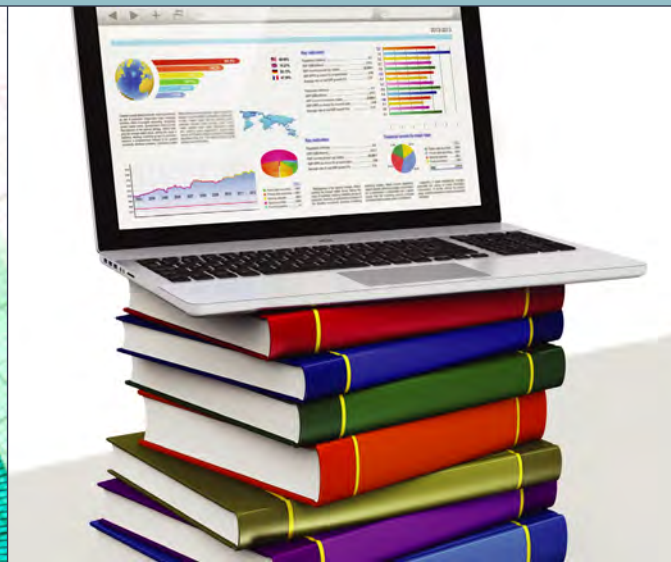
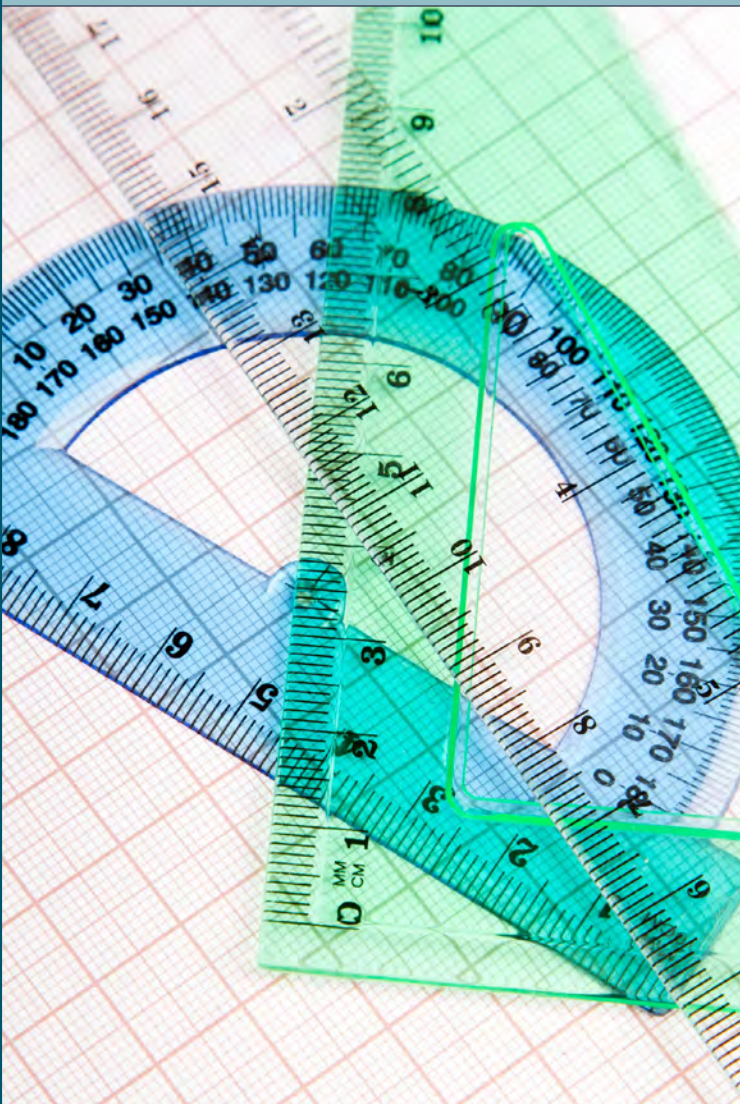


PCAP 2019

Contextual Report on Student Achievement in Mathematics



Pan-Canadian Assessment Program

PCAP 2019

Contextual Report on Student Achievement in Mathematics

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TABLE OF CONTENTS

Introduction: What Is the Pan-Canadian Assessment Program?	1
PCAP contextual questionnaires	1
Applications of PCAP data	2
Objectives and organization of the report	2
Chapter 1: Student Demographic and Socioeconomic Characteristics	4
Gender	4
Gender in PCAP 2019	4
Gender and mathematics achievement	6
Language	7
Learning in Canada’s official languages	8
Classifying language use in PCAP contextual data	8
Students’ first languages	8
Students’ language use in everyday life	11
Second-language study	12
Student socioeconomic status	15
Parents’ education	15
Books in students’ homes	18
Immigrant status	21
Indigenous self-identity	24
Summary	26
Chapter 2: A Profile of Student Attitudes and Engagement in Mathematics	28
Students’ attitudes and beliefs	30
Attitude toward mathematics	30
Mathematics self-efficacy	36
Student effort	45
Time management	50
Students’ learning experiences	55
Understanding the language of mathematics	55
Activities used to support learning in mathematics	65
Supporting student learning	71
Cross-curricular integration of mathematics	71
Homework activities	72
Assessment	73
Rubrics	74

Feedback and support	75
Students' sense of belonging	77
Cognitive demand in mathematical tasks	80
Level 1 problems.....	80
Level 3 problems.....	81
Cognitive demand of questions used in mathematics class	81
Summary	83
Chapter 3: Characteristics of Classrooms and Teachers	86
Classroom characteristics	86
Class size	86
Meeting the needs of all students	90
Class composition	93
Substitute teachers.....	95
Lost instructional time	97
Teacher characteristics	98
Gender.....	98
Teacher specialization.....	100
Professional development and self-efficacy	109
Professional development	109
Teacher self-efficacy	113
Classroom practices.....	116
Resources used for mathematics instruction	116
Probing student understanding	117
Curriculum knowledge and understanding of vertical articulation	118
Teachers' homework expectations	119
Assessment.....	123
Challenges in teaching mathematics	125
Summary	128
Chapter 4: Characteristics of Schools	129
School demographics and grade configuration	129
School demographics.....	130
Grade configuration.....	138
Diversity of the school population.....	142
Second-language learners	142
Indigenous students	145
Factors influencing learning.....	147
Instructional time management	147
Enrichment and extracurricular activities	153
Challenges to teaching and learning.....	155
Challenges to providing instruction	155
Challenges to learning	156
Summary	160

Conclusion	161
A profile of students	161
A profile of teaching	162
A profile of schools	164
Final statement.....	164
References	165
Appendix: Data Tables.....	179

LIST OF FIGURES

FIGURE 1.1	Percentage of students by gender self-identification	5
FIGURE 1.2	Achievement in mathematics by gender	7
FIGURE 1.3	Relationship between students' first language and mathematics achievement, by language of the school system	11
FIGURE 1.4	Percentage of students enrolled in language-immersion programs, 2016 and 2019	13
FIGURE 1.5	Mathematics achievement by second-language learning status and language of the school system	14
FIGURE 1.6	Percentage of students by their parents' education as reported by students.....	16
FIGURE 1.7	Relationship between parents' education and mathematics achievement.....	18
FIGURE 1.8	Percentage of students by the number of books in their home	19
FIGURE 1.9	Relationship between the number of books in the home and mathematics achievement	21
FIGURE 1.10	Percentage of students by immigrant status	22
FIGURE 1.11	Relationship between immigrant status and mathematics achievement.....	23
FIGURE 1.12	Trends in mathematics achievement for Indigenous students, 2010–2019	26
FIGURE 2.1	Percentage of students by their responses to questionnaire items constituting the attitude toward mathematics index	31
FIGURE 2.2	Results for the attitude toward mathematics index	32
FIGURE 2.3	Relationship between the attitude toward mathematics index and mathematics achievement	33
FIGURE 2.4	Percentage of students by their responses to questionnaire items constituting the confidence with mathematical processes index	37
FIGURE 2.5	Results for the confidence with mathematical processes index.....	37
FIGURE 2.6	Relationship between the confidence with mathematical processes index and mathematics achievement	38
FIGURE 2.7	Percentage of students by their responses to questionnaire items constituting the confidence using technology in mathematics index.....	41
FIGURE 2.8	Results for the confidence using technology in mathematics index.....	41
FIGURE 2.9	Relationship between the confidence using technology in mathematics index and mathematics achievement	42
FIGURE 2.10	Percentage of students by their responses to questionnaire items constituting the student effort index	46
FIGURE 2.11	Results for the student effort index	46
FIGURE 2.12	Relationship between the student effort index and mathematics achievement.....	47
FIGURE 2.13	Amount of time spent on homework each week	51
FIGURE 2.14	Relationship between mathematics homework effort and mathematics achievement	51
FIGURE 2.15	Student-reported school absences	52
FIGURE 2.16	Relationship between student absences and mathematics achievement.....	52
FIGURE 2.17	Student-reported skipping and tardiness	53

FIGURE 2.18	Relationship between students' skipping and tardiness and mathematics achievement	53
FIGURE 2.19	Time spent by students per week on activities outside of school hours	54
FIGURE 2.20	Percentage of students by their responses to questionnaire items constituting the knowledge of general terms in mathematics index.....	57
FIGURE 2.21	Results for the knowledge of general terms in mathematics index.....	57
FIGURE 2.22	Relationship between the knowledge of general terms in mathematics index and mathematics achievement	58
FIGURE 2.23	Percentage of students by their responses to questionnaire items constituting the knowledge of geometry and measurement terms index	61
FIGURE 2.24	Results for the knowledge of geometry and measurement terms index	62
FIGURE 2.25	Relationship between the knowledge of geometry and measurement terms index and mathematics achievement	63
FIGURE 2.26	Percentage of students by their responses to questionnaire items constituting the teacher-directed mathematics activities index.....	67
FIGURE 2.27	Results for the teacher-directed mathematics activities index.....	67
FIGURE 2.28	Relationship between the teacher-directed mathematics activities index and mathematics achievement	68
FIGURE 2.29	Percentage of students who reported using what they learned in mathematics in other school subjects.....	72
FIGURE 2.30	Types of homework assigned in mathematics class, as reported by students	73
FIGURE 2.31	Types of assessment in mathematics classes, as reported by students	74
FIGURE 2.32	Use of scoring rubrics in mathematics, as reported by students.....	75
FIGURE 2.33	Relationship between the frequency with which teachers use scoring rubrics and mathematics achievement	75
FIGURE 2.34	Types of teacher feedback and support given in mathematics class, as reported by students	76
FIGURE 2.35	Relationship between the frequency with which teachers provide feedback and support and mathematics achievement.....	77
FIGURE 2.36	Students' sense of belonging in school.....	78
FIGURE 2.37	Relationship between students' sense of belonging in school and mathematics achievement	79
FIGURE 2.38	Relationship between and students' response to the statement "I like school" and mathematics achievement	79
FIGURE 2.39	Cognitive demand of questions used in mathematics.....	82
FIGURE 2.40	Relationship between the cognitive demand of mathematics questions and mathematics achievement	83
FIGURE 3.1	Relationship between class size and mathematics achievement	88
FIGURE 3.2	Percentage of teachers indicating that other adults were present in their mathematics class	90
FIGURE 3.3	Relationship between the presence of another adult in the mathematics classroom and mathematics achievement	91
FIGURE 3.4	Accommodations and modifications used in mathematics classrooms	92

FIGURE 3.5	Relationship between the frequency of accommodations and modifications for students and mathematics achievement.....	93
FIGURE 3.6	Number of grade levels in mathematics classrooms	94
FIGURE 3.7	Mathematics achievement in single-grade and multi-grade classrooms	95
FIGURE 3.8	Number of days in the current school year taught by a substitute teacher	96
FIGURE 3.9	Relationship between the number of days taught by a substitute teacher and mathematics achievement	96
FIGURE 3.10	Reasons for lost instructional time	97
FIGURE 3.11	Relationship between lost instructional time and mathematics achievement.....	98
FIGURE 3.12	Relationship between gender of teacher and mathematics achievement	100
FIGURE 3.13	Academic credentials of Grade 8/Secondary II mathematics teachers	101
FIGURE 3.14	Relationship between teacher education and mathematics achievement.....	102
FIGURE 3.15	Number of postsecondary mathematics courses teachers completed	102
FIGURE 3.16	Areas of study during formal education and/or training	103
FIGURE 3.17	Years of teaching experience	104
FIGURE 3.18	Relationship between years of teaching experience and mathematics achievement	105
FIGURE 3.19	Percentage of teachers' schedule assigned to mathematics	106
FIGURE 3.20	Relationship between percentage of teachers' schedule assigned to mathematics and mathematics achievement	107
FIGURE 3.21	Percentage of teachers identifying themselves as mathematics specialists.....	108
FIGURE 3.22	Relationship between teacher specialization and student mathematics achievement	108
FIGURE 3.23	Number of days of professional development activities related to teaching mathematics in the past five years	110
FIGURE 3.24	Types of professional development activities for teachers in the past five years.....	111
FIGURE 3.25	Types of collaboration between mathematics teachers	113
FIGURE 3.26	Teachers' confidence in their ability to perform mathematics tasks	114
FIGURE 3.27	Teachers' confidence in their ability to help their students understand mathematics subdomains.....	114
FIGURE 3.28	Resources used in mathematics instruction	117
FIGURE 3.29	Teachers' use of opportunities for students to show understanding in mathematics	118
FIGURE 3.30	Teachers' understanding of vertical articulation in mathematics curricula	119
FIGURE 3.31	Amount of time teachers expect students to spend on mathematics homework per week	120
FIGURE 3.32	Relationship between the amount of mathematics homework assigned per week and mathematics achievement	121
FIGURE 3.33	Types of homework assigned by mathematics teachers	122
FIGURE 3.34	Teacher monitoring of students' homework	123
FIGURE 3.35	Types of questions teachers use on mathematics tests.....	124
FIGURE 3.36	Relationship between frequency of extended-response items requiring multi-step solutions and mathematics achievement	124
FIGURE 3.37	Types of questions teachers use in mathematics assessments to measure different levels of thinking.....	125

