

Getting Through Secondary School: The Example of Mathematics in Recent TDSB Grade 9 Cohorts

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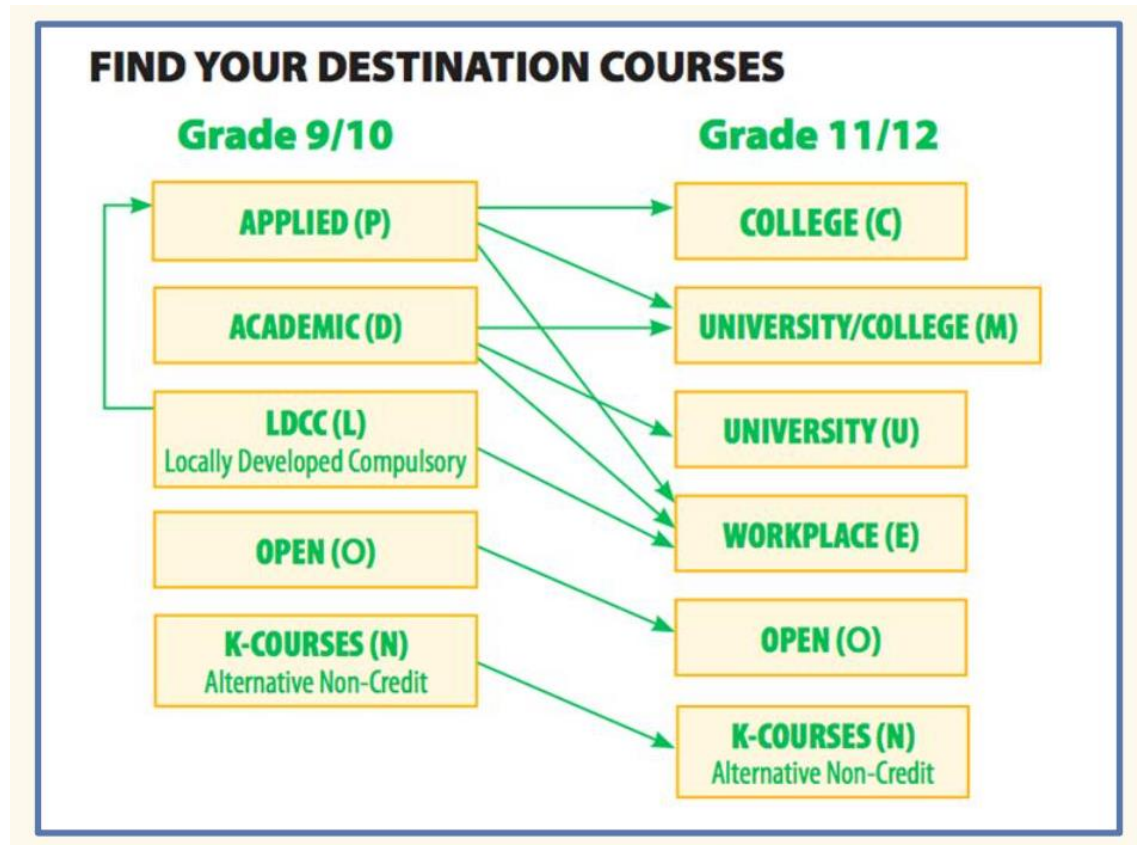
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Streaming and `student choice`: the theory

The Ministry of Education and the Toronto District School Board promote student choice and the visualization below suggests that students can straddle several programs of study and pursue various secondary pathways towards post-secondary (Figure 4: TDSB Choices 2017-18 document, D)

