percentage of students who answered “agree” or “strongly agree” in Grade 9, which were considered to reflect positive attitudes. The results are presented for each of the pathways for the pairs of successive grades and then for all three grades. These results are based on the students for whom questionnaire data were available. Since not all of the tracked students responded to all questionnaire items, the sample sizes may be a little smaller than the sample sizes in Part 2. For example, while 110 839 students were in the tracked sample across the applied and academic courses, student questionnaire results are for 109 303 students.

Student Attitudes and Pathway Results from Primary to Junior Mathematics Assessments

The percentages of students in the tracked sample expressing positive attitudes for the two questionnaire items are presented in Figures 16 and 17 for the four pathways for tracking mathematics achievement from Grade 3 to Grade 6.

Applied Course

Figure 16: Changes in Attitudes for Tracked Students from Grade 3 (2006) to Grade 6 (2009) Mathematics by Achievement Pathways (n = 109 303)

<table>
<thead>
<tr>
<th>I Like Mathematics</th>
<th>Maintained the Standard (n = 65 132)</th>
<th>Rose to the Standard (n = 9778)</th>
<th>Dropped from the Standard (n = 15 431)</th>
<th>Never Met the Standard (n = 18 962)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>62%</td>
<td>50%</td>
<td>56%</td>
<td>48%</td>
</tr>
<tr>
<td></td>
<td>52%</td>
<td>45%</td>
<td>31%</td>
<td>29%</td>
</tr>
</tbody>
</table>

As shown in Figure 16, of the students who:

- maintained the standard, 62% in Grade 3 and 52% in Grade 6 responded that they liked mathematics;
- rose to the standard, 50% in Grade 3 and 45% in Grade 6 responded that they liked mathematics;
- dropped from the standard, 56% in Grade 3 and 31% in Grade 6 responded that they liked mathematics (a decrease of 25%); and
- never met the standard, 48% in Grade 3 and 29% in Grade 6 responded that they liked mathematics (a decrease of 19%).

3 Detailed tables of results for student achievement, characteristics and attitudes can be found in the appendix.
I like mathematics: The results reveal that there is a clear drop in the percentage of students who like mathematics between Grades 3 and 6, particularly for those students who did not meet the standard in Grade 6. Approximately four in 10 Grade 3 students and six in 10 Grade 6 students indicated that they do not like mathematics. Further research is needed to determine why larger percentages of students did not express positive attitudes.

I am good at mathematics: The results suggest that many students do not perceive themselves as being good at math. The percentage of students who said they were good at math exceeded 60% only for the students who met the standard in both Grade 3 and Grade 6. The percentages for the other three pathways were, with one exception, no greater than 40%. As for the other questionnaire item, more research is needed to determine why elementary students do not perceive themselves as being good at math.

Student Attitudes and Pathway Results from Junior to Grade 9 Mathematics Assessments

The percentages of students in the tracked sample expressing positive attitudes for the two questionnaire items for the four pathways for tracking mathematics achievement from Grade 6 to Grade 9 are presented in Figures 18 and 19 for the academic course and in Figures 20 and 21 for the applied course. The percentages for the students when they were in Grade 6 are not the same as the Grade 6 percentages when they were paired with the Grade 3 students. This is due to some students not responding to the items and students being divided into two groups for this analysis—students enrolled in the Grade 9 academic course and those in the applied course.
Academic Course

Figure 18: Changes in Attitudes for Tracked Students from Grade 6 (2009) to Grade 9 (2012) Mathematics by Achievement Pathways for Academic Course

As shown in Figure 18, of the students who:

- maintained the standard for the Grade 6 assessment and the Grade 9 academic assessment, 54% in Grade 6 and 58% in Grade 9 indicated they liked mathematics;
- rose to the standard, 36% in Grade 6 and 40% in Grade 9 indicated they liked mathematics;
- dropped from the standard, 43% in Grade 6 and only 25% in Grade 9 indicated they liked mathematics; and
- never met the standard, 31% in Grade 6 and 22% in Grade 9 indicated they liked mathematics.