FIGURE 3.38	Challenges in mathematics teaching, as reported by teachers	126
FIGURE 3.39	Teachers' responses to questionnaire items related to the challenges to teaching index	127
FIGURE 3.40	Relationship between the challenges to teaching index and mathematics achievement	127
FIGURE 4.1	Size of communities in which schools are located.....	131
FIGURE 4.2	Relationship between the size of the community in which schools are located and mathematics achievement	133
FIGURE 4.3	Percentage of public and private schools	134
FIGURE 4.4	Relationship between school governance and mathematics achievement.....	135
FIGURE 4.5	Total enrolment in schools.....	136
FIGURE 4.6	Relationship between school size and mathematics achievement	137
FIGURE 4.7	Number of grade levels in schools.....	138
FIGURE 4.8	Relationship between the number of grade levels in schools and mathematics achievement	140
FIGURE 4.9	Grade 8/Secondary II enrolment in schools	140
FIGURE 4.10	Relationship between Grade 8/Secondary II enrolment and mathematics achievement	142
FIGURE 4.11	Percentage of second-language learners in schools	143
FIGURE 4.12	Percentage of students who identify as Indigenous in schools	145
FIGURE 4.13	Percentage of semestered and full-year mathematics classes	147
FIGURE 4.14	Minutes of mathematics instruction offered each week.....	149
FIGURE 4.15	Relationship between minutes of mathematics instruction each week and mathematics achievement	151
FIGURE 4.16	Percentage of schools offering daily mathematics instruction	152
FIGURE 4.17	Relationship between daily mathematics instruction and mathematics achievement	153
FIGURE 4.18	Enrichment and extracurricular activities offered by schools.....	154
FIGURE 4.19	Relationship between the enrichment and extracurricular activities index and mathematics achievement	155
FIGURE 4.20	Challenges to providing instruction, as reported by school principals	156
FIGURE 4.21	Percentage of schools by principals' responses to questionnaire items constituting the challenges to learning index.....	157
FIGURE 4.22	Relationship between the challenges to learning index and mathematics achievement	158
FIGURE 4.23	Percentage of students absent on a typical day for reasons other than school-sponsored activities	159

LIST OF TABLES

TABLE 1.1	Percentage of students by gender self-identification, by language of the school system.....	6
TABLE 1.2	Percentage of students by their first language	9
TABLE 1.3	Percentage of students by their first language and language of the school system	10
TABLE 1.4	Percentage of students by the language they use in their everyday life	12
TABLE 1.5	Percentage of students enrolled in second-language programs, by language of the school system	14
TABLE 1.6	Percentage of students by their parents' education as reported by students, and language of the school system	17
TABLE 1.7	Percentage of students by the number of books in their home and language of the school system	20
TABLE 1.8	Percentage of students by immigrant status and language of the school system	23
TABLE 1.9	Percentage of students by self-reported Indigenous identity.....	24
TABLE 1.10	Percentage of students by self-reported Indigenous identity and language of the school system	25
TABLE 2.1	Comparison of Canadian and provincial results, attitude toward mathematics index	34
TABLE 2.2	Comparison of Canadian and provincial results by language of the school system, attitude toward mathematics index	34
TABLE 2.3	Summary of provincial results by language of the school system, attitude toward mathematics index	35
TABLE 2.4	Comparison of Canadian and provincial results by gender, attitude toward mathematics index	35
TABLE 2.5	Summary of provincial results by gender, attitude toward mathematics index	36
TABLE 2.6	Comparison of Canadian and provincial results, confidence with mathematical processes index	39
TABLE 2.7	Comparison of Canadian and provincial results by language of the school system, confidence with mathematical processes index	39
TABLE 2.8	Summary of provincial results by language of the school system, confidence with mathematical processes index	39
TABLE 2.9	Comparison of Canadian and provincial results by gender, confidence with mathematical processes index	40
TABLE 2.10	Summary of provincial results by gender, confidence with mathematical processes index	40
TABLE 2.11	Comparison of Canadian and provincial results, confidence using technology in mathematics index	43
TABLE 2.12	Comparison of Canadian and provincial results by language of the school system, confidence using technology in mathematics index	43
TABLE 2.13	Summary of provincial results by language of the school system, confidence using technology in mathematics index	44
TABLE 2.14	Comparison of Canadian and provincial results by gender, confidence using technology in mathematics index	44

TABLE 2.15	Summary of provincial results by gender, confidence using technology in mathematics index	44
TABLE 2.16	Comparison of Canadian and provincial results, student effort index.....	48
TABLE 2.17	Comparison of Canadian and provincial results by language of the school system, student effort index	48
TABLE 2.18	Summary of provincial results by language of the school system, student effort index	49
TABLE 2.19	Comparison of Canadian and provincial results by gender, student effort index	49
TABLE 2.20	Summary of provincial results by gender, student effort index.....	49
TABLE 2.21	Principal component analysis of mathematics terms	56
TABLE 2.22	Comparison of Canadian and provincial results, knowledge of general terms in mathematics index	59
TABLE 2.23	Comparison of Canadian and provincial results by language of the school system, knowledge of general terms in mathematics index.....	59
TABLE 2.24	Summary of provincial results by language of the school system, knowledge of general terms in mathematics index	60
TABLE 2.25	Comparison of Canadian and provincial results by gender, knowledge of general terms in mathematics index	60
TABLE 2.26	Summary of provincial results by gender, knowledge of general terms in mathematics index	60
TABLE 2.27	Comparison of Canadian and provincial results, knowledge of geometry and measurement terms index.....	64
TABLE 2.28	Comparison of Canadian and provincial results by language of the school system, knowledge of geometry and measurement terms index	64
TABLE 2.29	Summary of provincial results by language of the school system, knowledge of geometry and measurement terms index	64
TABLE 2.30	Comparison of Canadian and provincial results by gender, knowledge of geometry and measurement terms index.....	65
TABLE 2.31	Summary of provincial results by gender, knowledge of geometry and measurement terms index.....	65
TABLE 2.32	Questionnaire items about activities in mathematics class.....	66
TABLE 2.33	Comparison of Canadian and provincial results, teacher-directed mathematics activities index	69
TABLE 2.34	Comparison of Canadian and provincial results by language of the school system, teacher-directed mathematics activities index.....	69
TABLE 2.35	Summary of provincial results by language of the school system, teacher-directed mathematics activities index	70
TABLE 2.36	Comparison of Canadian and provincial results by gender, teacher-directed mathematics activities index	70
TABLE 2.37	Summary of provincial results by gender, teacher-directed mathematics activities index	70
TABLE 3.1	Percentage of teachers by size of Grade 8/Secondary II mathematics classes.....	87
TABLE 3.2	Percentage of teachers by size of Grade 8/Secondary II mathematics classes and language of the school system	89
TABLE 3.3	Percentage of mathematics teachers by gender	99
TABLE 3.4	Percentage of teachers by their perceptions of the impact of professional development activities on student learning	112

TABLE 3.5	Percentage of teachers by level of agreement with statements about factors influencing student performance in mathematics.....	115
TABLE 3.6	Percentage of teachers by level of agreement with statements about attitudes related to teaching and learning mathematics.....	116
TABLE 4.1	Definitions of communities by population size.....	130
TABLE 4.2	Percentage of schools by size of communities in which they are located and language of school system.....	132
TABLE 4.3	Percentage of public and private schools, by language of the school system	135
TABLE 4.4	Percentage of schools by total enrolment and language of the school system.....	137
TABLE 4.5	Percentage of schools by number of grade levels and language of school system	139
TABLE 4.6	Percentage of schools by enrolment of Grade 8/Secondary II students and language of the school system	141
TABLE 4.7	Percentage of schools by proportion of second-language learners and language of the school system.....	144
TABLE 4.8	Percentage of schools by proportion of students who identify as Indigenous and language of the school system	146
TABLE 4.9	Percentage of semestered and full-year mathematics classes, by language of the school system	148
TABLE 4.10	Percentage of schools by minutes of mathematics instruction offered each week and language of the school system.....	150
TABLE 4.11	Percentage of schools offering daily mathematics instruction, by language of the school system	152
TABLE 4.12	Questionnaire items related to school-level challenges to learning.....	157
TABLE 4.13	Percentage of schools by proportion of students absent on a typical day for reasons other than school-sponsored activities and language of school system	159
TABLE A.1.1	Percentage of students by gender self-identification	180
TABLE A.1.2	Percentage of students by gender self-identification and language of school system.....	180
TABLE A.1.3	Achievement in mathematics by gender, Canada.....	181
TABLE A.1.4	Percentage of students by first language spoken	181
TABLE A.1.5	Percentage of students by first language spoken and language of school system	182
TABLE A.1.6	Mathematics achievement by students' first language and language of the school system, Canada.....	182
TABLE A.1.7	Percentage of students by language used in everyday life	183
TABLE A.1.8	Percentage of students by language used in everyday life and language of school system.....	184
TABLE A.1.9	Percentage of students enrolled in language-immersion programs.....	185
TABLE A.1.10	Percentage of students by enrolment in second-language programs and language of school system, Canada	185
TABLE A.1.11	Mathematics achievement by second-language learning status and language of school system, Canada.....	186
TABLE A.1.12	Percentage of students by their parents' education as reported by students.....	186
TABLE A.1.13	Percentage of students by their parents' education as reported by students, and language of school system.....	187
TABLE A.1.14	Mathematics achievement by parents' education as reported by students, Canada.....	188
TABLE A.1.15	Percentage of students by the number of books in their home	188

TABLE A.1.16	Percentage of students by the number of books in their home and language of school system	189
TABLE A.1.17	Mathematics achievement by the number of books in the home, Canada.....	189
TABLE A.1.18	Percentage of students by immigrant status	190
TABLE A.1.19	Percentage of students by immigrant status and language of school system	190
TABLE A.1.20	Mathematics achievement by immigrant status, Canada.....	191
TABLE A.1.21	Percentage of students by their Indigenous identity as reported by students.....	191
TABLE A.1.22	Percentage of students by their Indigenous identity as reported by students and language of school system.....	192
TABLE A.1.23	Mathematics achievement by Indigenous identity as reported by students, Canada	193
TABLE A.2.1.1	Distribution of students by questionnaire items constituting the attitude toward mathematics index, Canada.....	194
TABLE A.2.1.2	Attitude toward mathematics index scores	195
TABLE A.2.1.3	Attitude toward mathematics index scores by language of the school system	195
TABLE A.2.1.4	Attitude toward mathematics index scores by gender	196
TABLE A.2.1.5	Mathematics achievement by the attitude toward mathematics index, Canada	196
TABLE A.2.2.1	Distribution of students by questionnaire items constituting the confidence with mathematical processes index, Canada.....	197
TABLE A.2.2.2	Confidence with mathematical processes index scores	197
TABLE A.2.2.3	Confidence with mathematical processes index scores by language of the school system.....	198
TABLE A.2.2.4	Confidence with mathematical processes index scores by gender	198
TABLE A.2.2.5	Mathematics achievement by the confidence with mathematical processes index, Canada	199
TABLE A.2.3.1	Distribution of students by questionnaire items constituting the confidence using technology index, Canada.....	199
TABLE A.2.3.2	Confidence using technology index scores	200
TABLE A.2.3.3	Confidence using technology index scores by language of the school system	200
TABLE A.2.3.4	Confidence using technology index scores by gender	201
TABLE A.2.3.5	Mathematics achievement by the confidence using technology index, Canada	201
TABLE A.2.4.1	Distribution of students by questionnaire items constituting the student effort index, Canada	202
TABLE A.2.4.2	Student effort index scores.....	203
TABLE A.2.4.3	Student effort index scores by language of the school system.....	203
TABLE A.2.4.4	Student effort index scores by gender.....	204
TABLE A.2.4.5	Mathematics achievement by the student effort index, Canada.....	204
TABLE A.2.4.6	Distribution of students by hours per week spent on homework, Canada	205
TABLE A.2.4.7	Distribution and scores of students by frequency of homework completion, Canada	205
TABLE A.2.4.8	Distribution of students by the number of days absent or late for school, Canada	205
TABLE A.2.4.9	Distribution and scores of students by the number of days absent or late for school in the past two weeks, Canada	206
TABLE A.2.4.10	Distribution of students by hours per week spent on activities outside of school hours, Canada	206
TABLE A.2.5.1	Distribution of students by questionnaire items constituting the knowledge of general terms in mathematics index, Canada.....	207

TABLE A.2.5.2	Knowledge of general terms in mathematics index scores.....	208
TABLE A.2.5.3	Knowledge of general terms in mathematics index scores by language of the school system	208
TABLE A.2.5.4	Knowledge of general terms in mathematics index scores by gender.....	209
TABLE A.2.5.5	Mathematics achievement by the knowledge of general terms in mathematics index, Canada	209
TABLE A.2.6.1	Distribution of students by questionnaire items constituting the knowledge of geometry and measurement terms index, Canada	210
TABLE A.2.6.2	Knowledge of geometry and measurement terms index scores	210
TABLE A.2.6.3	Knowledge of geometry and measurement terms index scores by language of the school system	211
TABLE A.2.6.4	Knowledge of geometry and measurement terms index scores by gender	211
TABLE A.2.6.5	Mathematics achievement by the knowledge of geometry and measurement terms index, Canada	212
TABLE A.2.7.1	Distribution of students by questionnaire items constituting the teacher-directed mathematics activities index, Canada	213
TABLE A.2.7.2	Teacher-directed mathematics activities index scores	214
TABLE A.2.7.3	Teacher-directed mathematics activities index scores by language of the school system.....	214
TABLE A.2.7.4	Teacher-directed mathematics activities index scores by gender	215
TABLE A.2.7.5	Mathematics achievement by the teacher-directed mathematics activities index, Canada	215
TABLE A.2.8	Distribution of students who reported using what they learned in mathematics in other subjects, Canada	216
TABLE A.2.9	Distribution of students by type of mathematics homework assigned, Canada	216
TABLE A.2.10.1	Distribution of students by type of mathematics assessment method, Canada	217
TABLE A.2.10.2	Distribution of students by use of scoring rubrics in mathematics, Canada.....	217
TABLE A.2.10.3	Mathematics achievement of students by the frequency that teachers use rubrics, Canada	217
TABLE A.2.11.1	Distribution of students by teacher feedback and support in mathematics class, Canada	218
TABLE A.2.11.2	Mathematics achievement of students by teacher feedback and support in mathematics class, Canada.....	218
TABLE A.2.12	Distribution and scores of students by students' sense of belonging in school, Canada	219
TABLE A.2.13.1	Distribution of students by type of problems encountered in mathematics class or assignment, Canada.....	219
TABLE A.2.13.2	Mathematics achievement of students by type of problems encountered in mathematics class or assignment, Canada	220
TABLE A.3.1.1	Class size in Grade 8/Secondary II mathematics classes.....	220
TABLE A.3.1.2	Achievement in mathematics by class size, Canada	221
TABLE A.3.1.3	Class size in Grade 8/Secondary II mathematics classes by language of the school system.....	221
TABLE A.3.2.1	Percentage of teachers indicating that other adults were present in their mathematics class	222
TABLE A.3.2.2	Achievement in mathematics by presence of other adults in the mathematics classroom, Canada.....	222