Streaming and `Student Choice`: the theory

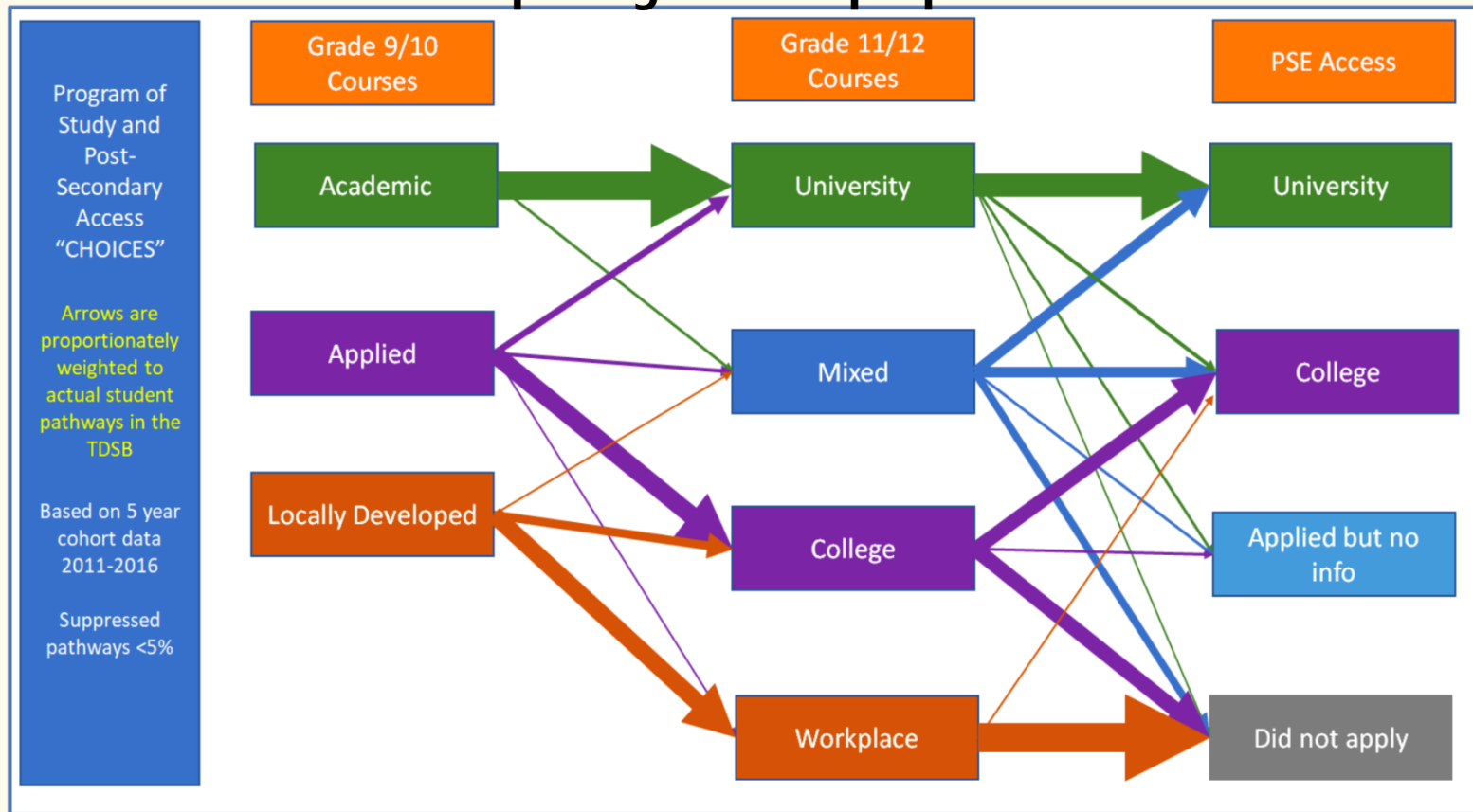


TDSB's 2017-18 Choices document, D

Streaming and `Student Choice`: The Reality

- The majority of students that pursue the Academic program of study in Grades 9-10 end up taking the majority of their courses within the University program of study for Grades 11-12 and gain post-secondary access to University and College.
- Similarly, the majority of students taking the Applied Program of study are most likely to pursue the College program of study in Grades 11-12.
- While the assumption would be that College prepared students would have post-secondary access to College following five years of high school, the graphic demonstrates that less than half of eligible students actually receive an offer of admission to an Ontario College

Figure X: Streaming in the TDSB with the use of weighted arrows depicting student proportions



Source: Parekh, Brown and Conley, 2017

How does this work? We will explore this through the example of Mathematics achievement in secondary school.

Grade 9 Achievement in Mathematics and Post-secondary 2011-2016

Students marks in Grade 9 Mathematics are very strongly related to their post-secondary pathways by the end of five years of secondary school.