Figure 19: Changes in Attitudes for Tracked Students from Grade 6 (2009) to Grade 9 (2012) Mathematics by Achievement Pathways for Academic Course

As shown in Figure 19, of the students who:

- maintained the standard for the Grade 6 assessment and the Grade 9 academic assessment, 68% of Grade 6 students and 63% in Grade 9 indicated they were good at mathematics;
- rose to the standard, nearly equal percentages of Grade 6 (35%) and Grade 9 (33%) students indicated they were good at mathematics;
- dropped from the standard, 43% in Grade 6 and only 17% in Grade 9 indicated they were good at mathematics; and
- never met the standard, only a quarter (25%) of the Grade 6 students and 12% in Grade 9 indicated they were good at mathematics.
Applied Course

The pathway results for the two attitude items for the tracked students between the Junior and Grade 9 applied mathematics assessments are reported in Figures 20 and 21.

Figure 20:
Changes in Attitudes for Tracked Students from Grade 6 (2009) to Grade 9 (2012) Mathematics by Achievement Pathways for Applied Course

As shown in Figure 20, of the students who:
- maintained the standard for the Grade 6 assessment and the Grade 9 applied assessment, 37% in Grade 6 and 42% in Grade 9 indicated they liked mathematics;
- rose to the standard, 30% in Grade 6 and 37% in Grade 9 indicated they liked mathematics;
- dropped from the standard, 32% in Grade 6 and 22% in Grade 9 indicated they liked mathematics; and
- never met the standard, 26% in Grade 6 and 22% in Grade 9 indicated they liked mathematics.

Figure 21:
Changes in Attitudes for Tracked Students from Grade 6 (2009) to Grade 9 (2012) Mathematics by Achievement Pathways for Applied Course

As shown in Figure 21, of the students who:
- maintained the standard for the Grade 6 assessment and the Grade 9 applied assessment, 37% in Grade 6 and 54% in Grade 9 indicated they were good at mathematics;
- rose to the standard, 22% in Grade 6 and 43% in Grade 9 indicated they were good at mathematics;
- dropped from the standard, nearly equal percentages of students indicated they were good at mathematics (Grade 6, 26% and Grade 9, 24%); and
- never met the standard, a greater percentage of students in Grade 9 than in Grade 6 indicated they were good at mathematics (19% versus 16%).
Pathway Results from Primary to Junior to Grade 9 Academic and Applied Mathematics Assessments

The presentation of responses to the two attitude items for the tracked students from Grade 3 to Grade 6 to the Grade 9 academic and applied courses are limited to two pathways—students who met the standard at all three grade levels and students who did not meet the standard in Grade 3, Grade 6 or Grade 9 (never met the standard). The percentages of students who provided positive responses for these two pathways are presented in Figure 22 for the academic course and in Figure 23 for the applied course. Percentages are reported for student responses when they were in each of the three grades.

Academic Course

Figure 22: Changes in Attitudes for Tracked Students from Grade 3 (2006) to Grade 6 (2009) to Grade 9 (2012), Academic Course for Met the Standard and Never Met the Standard Pathways

As shown in Figure 22, of the 54,329 students who met the standard for the three assessments,

- nearly two-thirds (66%) in Grade 3 indicated they were good at mathematics;
- seven of 10 (70%) in Grade 6 indicated they were good at mathematics; and
- just under two-thirds (64%) in Grade 9 indicated they were good at mathematics.

Further, of the students who met the standards for the three assessments,

- slight less than two-thirds (63%) in Grade 3 indicated they liked mathematics;
- 54% in Grade 6 indicated they liked mathematics; and
- nearly three in five (59%) in Grade 9 of the students indicated they liked mathematics.

In contrast, of the 3,311 students who did not meet the standard in any of the three assessments,

- nearly one-third (34%) in Grade 3 indicated they were good at mathematics;
- just over one in five (22%) in Grade 6 indicated they were good in mathematics; and
- just over one in 10 (12%) in Grade 9 indicated they were good at mathematics.