TABLE A.3.3	Percentage of teachers and mathematics achievement by accommodations and modifications used in mathematics classrooms, Canada	223
TABLE A.3.4.1	Percentage of teachers by number of grade levels in their mathematics classrooms	224
TABLE A.3.4.2	Achievement in mathematics by number of grade levels, Canada.....	224
TABLE A.3.5.1	Percentage of teachers by number of days taught by a substitute teacher	224
TABLE A.3.5.2	Achievement in mathematics by number of days taught by a substitute teacher, Canada	225
TABLE A.3.6.1	Percentage of teachers by reasons for lost instructional time, Canada.....	225
TABLE A.3.6.2	Achievement in mathematics by reasons for lost instructional time, Canada.....	225
TABLE A.3.7.1	Percentage of teachers by gender self-identification	226
TABLE A.3.7.2	Achievement in mathematics by gender self-identification of teacher, Canada	226
TABLE A.3.8.1	Percentage of teachers and mathematics achievement by academic credentials, Canada	227
TABLE A.3.8.2	Percentage of teachers by courses taken during postsecondary studies, Canada.....	227
TABLE A.3.8.3	Percentage of teachers by areas of study during formal pre-service education or training, Canada.....	227
TABLE A.3.8.4	Percentage of teachers by years of teaching experience.....	228
TABLE A.3.8.5	Achievement in mathematics by teacher's years of teaching experience, Canada	228
TABLE A.3.8.6	Percentage of teachers by proportion of schedule assigned to mathematics.....	229
TABLE A.3.8.7	Achievement in mathematics by proportion of teacher's schedule assigned to mathematics, Canada	229
TABLE A.3.8.8	Percentage of teachers by self-assessed specialization in mathematics	230
TABLE A.3.8.9	Achievement in mathematics by teacher's self-assessed specialization in mathematics, Canada	230
TABLE A.3.9.1	Percentage of teachers by number of days of professional development activities related to the teaching of mathematics in the past five years	231
TABLE A.3.9.2	Percentage of teachers by types of professional development and their perceived impact on student learning, Canada.....	232
TABLE A.3.9.3	Percentage of teachers by types of collaboration with other mathematics teachers, Canada	233
TABLE A.3.10	Percentage of teachers by confidence in their ability to do mathematics and to help students understand mathematics, Canada	233
TABLE A.3.11.1	Percentage of teachers by level of agreement with statements about factors influencing student performance in mathematics, Canada.....	234
TABLE A.3.11.2	Percentage of teachers by level of agreement with statements about attitudes related to teaching and learning mathematics, Canada	234
TABLE A.3.12.1	Percentage of teachers by resources used in mathematics instruction, Canada.....	235
TABLE A.3.12.2	Percentage of teachers by use of variety of opportunities for students to show understanding in mathematics, Canada	235
TABLE A.3.12.3	Percentage of teachers by amount of time in mathematics class spent on mathematics subdomains, Canada	236
TABLE A.3.12.4	Percentage of teachers by understanding of vertical articulation, Canada	236
TABLE A.3.13.1	Percentage of teachers by time they expect students to spend on mathematics homework each week.....	237
TABLE A.3.13.2	Achievement in mathematics by time teachers expect students to spend on mathematics homework each week, Canada	237

TABLE A.3.13.3	Percentage of teachers by types of homework assigned, Canada.....	238
TABLE A.3.13.4	Percentage of teachers by frequency of monitoring student homework, Canada	238
TABLE A.3.14.1	Percentage of teachers by types of questions used on mathematics assessment, Canada	239
TABLE A.3.14.2	Achievement in mathematics by frequency of teachers' use of extended-response items requiring multi-step solutions, Canada	239
TABLE A.3.14.3	Percentage of teachers by mathematics assessment used to measure different levels of thinking, Canada	239
TABLE A.3.15.1	Percentage of teachers by challenges to mathematics teaching, Canada	240
TABLE A.3.15.2	Relationship between the challenges to teaching index and mathematics achievement, Canada	241
TABLE A.4.1.1	Percentage of schools by size of communities in which they are located	241
TABLE A.4.1.2	Percentage of schools by size of communities in which they are located and language of school system	242
TABLE A.4.1.3	Achievement in mathematics by size of communities in which schools are located, Canada	243
TABLE A.4.2.1	Percentage of public and private schools	243
TABLE A.4.2.2	Percentage of public and private schools and language of school system	244
TABLE A.4.2.3	Achievement in mathematics by school governance, Canada.....	244
TABLE A.4.3.1	Percentage of schools by total enrolment	244
TABLE A.4.3.2	Percentage of schools by total enrolment, by language of the school system	245
TABLE A.4.3.3	Achievement in mathematics by total enrolment, Canada	246
TABLE A.4.4.1	Percentage of schools by number of grade levels	246
TABLE A.4.4.2	Percentage of schools by number of grade levels and language of school system	247
TABLE A.4.4.3	Achievement in mathematics by number of grade levels, Canada.....	248
TABLE A.4.5.1	Percentage of schools by total enrolment of Grade 8/Secondary II students	248
TABLE A.4.5.2	Percentage of schools by enrolment of Grade 8/Secondary II students and language of the school system	249
TABLE A.4.5.3	Achievement in mathematics by total enrolment of Grade 8/Secondary II students, Canada	250
TABLE A.4.6.1	Percentage of schools by proportion of second-language learners in schools	250
TABLE A.4.6.2	Percentage of schools by proportion of second-language learners and language of the school system	251
TABLE A.4.7.1	Percentage of schools by proportion of students who identify as Indigenous in schools	252
TABLE A.4.7.2	Percentage of schools by proportion of students who identify as Indigenous and language of the school system	253
TABLE A.4.8.1	Percentage of schools by semester and full-year classes	254
TABLE A.4.8.2	Percentage of schools by semester and full-year classes and language of school system.....	254
TABLE A.4.9.1	Percentage of schools by minutes of mathematics instruction per week	255
TABLE A.4.9.2	Percentage of schools by minutes of mathematics instruction offered each week and language of the school system.....	256
TABLE A.4.9.3	Achievement in mathematics by minutes of mathematics instruction per week, Canada	257
TABLE A.4.10.1	Percentage of schools by daily mathematics instruction.....	257
TABLE A.4.10.2	Percentage of schools by daily mathematics instruction and language of school system.....	258

TABLE A.4.10.3	Achievement in mathematics by daily mathematics instruction, Canada	258
TABLE A.4.11.1	Percentage of schools by enrichment and extracurricular activities, Canada	259
TABLE A.4.11.2	Relationship between the enrichment and extracurricular activities index and mathematics achievement, Canada	259
TABLE A.4.12	Percentage of schools by challenges to providing instruction due to shortage or inadequacy of resources, Canada	260
TABLE A.4.13.1	Percentage of schools by challenges to learning index, Canada.....	260
TABLE A.4.13.2	Relationship between the challenges to learning index and mathematics achievement, Canada	261
TABLE A.4.14.1	Percentage of schools by proportion of students absent on a typical day for reasons other than school-sponsored activities	261
TABLE A.4.14.2	Percentage of schools by proportion of students absent on a typical day for reasons other than school-sponsored activities and language of school system	262

INTRODUCTION: WHAT IS THE PAN-CANADIAN ASSESSMENT PROGRAM?

The Pan-Canadian Assessment Program (PCAP) is a collaborative project that provides data on student achievement in Canadian provinces and territories.¹ It is part of the ongoing commitment of the Council of Ministers of Education, Canada (CMEC) to inform Canadians about how well their education systems are meeting the needs of students and society. Every three years, close to 30,000 Grade 8/Secondary II² students from across Canada are assessed with respect to their achievement of the curricular expectations common to all provinces and territories in three core learning domains: reading, mathematics, and science. The information gained from this pan-Canadian assessment provides ministers of education and other stakeholders with a basis for examining their provincial curriculum and other aspects of their school systems.

School programs and curricula vary from province to province and from territory to territory across the country, so comparing results in these domains is a complex task. However, young Canadians in different provinces and territories learn many similar skills in reading, mathematics, and science. PCAP has been designed to determine whether students across Canada reach similar levels of performance in these core disciplines at about the same age, and to complement existing provincial/territorial assessments with comparative Canada-wide data on the achievement levels attained by Grade 8/Secondary II students. *PCAP 2019: Assessment Framework* (CMEC, 2020) provides the theoretical underpinnings, design principles, and performance descriptors that were used to develop test items in each of the three domains for the second cycle of PCAP (2016–23).³

Initial results from the PCAP 2019 assessment were released in *PCAP 2019: Report on the Pan-Canadian Assessment of Mathematics, Reading, and Science* (O’Grady, Houme, et al., 2021). In that report, results in mathematics, reading, and science were presented for Canada overall and for individual provinces. Results were further broken down by language of the school system and by gender.

The present report is the second of two reports providing results from PCAP 2019. While the first focused on the achievement results in the three domains assessed by PCAP, this report complements it by looking at contextual variables associated with mathematics achievement.

PCAP contextual questionnaires

Students participating in PCAP, and their teachers and school principals, complete questionnaires that are designed to provide all provinces and territories with contextual information to aid in the interpretation of the performance results. Researchers, policy-makers, and practitioners can use the information provided by these questionnaires to help them determine what factors influence learning outcomes. The content of the contextual questionnaires changes depending on which of the three domains is the primary focus of the PCAP assessment.

¹ All ten provinces have participated in each PCAP administration. The three territories did not participate in PCAP 2019.

² PCAP is administered to students in Secondary II in Quebec and Grade 8 in the rest of Canada.

³ During the first cycle of PCAP (2007–13), individual domains were the primary focus in a different year: reading in 2007, mathematics in 2010, and science in 2013. The pattern is being repeated during the second cycle (2016–23). Due to the global pandemic, the next administration of PCAP will be delayed from 2022 to 2023.

Because the primary domain of the 2019 PCAP assessment was mathematics, some contextual questions in the student questionnaire addressed factors that have been found in past studies to correlate with mathematics achievement. Some examples of these correlates include parental level of education, language spoken in the home, and the number of books in the home.

Contextual questionnaires completed by teachers cover questions about teaching and learning conditions, including teachers' homework expectations, assessment practices, areas of specialization, and years of teaching experience. The school questionnaire, completed by the principal, is the key source of information about each school, including the structure and organization of the school; school climate; school policies and practises; and curriculum and instruction.

The PCAP questionnaires are available on the CMEC website, at https://cmec.ca/697/PCAP_2019.html. Access to the PCAP data set is available upon request.

Applications of PCAP data

PCAP is designed as a system-level assessment to be used primarily by provincial ministries of education to monitor and assess their respective educational systems. PCAP results are reported only at the pan-Canadian and provincial levels, by language of the school system, and by gender. They are not included in students' academic records, and no results for individual students, schools, or school boards/districts are reported by CMEC.

The goal of national (and international) large-scale assessments is to provide reliable information about academic achievement and insight into contextual factors associated with it. The data from studies such as PCAP provide policy-makers, administrators, teachers, and researchers with meaningful insights into the functioning of education systems and how they might be improved.

Objectives and organization of the report

This report presents the contextual results of the 2019 Pan-Canadian Assessment Program. It describes student, teacher, and school factors related to mathematics learning and teaching in Canada. Although the questionnaires cover many relevant areas, only a select number of results are presented here for illustrative purposes.

Results are reported at both pan-Canadian and provincial levels, with comparisons across participating provinces, and, where relevant, with other large-scale assessment surveys. Prince Edward Island and Newfoundland and Labrador did not oversample separately by language in order to examine difference between the performance of students in their English- and French-language school systems; consequently, results for only English-language schools are provided for these two provinces throughout this report; results for French-language schools are included only in the calculations for the overall Canadian and provincial totals and means.

The report includes four content chapters and a conclusion.

Chapter 1 presents data on five student demographic and socioeconomic characteristics: gender, language, socioeconomic status, immigrant status, and Indigenous identity.⁴

⁴ Only students attending schools under provincial jurisdiction participated in this study. Federally funded, on-reserve schools did not participate in PCAP.

Chapter 2 presents information on student indices that are correlated with mathematics performance.

Chapter 3 focuses on the learning context in Canadian classrooms, as well as the practices of Grade 8/Secondary II teachers. It examines teachers' instructional strategies, tools, and activities and the relationship of those variables with achievement in mathematics. Assessment practices and their relationship to achievement in mathematics are also presented.

Chapter 4 explores issues surrounding time management in schools, including scheduled learning time, homework, out-of-class activities, and time lost to absenteeism. The chapter also provides an overview of Canadian schools that includes demographic information, factors influencing learning, and challenges to teaching and learning.

Major findings are summarized in the Conclusion. Finally, The appendix comprises tables with detailed data underpinning the findings discussed in this report.

A vast array of literature has illustrated that learning outcomes are affected by a student's individual and family demographic and socioeconomic characteristics. Academic achievement has been found to correlate, over time, with desirable social and personal outcomes, including better health, improved economic outcomes, political engagement, and overall well-being (Anderson & Winthrop, 2016; OECD, 2012; Onuzo et al., 2013). Family characteristics have been found to be a reliable predictor of a child's success at school, as well as their future career aspirations (Galliot et al., 2015; Hill et al., 2004).

This chapter presents the results of analyses of performance in the Pan-Canadian Assessment Program (PCAP) based on some background characteristics of participating Grade 8/Secondary II students. Five demographic and socioeconomic characteristics of students in Canada are examined for correlations with achievement in mathematics. These are gender, language, socioeconomic status, immigrant status, and Indigenous self-identity. Although these variables are reported separately in this report, many of them interact in producing observed patterns of academic achievement. For this reason, it is difficult to isolate the effects of any one variable on PCAP scores. Note that achievement results may differ slightly from those reported in the previous PCAP 2019 report (O'Grady, Houme, et al., 2021) because data for only those students who completed both the cognitive and questionnaire items are included in the present report.