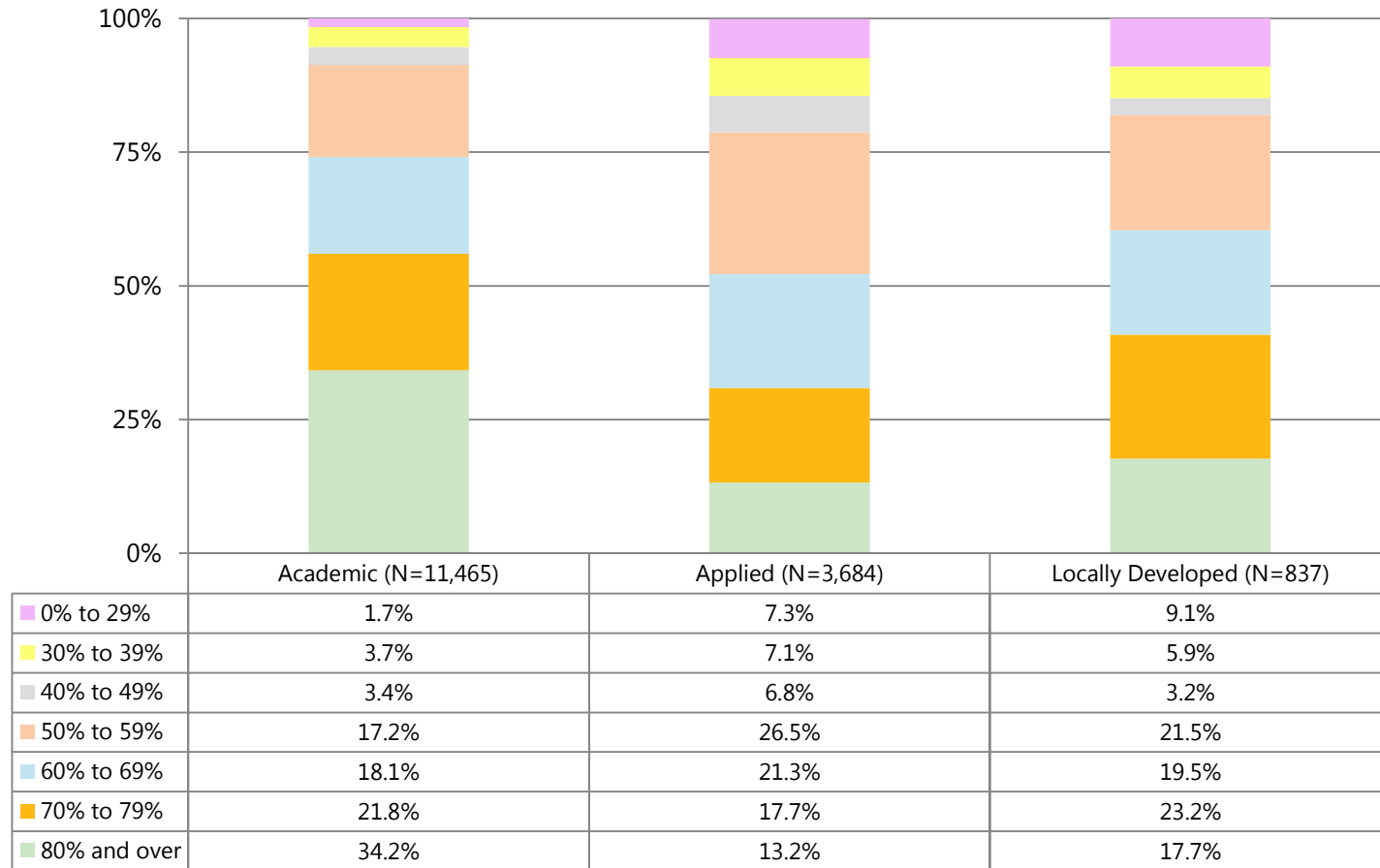
Grade 9 Mathematics Achievement	Confirmed university in Ontario	Confirmed college in Ontario	Applied but did not confirm	Did not apply to post-secondary	Total
Did not complete Grade 9 Mathematics	6.4%	14.6%	5.2%	73.7%	100.0%
Mathematics Mark 50 to 59	30.6%	29.7%	10.5%	29.1%	100.0%
Mathematics Mark 60 to 69	46.5%	24.6%	9.5%	19.4%	100.0%
Mathematics Mark 70 to 79	59.0%	18.3%	8.6%	14.1%	100.0%
Mathematics Mark 80 plus	76.5%	9.0%	8.3%	6.2%	100.0%
Total	52.8%	18.3%	8.8%	20.1%	100.0%

The same pattern can be observed for the other three compulsory Grade 9 subjects: English, Science, and Geography.

We will focus on the example of Mathematics, knowing that the same patterns can be generally observed for other key subjects.

First, we will look at Grade 9 Mathematics marks according to Program of study (streaming), from the earlier Grade 9 cohort 2008-2013.