Further, of the students who did not meet the standard in any of the three assessments,

- just over half (52%) in Grade 3 indicated they liked mathematics;
- just over three in 10 (31%) in Grade 6 indicated they liked mathematics; and
- just over one in five (22%) in Grade 9 indicated they liked mathematics.
As shown in Figure 23, of the 4846 students who met the standard for the three assessments,

- slightly more than half (52%) in Grade 3 indicated they were good at mathematics;
- two in five (40%) in Grade 6 indicated they were good at mathematics; and
- 55% in Grade 9 indicated they were good at mathematics.

Further, of the students who met the standards for the three assessments,

- 55% in Grade 3 indicated they liked mathematics;
- slightly less than two in five (38%) in Grade 6 indicated they liked mathematics; and
- slightly more than two in five (41%) in Grade 9 indicated they liked mathematics.

In contrast, of the 9331 students who did not meet the standard in any of the three assessments,

- nearly one in three (29%) in Grade 3 indicated they were good at mathematics;
- 14% in Grade 6 indicated they were good in mathematics; and
- slightly less than one in five (18%) in Grade 9 indicated they were good at mathematics.

Further, of the students who did not meet the standard in any of the three assessments,

- 46% in Grade 3 indicated they liked mathematics;
- slightly less than three in 10 (26%) in Grade 6 indicated they liked mathematics; and
- just over one in five (22%) in Grade 9 indicated they liked mathematics.
Discussion of Attitude Items

The percentages of students who indicated they were good at mathematics and who liked mathematics were higher for students in the academic course than in the applied course for students who met the standard at all three grades. The differences between the percentages of positive responses for students in the two courses were smaller for students who never met the standard; in some cases, the percentages were slightly larger for students in the applied course than for those in the academic course. There was a large decrease in the percentage of positive responses for students who did not meet the standard as they progressed from Grades 3 to 9, with larger decreases occurring between Grades 3 and 6 than between Grades 6 and 9; in one case there was a slight increase from Grade 6 to Grade 9.

Taken together, these results reflect the complexity of assessing attitudes and the stability of attitudes toward mathematics across grades. While it is clear that students who have experienced higher levels of achievement have a greater tendency to express positive attitudes than those with lower levels of achievement, it is also clear that many students who have met the standard at all three grade levels do not say they are good at mathematics or that they like mathematics. A variety of factors likely affect the relationship between achievement and attitudes. Further research is needed to explore these complex interactions and explain the results presented above.

Summary

Since every student in Ontario has an Ontario Education Number and they all participate in the EQAO assessments in Grades 3, 6, 9 and 10, it is possible to track the progress of students as they move through their school career. This makes it possible to report detailed achievement, contextual and attitudinal data for each school and board, as well as the province as a whole; to analyze data for sub-groups of students and cohorts of students; and to track achievement as students progress from Grade 3 to Grade 9. Schools and boards can thus examine the long-term impact of their teaching and learning programs and modify initiatives to meet the specific needs of individual students and groups of students for maximum effectiveness. This provides valuable information and insight for educators in their objective to ensure student learning and success in their schools.

This study examined the progress of student achievement in mathematics from Grade 3 to Grade 6 to the Grade 9 academic and applied mathematics courses. As well, student responses to two items of a student questionnaire in each of these grades were analyzed.

The findings provide evidence that students who met the provincial standards on the EQAO assessments in the early grades were more likely to meet the standards in later grades and to enroll in the academic course in Grade 9 than those who did not. As well, a larger percentage of students in the academic program met the standard for the Grade 9 academic assessment than did students in the applied program who met the standard for the Grade 9 applied program. It is also important to note that many students who did not meet the standards in Grades 3 and 6 did meet them in Grade 9. In addition, the results indicated that a slightly larger percentage of male students than female students met the standard for the Grade 9 applied assessment.