Gender

Gender disparities in educational attainment are of considerable concern because they can have future consequences for personal and professional choices of young men and women. The gender gap in science, technology, engineering, and mathematics (STEM) fields has been well documented (see Kahn & Ginther, 2017, for a review of this literature). Such gender disparity is seen as detrimental because STEM careers are among the highest paying and fastest growing occupations. Although participation in STEM-related courses has been found to be similar among sexual majority and minority students in high school (Gottfried et al., 2015), little is known about the experiences of sexual minorities in STEM careers.

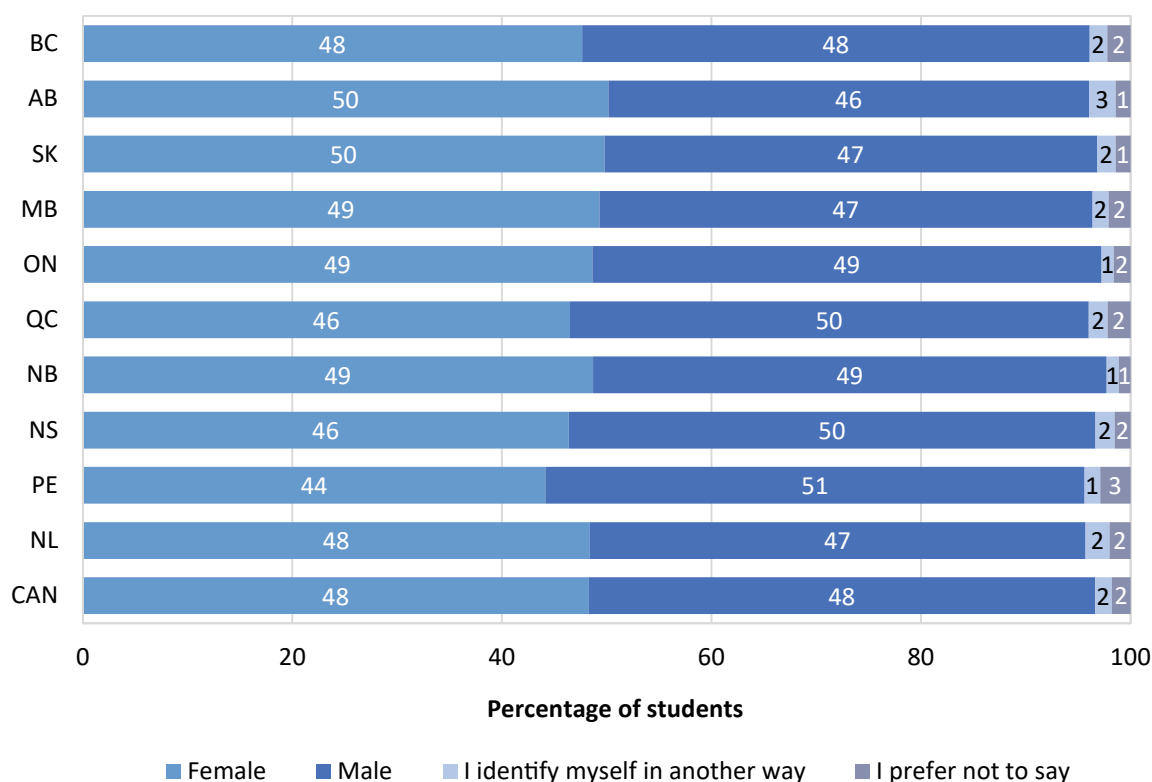
Gender in PCAP 2019

Inclusive education is valued in Canadian provinces and territories and has led to the development of policies and resources to support inclusion. One aspect of inclusive education relates to gender identity. In the PCAP 2019 student, teacher, and school questionnaires, the question about gender was expanded from the female/male choices of previous assessments to allow two additional choices, as shown in the box below.

How do you identify yourself?	
☐	Male
☐	Female
☐	I identify myself in another way.
☐	I prefer not to say.

In Canada overall, 96.6 per cent of students identified themselves as female or male, with 48.3 percent identifying with each gender (Figure 1.1). A small proportion of students chose to identify themselves in another way (1.6 percent) or preferred not to say (1.8 percent). Similar proportions are observed in the provinces, with those who chose to identify themselves in another way ranging from 1.2 percent in Ontario to 2.5 percent in Alberta. The proportion of those who preferred not to say ranged from 1.1 percent in New Brunswick to 2.9 percent in Prince Edward Island; however, fewer than 30 students choose this option in 4 of the 10 provinces (Appendix A.1.1). Some variations are observed between anglophone and francophone school systems, as shown in Table 1.1 (Appendix A.1.2). Particularly for populations⁵ with small sample sizes, such variations may be partly a result of the whole-class sampling process used in PCAP.

FIGURE 1.1 Percentage of students by gender self-identification



Note: Percentages may not add up to 100 due to rounding

⁵ “Population” refers to the respective official-language groups within each province.

TABLE 1.1 Percentage of students by gender self-identification, by language of the school system

	Anglophone school systems				Francophone school systems			
	Female	Male	I identify myself in another way	I prefer not to say	Female	Male	I identify myself in another way	I prefer not to say
BC	47.6	48.5	1.7	2.2	51.7	43.4	2.8‡	2.1‡
AB	50.2	45.9	2.5	1.4	47.3	45.9	4.8‡	2.0‡
SK	49.9	46.9	1.8	1.4	40.7	59.3	0.0	0.0
MB	49.4	47.0	1.6	2.1	45.3	51.1	0.7‡	2.8‡
ON	48.9	48.3	1.2	1.6	43.4	53.6	0.7‡	2.3
QC	48.1	47.8	2.5‡	1.6‡	46.3	49.7	1.7	2.2
NB	49.2	48.1	1.4‡	1.4‡	47.4	51.5	0.5‡	0.6‡
NS	46.4	50.1	1.9	1.6‡	45.2	54.1	0.7‡	0.0
PE	44.0	51.5	1.5‡	3.0‡	--	--	--	--
NL	48.4	47.3	2.3‡	2.0‡	--	--	--	--
CAN	48.9	47.8	1.6	1.7	46.1	50.1	1.6	2.2

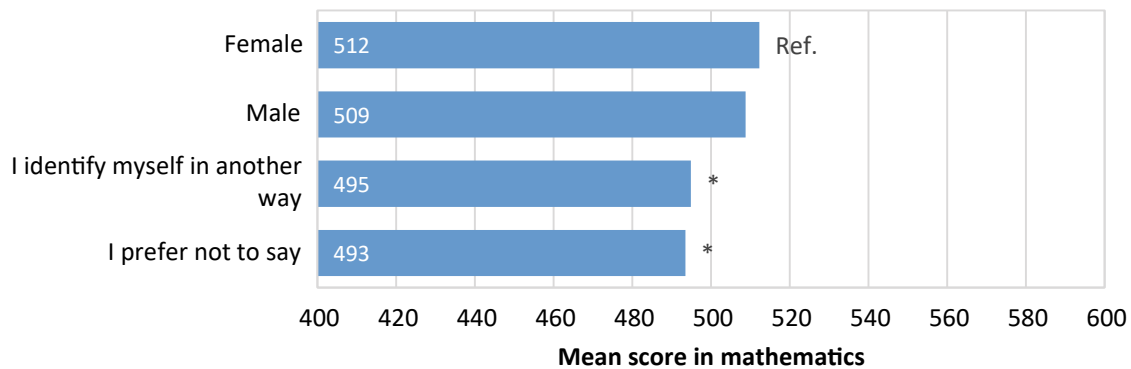
‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Gender and mathematics achievement

As shown in Figure 1.2, there was no difference between girls and boys in mathematics achievement at the pan-Canadian level, whereas students who identified themselves in another way or preferred not to say scored lower than those who identified themselves as female or male (Appendix A.1.3). The lack of difference between girls and boys in mathematics achievement is consistent with the results for Grade 8/Secondary II students in PCAP 2010 (CMEC, 2011), when mathematics was first the major domain. However, this result differs from the most recent international large-scale assessments in which Canada participated: boys outperformed girls in mathematics at the Grade 4 level in the 2019 administration of the Trends in International Mathematics and Science Study (TIMSS) (O’Grady, Rostamian, et al., 2021) and at age 15 in the 2018 administration of the Programme for International Student Assessment (PISA) (O’Grady, Deussing, et al., 2019).

FIGURE 1.2 Achievement in mathematics by gender



* Significant difference compared to the *female* category

According to Cvencek, Meltzoff, and Greenwald (2011), a widespread cultural stereotype exists with respect to gender and mathematics, and their findings suggest that this stereotype gains acceptance early — as early as Grade 2 — and influences students’ self-concept in relation to mathematics even before ages at which achievement gaps in mathematics emerge. Perceiving an academic field to be at odds with one’s identity or self-concept has been shown to deter people from pursuing study in that field (Cheryan et al., 2009).

“Numeracy” is generally defined as the ability to understand and work with numbers; however, the definition of numeracy varies widely in academic literature and curriculum documents. Borgonovi, Choi, and Paccagnella (2018) have explored the evolution of gender gaps related to numeracy from childhood to adulthood in 23 countries, including Canada. Using data from TIMSS, PISA, and the Programme for International Assessment of Adult Competencies (PIAAC), an international household survey of adults aged 16 to 65, they have suggested that the gender gap favouring males in numeracy is smallest at age 10 and largest at age 27. Results from PIAAC reveal that females report using their numeracy skills less frequently, both at home and at work, compared to males (Arora & Pawlowski, 2017), and that gender differences in the use of numeracy skills at work are found even within the same occupational groups (Lindemann, 2015).

Language

Canada is a multilingual and multicultural country with various immigrant and Indigenous populations. In the 2016 Census, over 200 languages were reported as a mother tongue (Statistics Canada, 2017c). “Mother tongue,” as used in Statistics Canada data reports, may be considered synonymous with “first language spoken.” Canada’s language groups may be classified into three distinct categories: official languages, non-official or heritage languages, and Indigenous languages (Duff & Becker-Zayas, 2017).

Learning in Canada's official languages

The two official languages of instruction in Canada are English and French, but the majority of students in Canada receive their first-language instruction in English. Canada's federal government and provincial and territorial governments, both in principle and practice, support opportunities for all Canadians to learn one or both of Canada's official languages (Government of Canada, 2017; Statistics Canada, 2016a). To ensure that all students have the opportunity to learn both of Canada's official languages, all school systems offer English or French as second language courses, and French immersion programs are offered in public education systems throughout Canada.⁶ Some provinces also offer bilingual programs that combine instruction in an official language and a heritage language or an Indigenous language. As well, many schools offer second-language courses in languages other than French or English (Government of Canada, 2017).

PCAP samples are representative of both majority and minority official language groups⁷ in the eight provinces that have sufficient numbers for valid statistical comparisons. Within anglophone school systems, although students in French immersion classes could opt, at the discretion of the school, to complete PCAP in either English or French, their results are reported with the English-language cohort.

Classifying language use in PCAP contextual data

First language: "First language" or "mother tongue" refers to the first language that the child learned in their family. In some families, children may have more than one language as their first language. In the PCAP 2019 student questionnaire, "first language" was explained as "the language you first learned and still understand."

Language used in everyday life: As students learn in school, expand their peer networks, and otherwise interact outside of their families, they may continue to use their first language, or they may come to adopt another language for most of their everyday communication. Some students maintain active fluency in more than one language. In the PCAP 2019 student questionnaire, students were asked about the languages they used outside of school (e.g., with family or friends, or in the community).

Language of instruction: Most Canadian students learn in one of Canada's two official languages. Some students learn in bilingual programs that combine instruction in a heritage language or an Indigenous language with one of Canada's official languages. In the student questionnaire, students were asked about enrolment in language-immersion programs, as well as second-language programs.

Students' first languages

Official languages and bilingualism are an important aspect of the Canadian identity. According to the 2016 Census, the proportion of population by mother tongue was 57 percent English, 21 percent French, and 22 percent other languages, of which over 215 were identified. When Canadians were asked about the first official language they spoke, the proportions were 75 percent English, 23 percent French, and 2 percent neither English nor French (Statistics Canada, 2019).

⁶ For a more detailed description of language policies in Canada, see the country chapter for Canada in the *PIRLS 2016 Encyclopedia* (Mullis, Martin, Goh, & Prendergast, 2017).

⁷ With respect to the two official languages in Canada, English is the majority language outside of Quebec — across the country, 64 percent of Canadians report speaking English most often at home. In Quebec, French is the majority language — 79 percent of people in Quebec report speaking French most often (Statistics Canada, 2020a).

PCAP results by province, and by the language of the school system, reflect the unique linguistic profiles of Canada's provinces. The majority of students who participated in PCAP 2019 spoke one of Canada's official languages as their first language. Canada is officially bilingual, and the highest rates of bilingualism are found in Quebec (45 percent) and New Brunswick (34 percent) (Statistics Canada, 2019).

Immigration also affects the first language of students: Canadian census data from 2016 show that 72.5 percent of immigrants have a first language other than French or English (Statistics Canada, 2017c). Provinces are differently impacted by immigration, with immigrants heavily concentrated in Canada's urban centres in British Columbia, Alberta, Ontario, and Quebec (Statistics Canada, 2015).

Students participating in PCAP 2019 were asked which language they considered to be their first language (the language first learned and still understood). Table 1.2 shows that, Canada-wide, 66 percent of participating students identified English as their first language and 18 percent identified French as their first language. In Canada overall, 17 percent of students reported that their first language was a language other than English or French; within the provinces, the proportions ranged from 4 percent in Newfoundland and Labrador and Prince Edward Island to 22 percent in British Columbia. At the pan-Canadian level, less than 1 percent of students stated that an Indigenous language was their first language. The highest proportions of students who reported an Indigenous language as their first language were in Manitoba and Quebec (1.4 percent) (Appendix A.1.4).