Program of Study Grade 9 Mathematics Course and Grade 9 Mathematics Mark Distribution

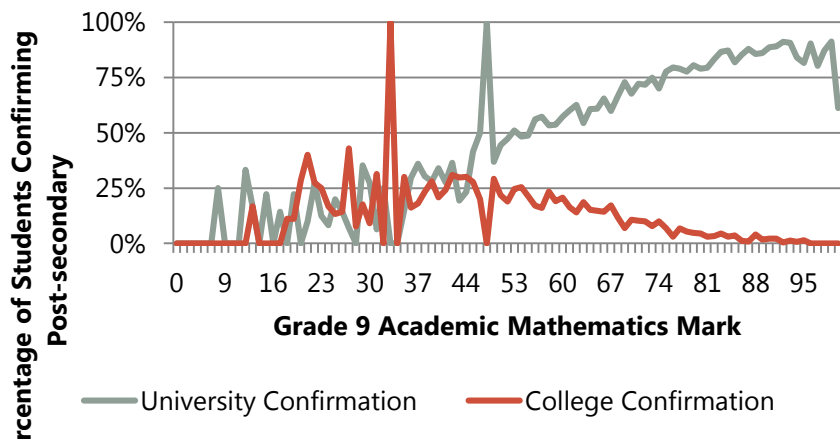


Program of Study Grade 9 Mathematics Course and Grade 9 Mathematics Mark Distribution

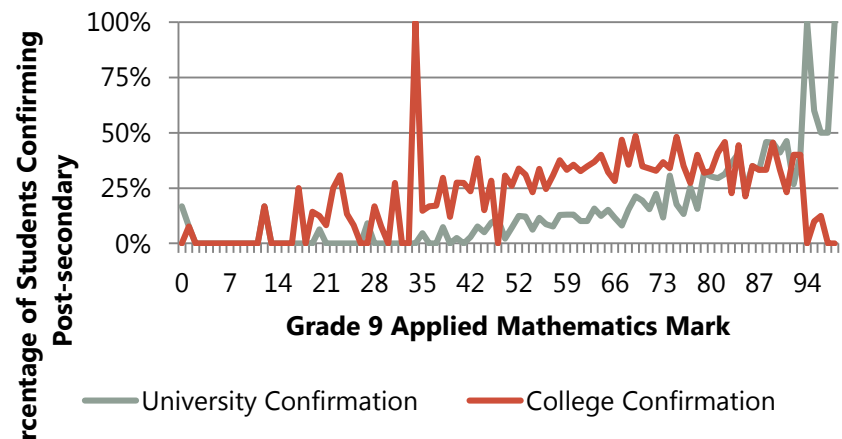
- Grade 9 marks in Mathematics depend upon the program of study taken.
- The range of Academic marks is higher than Applied or Locally Developed (Essentials) marks.
- Students in Academic are much less likely to fail than those taking non-Academic courses, and those who fail in Academic tend to fail with higher marks, compared to failures in non-Academic courses.

- Marks in non-Academic courses do not have the same value as Academic courses, in terms of going to post-secondary. Students with an 'A' (80% or more) in Grade 9 Applied Mathematics go to post-secondary (college and university) at the same rate as those with a 'D' in Academic Mathematics.

TDSB Students' Grade 9 Academic Mathematics Marks and Five Year Post-secondary Confirmations 2008-13



TDSB Students' Grade 9 Applied Mathematics Marks and Five Year Post-secondary Confirmations 2008-13



Mathematics in Grades 11-12 and the Transition to Post-secondary

- The requirements for OSSD graduation require only the completion of one (1) Grade 11 OR Grade 12 course in Mathematics.
- However, our examination of actual courses finds that for post-secondary pathways, a very different pattern exists.
- We use the most recent Grade 9 cohort (2011-16), using the post-secondary confirmations in Ontario universities (through OUAC) and colleges (OCAS) over the 2015 and 2016 application cycles.

1. University-Bound Students (N = 8,183)- Field of Study

Almost all (89%) of university-bound students from the 2011-2016 cohort confirmed an offer in six main fields or Program Categories: Arts/Humanities/Social Science (28%); Science (26%) Commerce/Business (17%); Engineering (11%) Fine and Applied Arts (5%) and Physical/Health Education (3%).

Mathematics as a field, itself accounted for only 1% of students.

Field (Program Category) of the University-bound (2011-2016 cohort)

University Program Category	N	%
Arts/Humanities and Social Science	2289	28.0
Science	2087	25.5
Commerce, Management and Business Administration	1363	16.7
Engineering and Applied Science	858	10.5
Fine and Applied Arts	396	4.8
Physical and Health Education and Recreation	257	3.1
Nursing	175	2.1
Other Administration	119	1.5
Other Degrees	117	1.4
Household Science	107	1.3
Mathematics	105	1.3
Environmental Studies	91	1.1
Social Work	57	.7
Journalism	47	.6
Education	39	.5
Music	39	.5
Architecture	29	.4
Other	8	.1
Total	8183	100.0

2. University-Bound Students (N = 8,183)- Top Completed Mathematics Course

Although there is technically no OSSD requirement for Grade 12 Mathematics, in fact nearly all of the university bound (83%) completed at least one Grade 12 University Mathematics course. In addition, 7% completed a Grade 11 Mixed and 6% completed a Grade 11 University course.