Students with special education needs and English language learners were less likely than other students in the tracked sample to meet the standards in all grades, but this difference was lowest for students enrolled in the academic course in Grade 9. However, for all groups, success in meeting the standards in later grades was strongly related to meeting the standard in earlier grades. Consequently, effort needs to be given to improving mathematics achievement in elementary school so that students have an appropriate and strong foundation that will enable them to be more successful at meeting expected standards in secondary school.
The results also highlight the strong relationship between achievement and student attitudes. Of particular note is the sharp decrease in the percentage of positive responses among students who did not meet the provincial standard as they progressed through the grades. This further emphasizes the importance of directed attention to students who do not meet the standard in Grade 3. If students begin to feel that they cannot do well in mathematics, it is possible they may decrease their efforts in mathematics class. *The Ontario Curriculum* cites the importance of student attitudes and how they relate to success in mathematics. Educators may wish to augment classroom instruction with activities designed to help students discover the pleasure in learning and doing mathematics and in persisting to solve challenging problems. Highlighting the relevance of mathematics in day-to-day life and the importance of mathematics and science in the global marketplace may help students see the value in developing their mathematics skills. Scaffolding learning activities may also help weaker students achieve success in stages, thereby increasing their confidence as they experience success in small increments.

**Implications for Improvement Planning**

EQAO has provided schools, boards and the province with cohort data since 2008–2009. With the launch of an interactive reporting application in 2012, new cohort reports were introduced for elementary schools, and for secondary schools in 2013. This enables principals and their teams to explore the progress of students as they move from Grade 3 to Grade 9. Tracking results through the grades provides evidence about where resources and interventions need to be focused for schools, boards and the province.

These results suggest that identifying student needs early and providing support makes a difference. Directed attention to students who do not meet the provincial standards should be a priority in all school improvement planning. Many students who did not meet the standard in the early grades did so in later grades. Students with special education needs have been identified as being less likely to meet the standards at all grade levels. It remains the responsibility of those currently in the field to address this issue both within schools and with those who provide external support. It is clear that for system-wide improvement to occur on these fronts, new approaches at the local-school level, school-board level and public-policy level must be considered.

Next steps:

- Provide early and ongoing interventions to support students who are at risk in kindergarten or the primary or junior level to help them meet the provincial mathematics standards in later grades.
- Use assessment data and detailed tracking of students through the grades to provide evidence of where resources and interventions may be most beneficial in supporting student success.
- Continue development of differentiated instructional strategies to maximize the effectiveness of teaching.
- Provide focused attention to students with special education needs.
- Investigate further the relationship between student attitudes and achievement in mathematics.
- Ensure that mathematics is presented in a way that is engaging and promotes the importance and relevancy of mathematics to student’s future success.

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APPENDIX: TABLES OF RESULTS

Note: A larger proportion of females than males were enrolled in the academic course; this must be taken into consideration when interpreting all gender data for Grade 9. When achievement results are combined across the two courses, an overall larger percentage of females than males met the standard.

Table 1: Number of Tracked Students in the Cohort, by Grade 9 Course Selection

<table>
<thead>
<tr>
<th>Grade 9 Mathematics Course Enrolment</th>
<th>Students Included in the Results for Grade 9 Assessment of Mathematics 2011–2012</th>
<th>Students with Results for all Three Assessments</th>
<th>Percentage of all Tracked Students in Grade 9 Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>43 174</td>
<td>30 119</td>
<td>70%</td>
</tr>
<tr>
<td>Academic Mathematics</td>
<td>98 819</td>
<td>80 270</td>
<td>81%</td>
</tr>
<tr>
<td>Total</td>
<td>141 993</td>
<td>110 389</td>
<td>78%</td>
</tr>
</tbody>
</table>

Table 2: Student Characteristics from Grade 3 to Grade 6, for All Students and by Mathematics Summary Achievement, in English language Schools

<table>
<thead>
<tr>
<th>Demographic Category</th>
<th>All Students (n = 110 389)</th>
<th>Maintained the Standard (n = 65 149)</th>
<th>Rose to the Standard (n = 9 784)</th>
<th>Dropped from the Standard (n = 15 876)</th>
<th>Never Met the Standard (n = 19 580)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>55 391 (50%)</td>
<td>32 526 (59%)</td>
<td>4 583 (8%)</td>
<td>8 672 (16%)</td>
<td>9 610 (17%)</td>
</tr>
<tr>
<td>Female</td>
<td>54 998 (50%)</td>
<td>32 623 (59%)</td>
<td>5 201 (9%)</td>
<td>7 204 (13%)</td>
<td>9 970 (18%)</td>
</tr>
<tr>
<td>English language learners Grade 3</td>
<td>7 558 (7%)</td>
<td>3 963 (52%)</td>
<td>1 087 (14%)</td>
<td>841 (11%)</td>
<td>1 667 (22%)</td>
</tr>
<tr>
<td>English language learners Grade 6</td>
<td>3 872 (4%)</td>
<td>1 700 (44%)</td>
<td>677 (17%)</td>
<td>417 (11%)</td>
<td>1 078 (28%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 3</td>
<td>8 095 (7%)</td>
<td>1 873 (23%)</td>
<td>899 (11%)</td>
<td>1 737 (21%)</td>
<td>3 586 (44%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 6</td>
<td>14 195 (13%)</td>
<td>3 176 (22%)</td>
<td>1 581 (11%)</td>
<td>2 832 (20%)</td>
<td>6 606 (47%)</td>
</tr>
</tbody>
</table>