TABLE 1.2 Percentage of students by their first language

	English	French	Indigenous language	Other language
BC	76.8	1.0	0.7 ‡	21.5
AB	78.9	1.7	0.8 ‡	18.6
SK	84.6	0.6	1.3 ‡	13.5
MB	78.5	2.1	1.4	18.0
ON	77.6	2.4	0.4‡	19.6
QC	13.2	77.6	1.4	7.8
NB	70.0	24.9	0.4‡	4.6
NS	92.3	2.7	0.3‡	4.7
PE	93.8	2.1‡	0.4‡	3.6‡
NL	95.4	0.7‡	0.8‡	3.1
CAN	65.6	17.5	0.7	16.2

‡ There are fewer than 30 observations.

Note: Percentages may not add up to 100 due to rounding.

Table 1.3 presents the first language reported by students by language of the school system. At the pan-Canadian level, close to 80 percent of students reported that their first language is the same as the language of the school system — English in anglophone systems, and French in francophone systems. The proportion of students whose first language is other than English, French, or an Indigenous language is higher in the anglophone system (18 percent) compared to the francophone system (8 percent). At the provincial level, the majority of students in anglophone school systems speak English as their first language, while approximately 1 in 5 students in British Columbia, Alberta, Manitoba, and Ontario reported that another language was their first language. It should also be noted

that, in about half of the provinces, the majority of students in the francophone school system speak English as their first language. The proportion of French-first-language students in francophone school systems ranges from over 80 percent in Quebec and New Brunswick to approximately 30 percent in British Columbia, Alberta, and Nova Scotia. The proportion of English-first-language students in francophone school systems is above 40 percent in all provinces except Quebec and New Brunswick, where the proportions are less than 20 percent (Appendix A.1.5). Only a small number of students in both school systems reported that their first language was an Indigenous language; similarly, only a small minority of students in francophone school systems reported having a language other than English, French, or an Indigenous language as their mother tongue.

TABLE 1.3 Percentage of students by their first language and language of the school system⁸

	Anglophone school systems				Francophone school systems			
	English	French	Indigenous language	Other language	English	French	Indigenous language	Other language
BC	76.9	0.8 ‡	0.7 ‡	21.6	59.6	29.3	0.0	11.1 ‡
AB	79.4	1.3 ‡	0.8 ‡	18.6	45.6	33.4	0.0	21.0
SK	84.9	U ‡	1.3 ‡	13.5	54.9	35.4	1.4 ‡	8.3 ‡
MB	79.5	0.8 ‡	1.4	18.3	40.8	53.2	0.4 ‡	5.7 ‡
ON	79.0	0.6 ‡	0.4 ‡	20.0	49.9	37.6	0.3 ‡	12.2
QC	70.8	17.8	1.4 ‡	10.0	6.6	84.5	1.4	7.6
NB	92.3	1.6 ‡	0.6 ‡	5.5	15.0	82.6	0.1 ‡	2.3 ‡
NS	93.5	1.4 ‡	0.3 ‡	4.8	66.3	31.0	U ‡	2.3 ‡
PE	95.3	0.6 ‡	0.4 ‡	3.7 ‡	--	--	--	--
NL	95.5	0.6 ‡	0.8 ‡	3.1	--	--	--	--
CAN	79.8	1.2	0.6	18.3	12.2	78.7	1.2	8.0

‡ There are fewer than 30 observations.

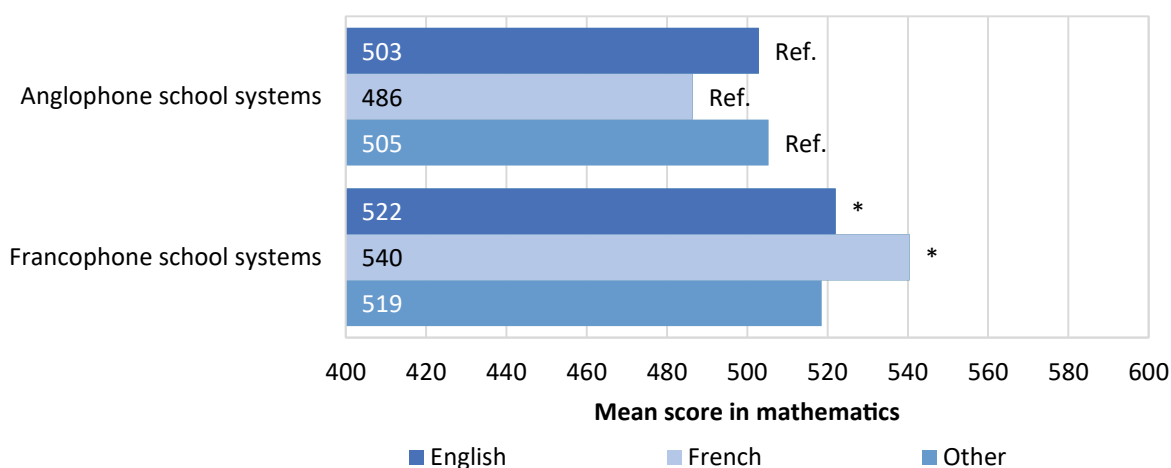
U Too unreliable to be published

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Figure 1.3 shows differences in achievement scores in mathematics between anglophone and francophone schools. Both English- and French-first-language students in francophone schools achieved higher scores in mathematics than their peers in anglophone schools; however, scores were similar for students who reported languages other than French or English in both language systems (Appendix A.1.6). The results for students reporting an Indigenous language as their first language are not reported here because the number of students was too small to allow reliable reporting.

⁸ Data quality indicators presented in this report are adapted from data accuracy standards set forth by Statistics Canada (Statistics Canada, 2009); estimates based on fewer than 30 observations are flagged with the symbol ‡, and estimates with a coefficient of variation greater than 33.3 percent are considered to be too unreliable to be published and are therefore suppressed and represented by a “U.”

FIGURE 1.3 Relationship between students' first language and mathematics achievement, by language of the school system



* Significant difference compared to same language in anglophone school systems

Students' language use in everyday life

Linguistic diversity is on the rise in Canada. More than 7.5 million Canadians reported speaking a language other than English and French at home, an increase of 14.5 percent between 2011 and 2016 (Statistics Canada, 2017e). Students may master several languages, and the language of the school may not be the same as the one(s) they use outside the school (e.g., with family or friends, or in the community). Students who speak a language other than French or English as their first language are exposed to one or both of Canada's official languages when they enter the school system, and they tend to adopt an official language in their daily interactions (Duff & Becker-Zayas, 2017). When the language(s) of fluency are different from the language of instruction, school achievement may be impacted (Bruckauf, 2016; OECD, 2010, 2016b). Immigrant status, considered later in this chapter, influences the likelihood that a student will speak a different language at home than that in which they are taught.

As shown in Table 1.4, at the pan-Canadian level, over half of students speak predominantly English, more than 1 in 10 students speak predominantly French, and 7 percent of students report speaking English and French equally in their everyday lives. The highest proportion of students who reported using other languages indicated that they also spoke English outside of school (16 percent) (Appendix A.1.7). As expected, the majority of students who reported French as their everyday language reside in Quebec (60 percent) and New Brunswick (13 percent); students in these provinces also reported the highest level of bilingualism in the two official languages in Canada (18 percent). More than 20 percent of Ontario students reported speaking English and another unofficial language, and more than 10 percent of British Columbia students speak predominantly other languages outside of school. The proportion of students that speak mostly an Indigenous language in their everyday lives is 1 percent or less; however, in every province, fewer than 30 students selected this choice. Further breakdown by language of the school system can be found in Appendix A.1.8.

TABLE 1.4 Percentage of students by the language they use in their everyday life

	English only or mostly English	French only or mostly French	English and French equally	English and a language other than French	French and a language other than English	Mostly an Indigenous language	Mostly other languages
BC	65.3	0.6	2.1	19.7	0.3 ‡	0.5 ‡	11.6
AB	69.1	0.5 ‡	2.4	17.9	U ‡	0.3 ‡	9.4
SK	77.1	0.8 ‡	2.4	13.2	0.5 ‡	1.2 ‡	4.8
MB	68.5	0.9	4.6	15.0	0.2 ‡	1.2 ‡	9.4
ON	61.5	1.3	4.1	23.0	0.6	0.5 ‡	9.0
QC	7.5	60.1	18.0	3.7	6.5	0.6 ‡	3.5
NB	62.1	12.9	18.0	4.0	0.4 ‡	0.4 ‡	2.3
NS	83.4	1.7	6.4	4.7	0.5 ‡	0.3 ‡	2.9
PE	85.9	1.2 ‡	6.3	3.9 ‡	0.3 ‡	0.4 ‡	2.1 ‡
NL	90.2	0.2 ‡	2.5 ‡	4.2	0.1 ‡	0.5 ‡	2.4 ‡
CAN	54.0	13.0	6.7	16.3	1.7	0.5	7.8

‡ There are fewer than 30 observations.

U Too unreliable to be published

Second-language study

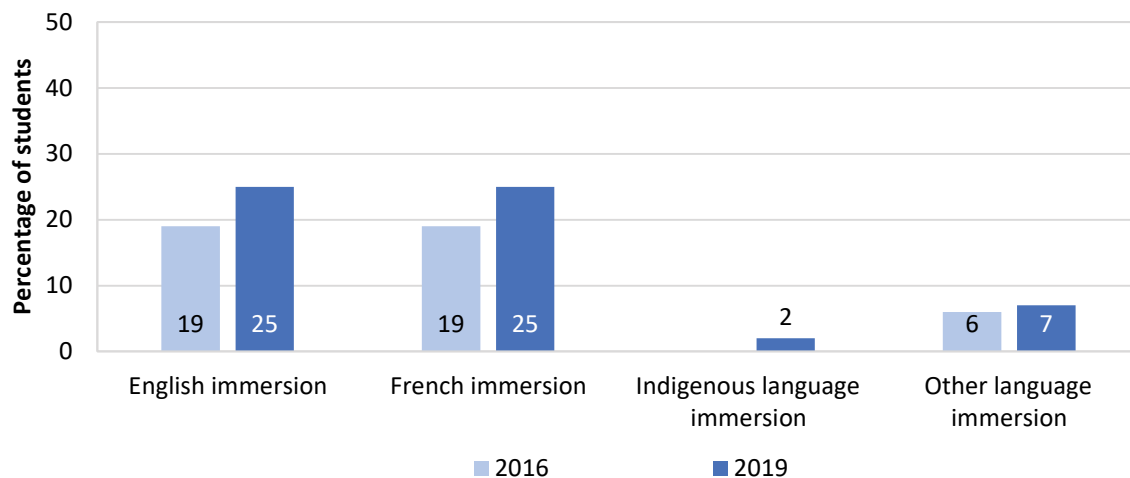
A substantial minority of Canadian students are enrolled in immersion programs to learn a second language. Between 2016 and 2019, the proportion of students in second-language programs in Canadian public schools increased by approximately 3 percent, while those in French immersion programs increased by nearly 6 percent (Statistics Canada, 2021a). Enrolment in French immersion programs outside of Quebec has been growing in popularity, increasing by almost 45 percent since 2003 (Government of Canada, 2017).

Research has indicated that second-language learners face particular difficulties in problem solving in mathematics. Although some of these difficulties can be attributed to language transfer and reading skills (Farnia & Geva, 2011; Han, 2012), a cohort study on the components of working memory that underlie the acquisition of mathematical calculation skills in elementary students in the United States did not find an achievement gap in mathematics between English-language learners (ELL) and monolingual children over the three years of the study (Swanson et al., 2019). The authors concluded that working memory tasks, which are highly associated with the control and focus of attention, play an important role in the development of computation abilities in both ELL and monolingual children.

In the PCAP 2019 student questionnaire, an immersion program was described as a program in which the majority of a student's courses are taught in a second language. As shown in Figure 1.4, at the pan-Canadian level, one-quarter of students reported that they have been enrolled in an English or French immersion program to learn a second language (Appendix A.1.9). For descriptive purposes, data from PCAP 2016 are also shown in the figure. These indicate that student-reported enrolment in second-language programs has increased between PCAP 2016 and 2019 for both official languages; by contrast, the proportion of students who reported enrolment in immersion programs for other languages remained about the same. For PCAP 2019, 2 percent of students reported that they had

been enrolled in immersion programs for an Indigenous language. This question about Indigenous-language immersion was asked for the first time in 2019 and may provide interesting data in future administrations of PCAP. The results related to enrolment in all language-immersion programs should be treated with caution. In the student questionnaire, students were asked about enrolment in language-immersion programs and enrolment in second-language programs. Students enrolled in programs to learn a second language may have misinterpreted the definition of an immersion program, leading to higher-than-expected proportions of students reporting enrolment in language-immersion programs.

FIGURE 1.4 Percentage of students enrolled in language-immersion programs, 2016 and 2019



Note: Information on Indigenous languages immersion programs was not collected in 2016.

As noted above, the student questionnaire also asked about second-language programs — programs that usually focus on speaking, listening, reading, and writing in the second language. As shown in Table 1.5, about 1 in 4 students in both language systems reported being enrolled in such programs at the time of the assessment (Appendix A.1.10). Compared to the previous administration of PCAP in 2016, the percentage of students currently enrolled in French-as-a-second-language programs in anglophone schools has increased from 23 to 25 percent, while the percentage of students currently enrolled in English-as-a-second-language programs in francophone schools has increased from 13 to 23 percent. The percentage of students who reported that they were previously enrolled in such programs has remained stable in anglophone systems while increasing in francophone systems (O’Grady, Fung, Brochu, et al., 2019, Table 1.7). Although students were also asked about second-language programs in Indigenous and other languages, the response rate was too low for the results to be valid.