Top Completed Mathematics Course of the University-bound (2011-2016 Cohort)

a. Highest Mathematics Credit- University	N	%
Grade 12 University	6756	82.6
Grade 11 Mixed	599	7.3
Grade 11 University	511	6.2
Grade 11 College	234	2.9
Grade 12 College	32	.4
Other	51	.6
Total	8183	100.0

3. University-Bound Students: Top Completed Mathematics Course in Key Subjects

When we examined the six university fields where most of our students went, in four of those fields, nearly all (93%-100%) had completed a Grade 12 'U' course in Mathematics: Science; Commerce/Business; Engineering/Applied Science; and Physical/Health Education.

In the largest field (Arts/Humanities/Social Sciences) the majority (58%) still completed a Grade 12 'U' course, and when Grade 11 'U' is added, the proportion is over 70%.

Fewer than half (44%) of those in Fine/Applied Arts took Grade 12 'U' course; 16% took a Grade 11 'U' course.

Top Completed Mathematics: Key University Fields (2011-2016 Cohort)

Key University Program Grouping	Grade 12 University	Grade 12 College	Grade 11 University	Grade 11 Mixed	Grade 11 College	N
Arts/Humanities and Social Science	58%	1%	15%	17%	8%	2289
Science	98%		1%	1%		2087
Commerce, Management and Business Administration	98%		1%			1363
Engineering and Applied Science	100%					858
Fine and Applied Arts	44%		16%	27%	9%	396
Physical and Health Education and Recreation	93%					257

Note: percentages where the number of students in the cell was below 10 were deleted.

University Summary: While not impossible, getting into university without a 'U' course- in particular a Grade 12 'U' course- seems to be very difficult.

- For STEM and Business fields, a *Grade 12 'U' course appears mandatory* for university entry.
- Even with Art/Humanities/Social Sciences, a *Grade 12 'U' course is the majority* highest Mathematics course taken by those gaining university entry.
- For University Fine and Applied Arts, *Grade 12 and Grade 11 'U' courses are the majority pathway* (although a quarter also entered with Grade 11 Mixed U/C courses).

4. College-Bound Students (N = 2,840)- Top Completed Mathematics Course

Students from the cohort entering college had a wider-range of mathematics courses. That being said, over half had completed a Grade 12 College course (34%) or Grade 12 University course (27%).

Top Completed Mathematics Course of the College-bound (2011-2016 Cohort)

b. Highest Mathematics Credit-College		
	N	%
Grade 12 College	953	33.6
Grade 12 University	768	27.0
Grade 11 College	402	14.2
Grade 11 Mixed	367	12.9
Grade 11 University	135	4.8
Other	100	3.5
Total	2840	100.0

Conclusion:

- There is a pronounced gap between the official pathways process and actual outcomes. Most students who take Academic courses will transition into University courses in Grades 11-12 and then into post-secondary. Options for students taking Applied and Locally-developed are much more limited.
- We used Mathematics courses to shed more light on this. Grade 9 Mathematics achievement, as with the other three compulsory subjects, was highly connected to post-secondary pathways.
- However, we found that the streaming process complicated this relationship with marks. First, the mark range of Applied students in Mathematics is much lower than that of Academic students. Secondly, marks in non-Academic courses do not have the same value as Academic courses, in terms of going to tdsb.on.ca

Conclusion (2)

- When we looked at Grade 11-12 Mathematics courses and postsecondary access, we found additional (or perhaps related) hurdles. For most of the university-bound, successful completion of a Grade 12 'U' Mathematics course appears to be necessary- regardless of any secondary school requirements.
- The completion of at least one Grade 12 'U' courses in Mathematics appears *functionally* mandatory admission for most university STEM and Business fields, and highly important for Arts/Humanities/Social Science fields.
- College-bound students have broader requirements, although over a quarter of the college-bound also completed at least one Grade 12 'U' course in Mathematics.

Conclusion (3)

- Therefore, the very low mark range of students taking Grade 9 Applied Mathematics courses would make achievement in Grade 11-12 College courses difficult.
- But even those who successfully transitioned into College level courses and completed them, would find themselves competing for college entry with students with completed Grade 11 or 12 University Mathematics courses.

Summary: secondary course pathways to post-secondary are opaque, partly because of the gap between high school graduation requirements, and entry to post-secondary.

This puts those without the necessary insider knowledge (e.g. those unfamiliar with the nuances of Ontario education) at a disadvantage.