Table 3: Student Characteristics from Grade 6 to Grade 9, for All Students and by Mathematics Summary Achievement, in English language Schools, Applied Course

<table>
<thead>
<tr>
<th>Demographic Category</th>
<th>All Students (n = 30 119)</th>
<th>Maintained the Standard (n = 6 631)</th>
<th>Rose to the Standard (n = 7 958)</th>
<th>Dropped from the Standard (n = 2 464)</th>
<th>Never Met the Standard (n = 13 066)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>16 590 (55%)</td>
<td>3 832 (23%)</td>
<td>4 622 (28%)</td>
<td>1 326 (8%)</td>
<td>6 810 (41%)</td>
</tr>
<tr>
<td>Female</td>
<td>13 529 (45%)</td>
<td>2 799 (21%)</td>
<td>3 336 (25%)</td>
<td>1 138 (8%)</td>
<td>6 256 (46%)</td>
</tr>
<tr>
<td>English language learners Grade 6</td>
<td>965 (3%)</td>
<td>153 (16%)</td>
<td>281 (29%)</td>
<td>61 (6%)</td>
<td>470 (49%)</td>
</tr>
<tr>
<td>English language learners Grade 9</td>
<td>508 (2%)</td>
<td>94 (19%)</td>
<td>157 (31%)</td>
<td>28 (6%)</td>
<td>229 (45%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 6</td>
<td>9 913 (33%)</td>
<td>1 369 (14%)</td>
<td>2 303 (23%)</td>
<td>769 (8%)</td>
<td>5 472 (55%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 9</td>
<td>10 744 (36%)</td>
<td>1 429 (13%)</td>
<td>2 613 (24%)</td>
<td>812 (8%)</td>
<td>5 890 (55%)</td>
</tr>
</tbody>
</table>

5 Based on students for whom gender data were available.
Table 4: Student Characteristics from Grade 6 to Grade 9, for All Students and by Mathematics Summary Achievement, in English language Schools, Academic Course

<table>
<thead>
<tr>
<th>Student Questionnaire Responses</th>
<th>All Students (n = 80 270)</th>
<th>Maintained the Standard (n = 59 591)</th>
<th>Rose to the Standard (n = 8 224)</th>
<th>Dropped from the Standard (n = 6 247)</th>
<th>Never Met the Standard (n = 6 208)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>38 801 (48%)</td>
<td>29 156 (75%)</td>
<td>4 074 (10%)</td>
<td>2 795 (7%)</td>
<td>2 776 (7%)</td>
</tr>
<tr>
<td>Female</td>
<td>41 469 (52%)</td>
<td>30 435 (73%)</td>
<td>4 150 (10%)</td>
<td>3 452 (8%)</td>
<td>3 432 (8%)</td>
</tr>
<tr>
<td>English language learners Grade 6</td>
<td>2 907 (4%)</td>
<td>1 993 (69%)</td>
<td>425 (15%)</td>
<td>170 (6%)</td>
<td>319 (11%)</td>
</tr>
<tr>
<td>English language learners Grade 9</td>
<td>1 627 (2%)</td>
<td>1 141 (70%)</td>
<td>242 (15%)</td>
<td>78 (5%)</td>
<td>166 (10%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 6</td>
<td>4 282 (5%)</td>
<td>2 189 (51%)</td>
<td>848 (20%)</td>
<td>430 (10%)</td>
<td>815 (19%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 9</td>
<td>4 383 (5%)</td>
<td>2 337 (53%)</td>
<td>870 (20%)</td>
<td>410 (9%)</td>
<td>766 (17%)</td>
</tr>
</tbody>
</table>