TABLE 1.5 Percentage of students enrolled in second-language programs, by language of the school system

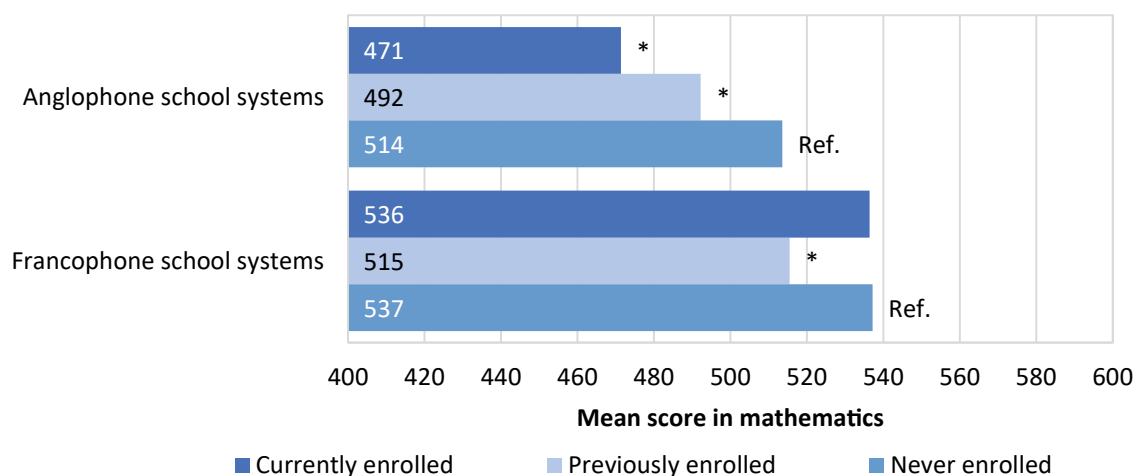
	Anglophone school systems		Francophone school systems	
	Currently enrolled	Previously enrolled	Currently enrolled	Previously enrolled
English-second-language program*	18	11	23	18
French-second-language program**	25	12	13	6

* These include English-language-learner (ELL), English-as-an-additional-language (EAL), and English-as-a-second-language (ESL) programs.

** These include extended and intensive French.

Figure 1.5 shows that, in Canada overall, students in francophone school systems who were currently enrolled or had never been enrolled in a second-language program achieved statistically similar mathematics scores; however, the scores of students who previously had been enrolled in such programs were lower than these other two groups. In anglophone school systems, students who were enrolled in a second-language program, either currently or in the past, achieved significantly lower mean scores in mathematics compared to students who had never been enrolled in such a program (Appendix A.1.11).

FIGURE 1.5 Mathematics achievement by second-language learning status and language of the school system



* Significant difference compared to the *never enrolled* category within each school system

Student socioeconomic status

Socioeconomic status (SES), broadly understood and measured as a combination of parental educational attainment and family income, is one of the strongest predictors of academic achievement (Bruckauf, 2016; OECD, 2012; Perry & McConney, 2010). SES, which comprises both cultural and economic factors, is difficult to measure and understand because it is a complex cluster of variables that include parents' occupations and educational attainment, learning resources in the home, and how parents communicate the value of education to their children, among other variables (Crowe, 2013; Chevalier et al., 2013). It is also difficult to isolate the effects of SES from those of other factors like geography, genetic endowment, school characteristics, and immigrant status (Causa et al., 2009; OECD, 2016b).

A consequence of SES and home environment is that educational attainment tends to have an intergenerational correlation: that is, highly educated parents are more likely to have children who attain more education, while parents with less education are more likely to have children who attain lower levels of education (Causa et al., 2009; Chevalier et al., 2013; Onuzo et al., 2013). Because educational attainment is a central component of social mobility (i.e., the relationship between the socioeconomic status of parents and that of their offspring when they become adults), policy-makers have a strong interest in improving educational outcomes for all students, regardless of their socioeconomic backgrounds (Chevalier et al., 2013). Fortunately, evidence suggests that well-structured policy interventions, such as income support policies, have a particularly strong positive effect on the most disadvantaged children and families (Causa et al., 2009; Merry, 2013).

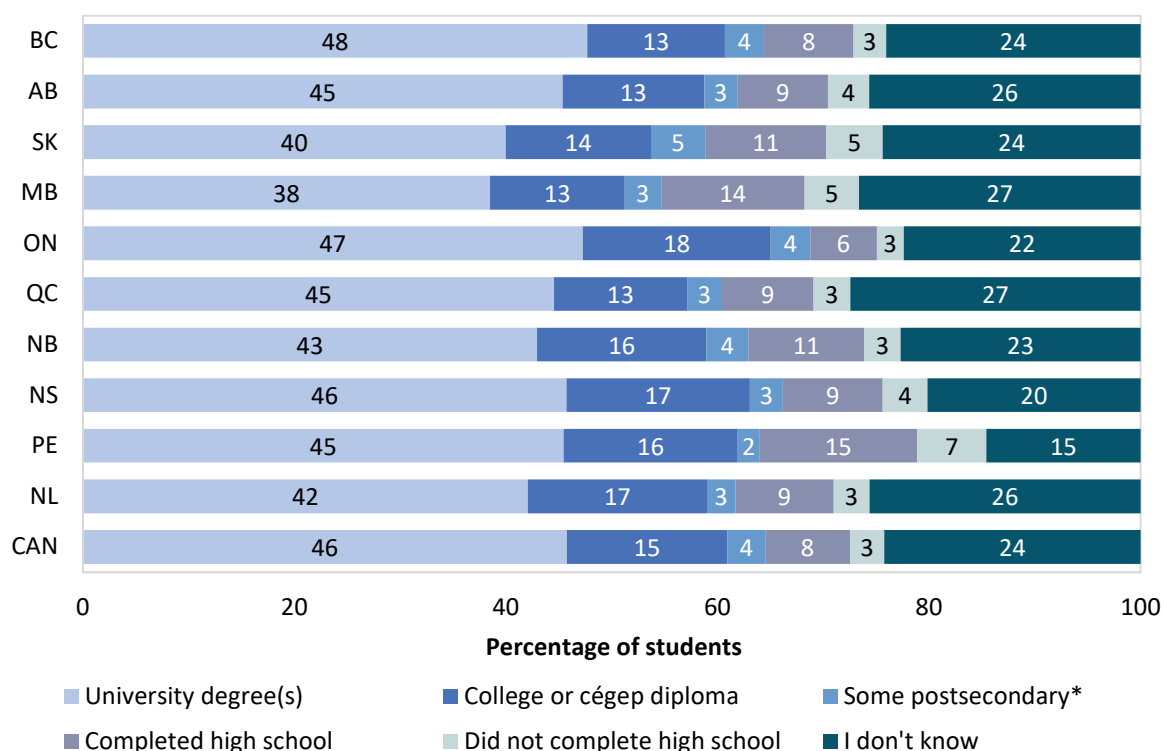
In this report, two measures serve as proxies for socioeconomic status: parents' education and the number of books in the home. Both of these factors have consistent correlations with students' academic achievement, but these correlations should be interpreted carefully, with a recognition that many factors influence a family's ability to support their child's learning.

Parents' education

Students were asked about the highest level of education completed by one of their parents — specifically, the parent with the highest level of education. To better reflect current family structures, students were instructed to answer this question by thinking either about their own parent or the person who is most like a parent to them.

At the pan-Canadian level, 61 percent of students reported that one of their parents had a college diploma or university degree. Provincially, this proportion ranged from 51 percent in Manitoba to 65 percent in Ontario. The distribution of credentials below a degree is relatively consistent across the provinces. At the same time, over 20 percent of students did not know the educational attainment of their parents, both in Canada overall and in all provinces except Prince Edward Island, where 15 percent of students could not provide information on parental education (Figure 1.6, Appendix A.1.12).

FIGURE 1.6 Percentage of students by their parents' education as reported by students



* "Some postsecondary" refers to any kind of education after high school.

Within provinces and at the pan-Canadian level, parents of students in both French- and English-language school systems had similar levels of educational attainment, although more students in the francophone system did not know about their parent's education (Table 1.6, Appendix A.1.13).

TABLE 1.6 Percentage of students by their parents' education as reported by students, and language of the school system

	University degree(s)	College or cégep diploma	Some postsecondary*	Completed high school	Did not complete high school	I don't know
Anglophone school systems						
BC	48	13	4	8	3	24
AB	45	13	3	9	4	26
SK	40	14	5	11	5	24
MB	38	13	3	14	5	26
ON	47	18	4	6	3	22
QC	50	13	7	8	3	20
NB	45	17	5	13	4	18
NS	45	18	3	9	4	20
PE	45	16	2 ‡	15	7 ‡	14
NL	42	17	3	9	3	26
CAN	46	16	4	8	3	23
Francophone school systems						
BC	50	4 ‡	2 ‡	5 ‡	1 ‡	37
AB	47	12 ‡	U ‡	U ‡	3 ‡	35
SK	53	9 ‡	1 ‡	6 ‡	2 ‡	29 ‡
MB	49	8 ‡	2 ‡	7 ‡	2 ‡	33
ON	49	13	2	4	1	31
QC	44	13	3	9	4	28
NB	39	14	2 ‡	6	3 ‡	35
NS	50	9 ‡	U ‡	9 ‡	2 ‡	30
CAN	44	13	3	8	3	29

* "Some postsecondary" refers to any kind of education after high school.

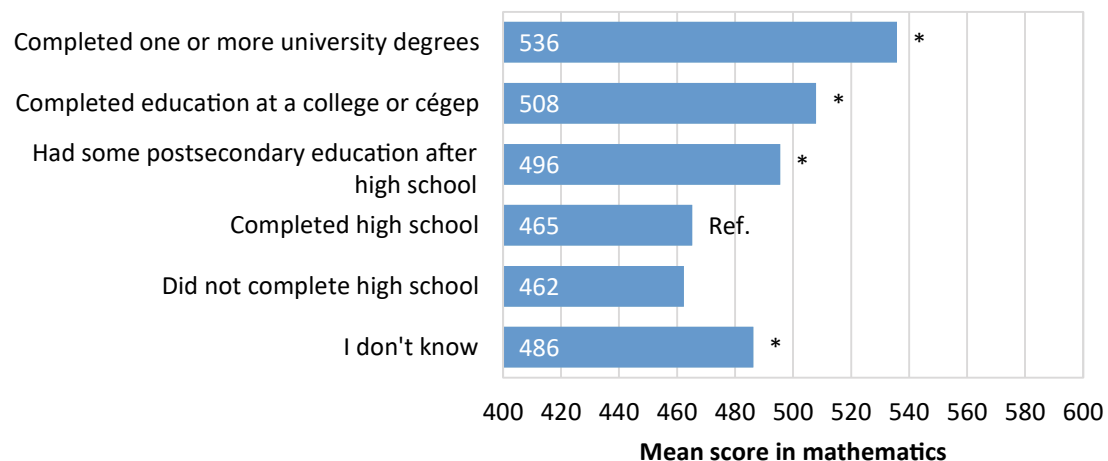
‡ There are fewer than 30 observations.

U Too unreliable to be published

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Student achievement correlates positively with the highest educational levels achieved by parents of students. There was a linear relationship between parental education and student achievement, with the highest mathematics scores attained by students whose parents had completed one or more university degrees. Achievement was significantly lower for students who reported that their parents finished their studies at the high school level (Figure 1.7, Appendix A.1.14).

FIGURE 1.7 Relationship between parents' education and mathematics achievement



* Significant difference compared to the *completed high school* category

Books in students' homes

The provision of enriched home environments is associated with families with higher SES, which in turn is associated with an increased likelihood that children will succeed in school (Evans et al., 2014). Families with higher SES are able to provide their children with social and cultural capital that increases the probability of success in school (Crowe, 2013; Huang & Liang, 2016; Lam & Ho, 2013). They are also likely to be more involved in their children's education and to have more learning resources like books, puzzles, games, and computers in their homes (Crowe, 2013; Shipley, 2011). The number of books in students' homes has been found to correlate with SES and student academic achievement. In the research literature, books in the home are regarded as both a source of academic knowledge and skills and a measure of the parents' commitment to the education of their children (Evans et al., 2014).

The PCAP student questionnaire asked students about the number of books in their homes. As shown in Figure 1.8, the results are similar across most of the provinces. In Canada overall and in all provinces except Quebec, at least 20 percent of students reported that there were more than 200 books in their home. The largest proportions of students have between 26 and 100 books in the home: this ranged from 30 percent in Saskatchewan to 37 percent in Newfoundland and Labrador (Appendix A.1.15). Across provinces, the distribution of the number of books in the home was similar in anglophone and francophone school systems (Table 1.7, Appendix A.1.16).

FIGURE 1.8 Percentage of students by the number of books in their home

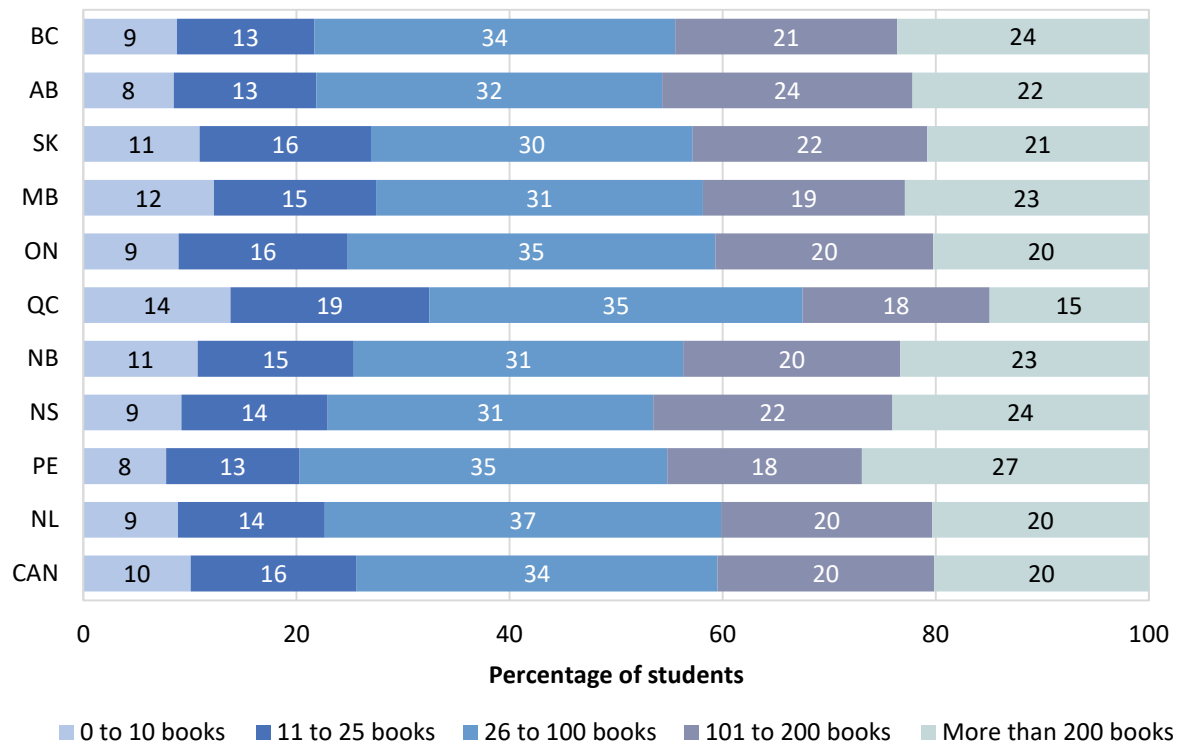


TABLE 1.7 Percentage of students by the number of books in their home and language of the school system

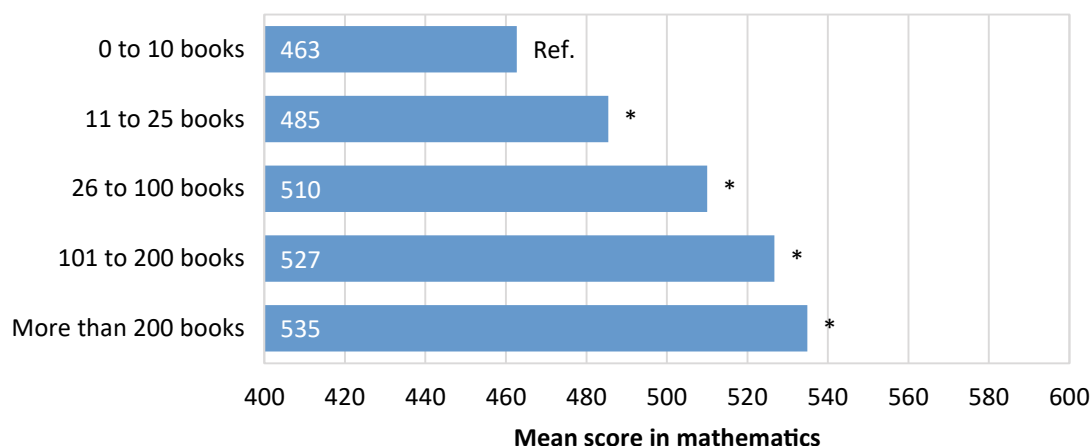
	0 to 10 books	11 to 25 books	26 to 100 books	101 to 200 books	More than 200 books
Anglophone school systems					
BC	9	13	34	21	24
AB	8	13	33	23	22
SK	11	16	30	22	21
MB	12	15	31	19	23
ON	9	16	35	20	20
QC	8	13	30	26	22
NB	8	12	30	22	27
NS	9	14	31	22	24
PE	8 ‡	13	35	18	27
NL	9	14	37	20	20
CAN	9	15	34	21	22
Francophone school systems					
BC	11‡	12	28	23	26
AB	12‡	12 ‡	25	29	22
SK	6‡	16 ‡	28‡	23‡	27‡
MB	4‡	11	31	28	27
ON	10	17	33	20	19
QC	14	19	36	17	14
NB	18	20	33	15	14
NS	11‡	18‡	29	23	20‡
CAN	14	19	35	17	15

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

There is a clear positive relationship between the number of books in the home and achievement in mathematics (Figure 1.9, Appendix A.1.17). These results confirm data obtained in previous PCAP administrations.

FIGURE 1.9 Relationship between the number of books in the home and mathematics achievement



* Significant difference compared to the 0 to 10 books category

The pattern of higher achievement in mathematics in homes with more educational resources is consistent with the finding at the Grade 4 level in the TIMSS 2019 study. In that study, the home resources learning scale combined data on the number of books in the home, home study supports (e.g., internet connection, students having their own room), and parental education. That study found that, in Canada, 36 percent of students had many resources available at home, while 64 percent of students had some or few resources at home. Having many resources at home corresponded to students reporting more than 100 books in the home; the home study supports of both an internet connection and their own room; parents reporting more than 25 children's books at home; and at least one parent who had completed university and one parent who had a professional occupation. Students who reported having many resources for learning at home achieved high scores in mathematics (O'Grady, Rostamian, et al., 2021).

Immigrant status

Canada has the second-largest foreign-born population in the world in proportion to its overall population, behind only Australia (CMEC, 2015; Duff & Becker-Zayas, 2017; Parkin, 2015). Research has found that children in immigrant families are more likely to be educationally disadvantaged (Andon et al., 2014; Bruckauf, 2016; OECD, 2010). Using data from earlier cycles of PISA, TIMSS, and the Progress in International Reading Literacy Study (PIRLS), Andon et al. (2014) have concluded that an achievement gap exists between immigrant and non-immigrant students in the three domains of reading, mathematics, and science across Member countries of the Organisation for Economic Co-operation and Development (OECD).

In Canada, immigrants are more likely than non-immigrants to fall into low-income categories (Collin & Jensen, 2009; CMEC, 2015). Despite this disadvantage, Canada is among the OECD countries that are more successful in closing the "immigrant achievement gap" (Parkin, 2015; Wech & Weinkam, 2016). Comparisons of average achievement between students who are immigrants and those who were born in Canada must be treated with caution, as scores may obscure important disparities among immigrant groups (Schnepf, 2008). Immigrant children and youth are not homogeneous (Andon et al., 2014; OECD, 2010; Parkin, 2015; Schnepf, 2008; Wech & Weinkam, 2016). They vary with respect to where they completed their previous education, at what age they

were immersed in schooling in one of Canada’s official languages, and whether they already spoke English or French upon arriving in Canada (Bruckauf, 2016; OECD, 2016a). Like their domestic-born counterparts, immigrant children and youth also vary in the levels of education held by their parents.

In PCAP 2019, Manitoba had the largest proportion of students who were not born in Canada, followed by Alberta, British Columbia, Saskatchewan, and Ontario (Figure 1.10; Appendix A.1.18). The proportion of students not born in Canada is similar in the anglophone and francophone school systems in Canada overall and in most provinces (Table 1.8, Appendix A.1.19).

FIGURE 1.10 Percentage of students by immigrant status

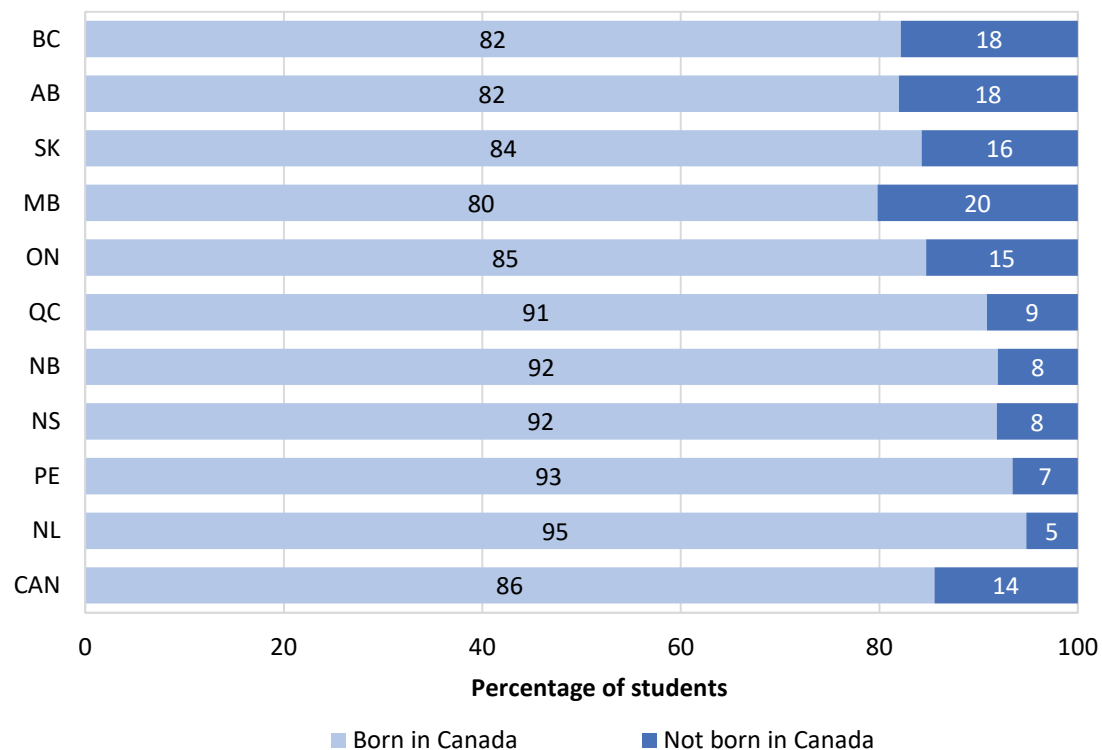


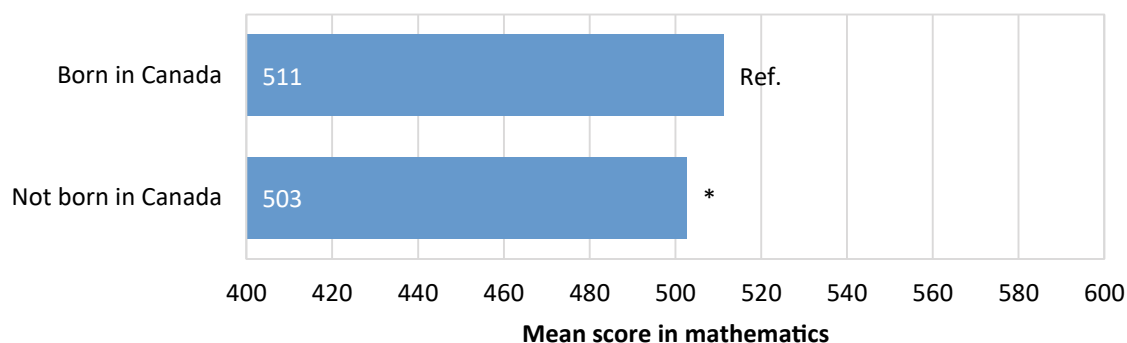
TABLE 1.8 Percentage of students by immigrant status and language of the school system

	Anglophone school systems		Francophone school systems	
	Born in Canada	Not born in Canada	Born in Canada	Not born in Canada
BC	82	18	82	18
AB	82	18	76	24
SK	84	16	82	18 ‡
MB	80	20	87	13
ON	85	15	86	14
QC	92	8	91	9
NB	91	9	95	5
NS	92	8	94	6 ‡
PE	93	7 ‡	--	--
NL	95	5	--	--
CAN	84	16	90	10

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

As shown in Figure 1.11, mathematics achievement of students born in Canada was higher than that of students with an immigrant background (Appendix A.1.20). This differs from the results found for Grade 4 students in TIMSS 2019 (O’Grady, Rostamian, et al., 2021) and for 15-year-olds in PISA 2018 (O’Grady, Deussing, et al., 2019), where no significance difference in achievement was found between students born in Canada and those with an immigrant background. This is also the opposite of the results in PCAP 2010 (where mathematics was also the major domain), in which students born outside of Canada achieved significantly higher scores in mathematics compared to those born in Canada (CMEC, 2012b).

FIGURE 1.11 Relationship between immigrant status and mathematics achievement

* Significant difference compared to the *born in Canada* category

Indigenous self-identity

Achievement gaps between Indigenous and non-Indigenous students are a persistent educational issue in Canada. High-school non-completion for Indigenous youth living off reserve compared to non-Indigenous youth is twice as high for males (20 percent versus 9 percent) and three times higher for females (16 percent versus 5 percent) (Uppal, 2017). The urgency of improving outcomes for Indigenous students is stressed in *Truth and Reconciliation Commission of Canada: Calls to Action* (Truth and Reconciliation Commission of Canada, 2012).

Based on data from the 2016 Canadian Census, there are a total of 1,673,785 Indigenous peoples in Canada, representing 4.9 percent of the total population. Outside the territories, the proportion of Indigenous peoples is highest in Saskatchewan (16 percent) and Manitoba (18 percent) (Statistics Canada, 2017a). Among school-aged children and youth, Indigenous populations are growing at much faster rates than the general population (Statistics Canada, 2017b).

In responding to the PCAP student questionnaire, students could identify themselves as First Nations, Inuit, or Métis. As shown in Table 1.9, the highest proportions of students who identified themselves as First Nations or Métis were in Saskatchewan (11 percent and 8 percent, respectively) and Manitoba (9 percent for both populations). The number of students who identified themselves as Inuit was very small, in both Canada overall and all provinces (Table 1.9, Appendix A.1.21), and in both language systems (Table 1.10, Appendix A.1.22). Although students could select more than one option with respect to Indigenous identity, only a very small proportion of students across the provinces chose to do so. It is important to note that, although Indigenous peoples make up a large proportion of the population in Nunavut (86 percent), Northwest Territories (51 percent), and Yukon (23 percent) (Government of Canada, 2020), the three territories did not participate in PCAP 2019.

TABLE 1.9 Percentage of students by self-reported Indigenous identity

	Not Indigenous	First Nations	Inuit	Métis
BC	90.6	5.7	U ‡	2.4
AB	90.1	4.2	U ‡	3.8
SK	79.4	10.9	U ‡	7.5
MB	79.7	9.4	U ‡	9.4
‡ON	94.8	3.6	U ‡	0.9
QC	93.1	3.0	0.6 ‡	1.9
NB	91.9	5.6	0.1 ‡	1.2 ‡
NS	89.1	6.7	0.3 ‡	2.4
PE	95.4	3.6 ‡	0.2 ‡	0.3 ‡
NL	87.5	6.5	2.4 ‡	1.6 ‡
CAN	92.0	4.4	0.3	2.3

‡ There are fewer than 30 observations.

U Too unreliable to be published

TABLE 1.10 Percentage of students by self-reported Indigenous identity and language of the school system

Anglophone school systems				Francophone school systems		
	First Nations	Inuit	Métis	First Nations	Inuit	Métis
BC	5.7	U‡	2.4	2.4‡	0.0	4.8‡
AB	4.3	U‡	3.8	U‡	U‡	U‡
SK	11.0	U‡	7.4	0.0	0.0	12.8‡
MB	9.6	U‡	9.1	0.3‡	0.6‡	23.7
ON	3.6	U‡	0.8‡	2.5	U‡	4.1
QC	4.8	0.8‡	1.2‡	2.7	0.6‡	2.0
NB	6.1	0.0‡	0.6‡	4.3	0.3‡	2.5‡
NS	6.8	0.3‡	2.3	5.8‡	1.6‡	2.8‡
PE	3.5‡	0.2‡	0.2‡	--	--	--
NL	6.5	2.4‡	1.6‡	--	--	--
CAN	4.9	0.2	2.2	2.7	0.6 ‡	2.3

‡ There are fewer than 30 observations.