* Based on students for whom gender data were available.
Table 5: Student Characteristics from Grade 3 to Grade 6 to Grade 9, for All Students and by Mathematics Summary Achievement, in English language Schools, Applied Course

<table>
<thead>
<tr>
<th>Demographic Category</th>
<th># (%)</th>
<th># (%) Within Demographic Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>16 590 (55%)</td>
<td>2 876 (17%)</td>
</tr>
<tr>
<td>Female</td>
<td>13 529 (45%)</td>
<td>1 970 (15%)</td>
</tr>
<tr>
<td>English language learners Grade 3</td>
<td>1 476 (5%)</td>
<td>139 (9%)</td>
</tr>
<tr>
<td>English language learners Grade 6</td>
<td>965 (3%)</td>
<td>80 (8%)</td>
</tr>
<tr>
<td>English language learners Grade 9</td>
<td>508 (2%)</td>
<td>45 (9%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 3</td>
<td>5 594 (19%)</td>
<td>467 (8%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 6</td>
<td>9 913 (33%)</td>
<td>849 (9%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 9</td>
<td>10 744 (36%)</td>
<td>900 (8%)</td>
</tr>
</tbody>
</table>

Table 6: Student Characteristics from Grade 3 to Grade 6 to Grade 9, for All Students and by Mathematics Summary Achievement, in English language Schools, Academic Course

<table>
<thead>
<tr>
<th>Demographic Category</th>
<th># (%)</th>
<th># (%) Within Demographic Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>38 801 (48%)</td>
<td>26 753 (69%)</td>
</tr>
<tr>
<td>Female</td>
<td>41 469 (52%)</td>
<td>27 576 (66%)</td>
</tr>
<tr>
<td>English language learners Grade 3</td>
<td>6 082 (8%)</td>
<td>3 586 (59%)</td>
</tr>
<tr>
<td>English language learners Grade 6</td>
<td>2 907 (4%)</td>
<td>1 515 (52%)</td>
</tr>
<tr>
<td>English language learners Grade 9</td>
<td>1 627 (2%)</td>
<td>878 (54%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 3</td>
<td>2 501 (3%)</td>
<td>1 069 (43%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 6</td>
<td>4 282 (5%)</td>
<td>1 760 (41%)</td>
</tr>
<tr>
<td>Students with special education needs Grade 9</td>
<td>4 383 (5%)</td>
<td>1 940 (44%)</td>
</tr>
</tbody>
</table>

7 **Sustained Strength**: maintained the standard from Grade 3 to Grade 6 and met the standard in Grade 9; **Increasing Strength**: rose to the standard from Grade 3 to Grade 6 and met the standard in Grade 9; **Returning Strength**: dropped from the standard from Grade 3 to Grade 6 and met the standard in Grade 9; **New Strength**: never met the standard in Grade 3 and Grade 6 and met the standard in Grade 9; **New Difficulty**: maintained the standard from Grade 3 to Grade 6 and did not meet the standard in Grade 9; **Returning Difficulty**: rose to the standard from Grade 3 to Grade 6 and did not meet the standard in Grade 9; **Increasing Difficulty**: dropped from the standard from Grade 3 to Grade 6 and did not meet the standard in Grade 9; **Sustained Difficulty**: never met the standard in Grade 3 and Grade 6 and did not meet the standard in Grade 9.

8 Based on students for whom gender data were available.
Table 7: Student Attitudes from Grade 3 to Grade 6, for All Students and by Mathematics Summary Achievement, in English language Schools

<table>
<thead>
<tr>
<th>Student Questionnaire Responses</th>
<th>All Students (n = 109 303)</th>
<th>Maintained the Standard (n = 65 132)</th>
<th>Rose to the Standard (n = 9 778)</th>
<th>Dropped from the Standard (n = 15 431)</th>
<th>Never Met the Standard (n = 18 962)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like math⁹ Grade 3</td>
<td>62 879 (57%)</td>
<td>40 303 (62%)</td>
<td>4 932 (50%)</td>
<td>8 514 (56%)</td>
<td>9 130 (48%)</td>
</tr>
<tr>
<td>I like math⁹ Grade 6</td>
<td>48 452 (44%)</td>
<td>33 759 (52%)</td>
<td>4 351 (45%)</td>
<td>4 793 (31%)</td>
<td>5 549 (29%)</td>
</tr>
<tr>
<td>I am good at math⁹ Grade 3</td>
<td>58 372 (54%)</td>
<td>41 377 (64%)</td>
<td>3 660 (37%)</td>
<td>7 282 (47%)</td>
<td>6 053 (32%)</td>
</tr>
<tr>
<td>I am good at math⁹ Grade 6</td>
<td>54 447 (50%)</td>
<td>42 566 (65%)</td>
<td>3 902 (40%)</td>
<td>4 409 (29%)</td>
<td>3 570 (19%)</td>
</tr>
</tbody>
</table>

Table 8: Student Attitudes from Grade 6 to Grade 9, for All Students and by Mathematics Summary Achievement, in English language Schools, Applied Course

<table>
<thead>
<tr>
<th>Student Questionnaire Responses</th>
<th>All Students (n = 29 526)</th>
<th>Maintained the Standard (n = 6 636)</th>
<th>Rose to the Standard (n = 7 768)</th>
<th>Dropped from the Standard (n = 2 472)</th>
<th>Never Met the Standard (n = 12 650)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like math¹⁰ Grade 6</td>
<td>8 897 (30%)</td>
<td>2 488 (37%)</td>
<td>2 318 (30%)</td>
<td>801 (32%)</td>
<td>3 290 (26%)</td>
</tr>
<tr>
<td>I like math¹⁰ Grade 9</td>
<td>8 764 (30%)</td>
<td>2 776 (42%)</td>
<td>2 838 (37%)</td>
<td>519 (22%)</td>
<td>2 631 (22%)</td>
</tr>
<tr>
<td>I am good at math¹⁰ Grade 6</td>
<td>6 821 (23%)</td>
<td>3 437 (37%)</td>
<td>1 778 (22%)</td>
<td>644 (26%)</td>
<td>1 962 (16%)</td>
</tr>
<tr>
<td>I am good at math¹⁰ Grade 9</td>
<td>9 736 (34%)</td>
<td>3 560 (54%)</td>
<td>3 351 (43%)</td>
<td>555 (24%)</td>
<td>2 270 (19%)</td>
</tr>
</tbody>
</table>

Table 9: Student Attitudes from Grade 6 to Grade 9, for All Students and by Mathematics Summary Achievement, in English language Schools, Academic Course

<table>
<thead>
<tr>
<th>Student Questionnaire Responses</th>
<th>All Students (n = 79 777)</th>
<th>Maintained the Standard (n = 59 572)</th>
<th>Rose to the Standard (n = 7 860)</th>
<th>Dropped from the Standard (n = 6 230)</th>
<th>Never Met the Standard (n = 6 115)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like math⁹ Grade 6</td>
<td>39 555 (50%)</td>
<td>32 155 (54%)</td>
<td>2 820 (36%)</td>
<td>2 666 (43%)</td>
<td>1 914 (31%)</td>
</tr>
<tr>
<td>I like math¹⁰ Grade 9</td>
<td>40 630 (51%)</td>
<td>34 681 (58%)</td>
<td>3 140 (40%)</td>
<td>1 487 (25%)</td>
<td>1 322 (22%)</td>
</tr>
<tr>
<td>I am good at math⁹ Grade 6</td>
<td>47 626 (60%)</td>
<td>40 712 (68%)</td>
<td>2 740 (35%)</td>
<td>2 675 (43%)</td>
<td>1 499 (25%)</td>
</tr>
<tr>
<td>I am good at math¹⁰ Grade 9</td>
<td>41 674 (53%)</td>
<td>37 289 (63%)</td>
<td>2 618 (33%)</td>
<td>1 025 (17%)</td>
<td>742 (12%)</td>
</tr>
</tbody>
</table>

⁹ Response categories: Yes; Sometimes; No. Percentages reflect students who responded “yes.”
¹⁰ Response categories: Strongly agree; Agree; Undecided; Disagree; Strongly disagree. Percentages reflect students who responded “Strongly agree” or “Agree.” NB: For these questions, the majority of Grade 9 students’ positive responses fall in the “Agree” category, as opposed to the “Strongly agree” category.
Table 10: Student Attitudes from Grade 3 to Grade 6 to Grade 9, for All Students and by Mathematics Summary Achievement, in English language Schools, Applied Course

<table>
<thead>
<tr>
<th>Student Questionnaire Responses</th>
<th># (%)</th>
<th># (%) Within Achievement Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All Students (n = 29,526)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I like math13 Grade 3</td>
<td>14,790 (50%)</td>
<td>2,688 (55%)</td>
</tr>
<tr>
<td>I like math12 Grade 6</td>
<td>8,897 (30%)</td>
<td>1,837 (38%)</td>
</tr>
<tr>
<td>I like math13 Grade 9</td>
<td>8,764 (30%)</td>
<td>2,009 (41%)</td>
</tr>
<tr>
<td><strong>I am good at math12 Grade 3</strong></td>
<td>11,392 (39%)</td>
<td>2,514 (52%)</td>
</tr>
<tr>
<td><strong>I am good at math12 Grade 6</strong></td>
<td>6,821 (23%)</td>
<td>1,931 (40%)</td>
</tr>
<tr>
<td><strong>I am good at math13 Grade 9</strong></td>
<td>9,736 (34%)</td>
<td>2,651 (55%)</td>
</tr>
</tbody>
</table>

Table 11: Student Attitudes from Grade 3 to Grade 6 to Grade 9, for All Students and by Mathematics Summary Achievement, in English language Schools, Academic Course

<table>
<thead>
<tr>
<th>Student Questionnaire Responses</th>
<th># (%)</th>
<th># (%) Within Achievement Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All Students (n = 79,777)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I like math12 Grade 3</td>
<td>48,089 (60%)</td>
<td>34,136 (63%)</td>
</tr>
<tr>
<td>I like math12 Grade 6</td>
<td>39,555 (50%)</td>
<td>29,471 (54%)</td>
</tr>
<tr>
<td>I like math13 Grade 9</td>
<td>40,630 (51%)</td>
<td>31,975 (59%)</td>
</tr>
<tr>
<td><strong>I am good at math12 Grade 3</strong></td>
<td>46,980 (59%)</td>
<td>35,698 (66%)</td>
</tr>
<tr>
<td><strong>I am good at math12 Grade 6</strong></td>
<td>47,626 (60%)</td>
<td>38,119 (70%)</td>
</tr>
<tr>
<td><strong>I am good at math13 Grade 9</strong></td>
<td>41,674 (53%)</td>
<td>34,781 (64%)</td>
</tr>
</tbody>
</table>

11 **Sustained Strength**: maintained the standard from Grade 3 to Grade 6 and met the standard in Grade 9; **Increasing Strength**: rose to the standard from Grade 3 to Grade 6 and met the standard in Grade 9; **Returning Strength**: dropped from the standard from Grade 3 to Grade 6 and met the standard in Grade 9; **New Strength**: never met the standard in Grade 3 and Grade 6 and met the standard in Grade 9; **New Difficulty**: maintained the standard from Grade 3 to Grade 6 and did not meet the standard in Grade 9; **Returning Difficulty**: rose to the standard from Grade 3 to Grade 6 and did not meet the standard in Grade 9; **Increasing Difficulty**: dropped from the standard from Grade 3 to Grade 6 and did not meet the standard in Grade 9; **Sustained Difficulty**: never met the standard in Grade 3 and Grade 6 and did not meet the standard in Grade 9.

12 Response categories: Yes; Sometimes; No. Percentages reflect students who responded “yes.”

13 Response categories: Strongly agree; Agree; Undecided; Disagree; Strongly disagree. Percentages reflect students who responded “Strongly agree” or “Agree.” NB: For these questions, the majority of Grade 9 students’ positive responses fall in the “Agree” category, as opposed to the “Strongly agree” category.