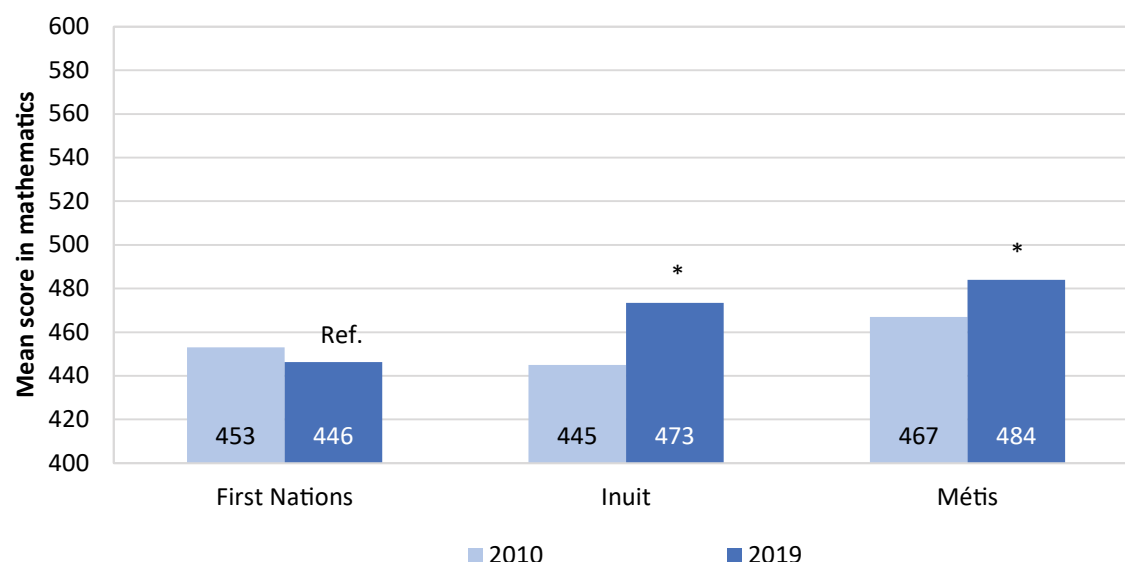
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Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

The PCAP sample is randomly drawn from school systems under the purview of the provincial ministry/department of education. Schools in remote locations and with a very small number of Grade 8/Secondary II students (generally fewer than 5) can be exempted from participating in PCAP. In all provinces, fewer than 30 students self-identified as Inuit. Because of these small numbers, the results for Indigenous students cannot be considered representative and are included here for descriptive purposes only.

As shown in Figure 1.12, among Indigenous students, students who identified as Métis achieved the highest scores in mathematics in PCAP 2019. Although a test for significance cannot be calculated for changes over time between 2010, when mathematics was first the major domain, and 2019, Figure 1.12 illustrates the pattern of change over time for mathematics (Appendix A.1.23; CMEC, 2012b, Chart 3.19).

FIGURE 1.12 Trends in mathematics achievement for Indigenous students, 2010–2019



* Significant difference compared to *First Nations* category

Summary

This chapter has presented PCAP 2019 data related to five student demographic and socioeconomic characteristics: gender, language, socioeconomic status, immigrant status, and Indigenous self-identification.

With respect to gender, no gender gap was found in mathematics in PCAP 2019. This finding is consistent with the results in PCAP 2010, when mathematics was first the major domain. However, these results differ from the most recent international large-scale assessments in which Canada participated. Boys outperformed girls in mathematics at the Grade 4 level in TIMSS 2019 and at age 15 in PISA 2018.

Canada-wide, both English- and French-first-language students in francophone schools achieved higher scores in mathematics than their peers in anglophone schools. Scores were similar in both language systems for students who reported first languages other than French or English.

In anglophone school systems, students who were enrolled in a second-language program, either currently or in the past, achieved significantly lower mean scores in mathematics compared to students who had never been enrolled in such a program. In francophone school systems, students who were previously enrolled in second-language programs had lower achievement than those who were never enrolled; however, the difference in achievement between students currently enrolled compared to those who were never enrolled in second-language programs was not statistically significant.

Two proxies for socioeconomic status are used in PCAP contextual reports: parents' educational levels and the number of books in students' homes. Both measures were clearly correlated with student achievement. Students with parents who have a university-level education achieved

significantly higher scores in mathematics than those whose parents have less education. Mathematics achievement was also highest among students with the greatest number of books in their home.

In PCAP 2019, students who were not born in Canada achieved scores in mathematics that were statistically lower than those of their Canadian-born counterparts. Among Indigenous students, student who identified themselves as Inuit or Métis achieved higher scores in mathematics compared to those who self-identified as First Nations.



A PROFILE OF STUDENT ATTITUDES AND ENGAGEMENT IN MATHEMATICS

This chapter examines the relationship between student variables and mathematics performance. It is organized around three broad themes: students' attitudes and beliefs, students' learning experiences, and supporting student learning. Within each theme, indices and variables related to responses to the PCAP 2019 student questionnaire and cognitive test are analyzed.

The first section explores students' attitudes toward and beliefs about mathematics, looking at students' self-efficacy, their effort in doing mathematics, and their time management. The chapter then turns to students' learning experiences, including their knowledge of mathematics terms and the activities used in the classroom to support learning in mathematics. The next section looks at how teachers support student learning, including the cross-curricular integration of mathematics, homework activities, assessment, and feedback, along with an examination of students' sense of belonging. The final section presents information on the cognitive levels of types of questions used in mathematics lessons and assessment.

Some groups of questions from the student questionnaire were subjected to principal component analysis, which allowed researchers to identify items that were related to a single construct; these items were then used to form indices (see the box below for more information on principal components analysis and indices). Most of the indices showed a significant relationship with mathematics performance; however, unless stated otherwise, only the indices with a correlation coefficient equal to or above .20 are included in this report.

In addition to the indices, this chapter analyzes other items from the student questionnaire, either individually or in groups. In some cases, items or groups of items that have either a weak or no correlation with achievement are included for descriptive purposes. As with all self-reported data, the questionnaire responses are based on students' perceptions of the construct being measured.

Statistical note on principal components analysis and index scores

Principal component analysis (PCA). To reduce the complexity of the analysis and to obtain more stable measures of attitudes, values, and learning experiences, some groups of questions from the PCAP 2019 questionnaires were subjected to PCA with direct oblimin rotation ($\delta = 0$). This technique is designed to determine if item responses cluster together in some meaningful way. If meaningful groupings can be found, PCA permits the construction of a number of indices that combine individual items. As an example of the efficiency of this technique, applying PCA to responses about student attitudes toward mathematics yielded one index, reduced from 10 individual questionnaire items.

Index scores. A score for each student on each index is derived from the PCA, in much the same way as a scaled mathematics score is derived from analyzing the mathematics test items. Index scores are typically computed in standard score form, with a mean of 0 and a standard deviation of 1. For convenience in presentation, and to avoid negative values on charts, the scores are transformed into a mean of 50 and a standard deviation of 10 for Canada as a whole. This is analogous to the transformation of mathematics scores to a mean of 500 and a standard deviation of 100. However, the index scale is deliberately different, in order to avoid confusing index scores with achievement scores. Mean index scores for groups such as provinces should be examined in relation to the Canadian mean of 50 and standard deviation of 10. For example, a mean score of 52 for a group implies that the group is 0.20 standard deviation units above the Canadian mean for that index. It is important to stress that index scores should not be interpreted as percentages. It should also be noted that the Canadian means may not be exactly at 50, due to the use of unweighted data during the computation of index scores. However, weights were used for all analyses of the index scores.

Quarters. In this report, the PCAP populations of interest are divided into four equal groups (quarters or quartiles), with regard to the value of the index under study. The mean score for each of these groups appears in applicable tables and/or figures. The bottom quarter represents numbers below the 25th percentile; the second quarter represents the 25th to the 49th percentile; the third quarter represents the 50th to the 74th percentile; and the top quarter represents the 75th percentile and above.

Index names. It should be noted that, although the names of indices in this report are somewhat arbitrary, they are intended to capture the main underlying idea represented by the items that constitute a specific index. Sometimes the index name conveys the construct being investigated; in other cases, the underlying idea is more generic. Included throughout the report are tables that identify questionnaire items with the corresponding index name. These are intended to convey a sense of how the indices have been labelled.

Statistical significance. This report discusses only variables that show statistically significant relationships ($p < 0.05$) with mathematics achievement and indices with a correlation coefficient equal to or above .20, unless otherwise noted. When comparing index scores, statistical significance is determined using the unrounded values for the index.

Students' attitudes and beliefs

Students' attitudes toward and beliefs about mathematics have been a topic of great interest for many years, in part because many societies look to fields related to science, technology, engineering, and mathematics (STEM) to bolster economic growth. Attitude (e.g., liking or disliking geometry, preferences for discovery learning) can be separated from beliefs (e.g., about mathematics, about themselves, about teaching, about social context) and emotions (e.g., joy or frustration in solving problems or aesthetic responses to mathematics) (McLeod, 1992).

Despite the need for STEM-related skills in work and everyday life, and the number of career opportunities in those fields, a majority of students do not view mathematics as personally beneficial (Middleton et al., 2016). Such attitudes could influence the amount of effort a student puts into learning mathematics. Disentangling the impact of attitudes on learning by further disaggregating constructs can help to define “variables and fuzzy definitions” (Batchelor et al., 2019) and identify attributes that contribute to achievement.

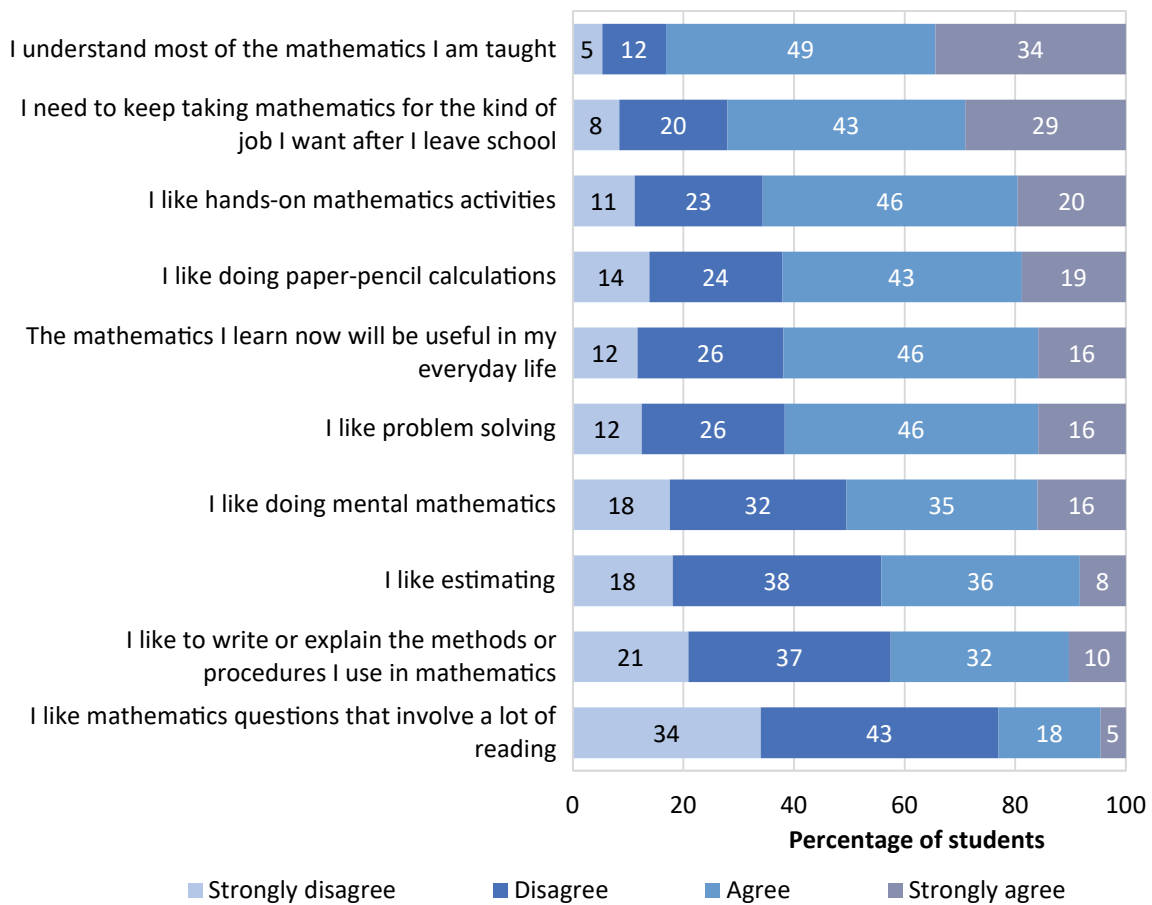
Attitude toward mathematics

Attitudes have a profound impact on teaching and learning mathematics. Distinguishing between what students can do and what they will do can reveal important information about their learning (Hattie, 2009). Children are more likely to engage in an activity if they expect to do it well and if they value the activity (Eccles et al., 1993; Simpkins et al., 2006). According to the Western and Northern Canadian Protocol, *Common Curriculum Framework for K–9 Mathematics* (Western and Northern Canadian Protocol, 2006), “Students with positive attitudes towards learning mathematics are likely to be motivated and prepared to learn, participate willingly in classroom activities, persist in challenging situations and engage in reflective practices” (p. 3).

Description of the index

In PCAP 2019, students were asked to respond to 10 items concerning their attitudes toward mathematics, as shown in Figure 2.1 (Appendix A.2.1.1). Through the process of principal component analysis, this set of items formed the *attitude toward mathematics index*. This index measures students' perception of their ability to do mathematics as well as their general attitudes toward mathematics. In Figure 2.1, questionnaire items for this index are presented in descending order by the percentage of students who either agreed or strongly agreed with each statement. Overall in Canada, 83 percent of students agreed or strongly agreed that they understood most of the mathematics that they were taught. At the Grade 8/Secondary II level, close to three-quarters of students recognized the importance of mathematics in preparing them for future job opportunities, and almost two-thirds believed that mathematics would be useful in their everyday lives. The pattern of responses for tasks related to learning mathematics was generally positive. However, more than half of students reported that they did not like estimating or explaining how they did mathematics, and more than three-quarters did not like mathematics questions that involve a lot of reading.

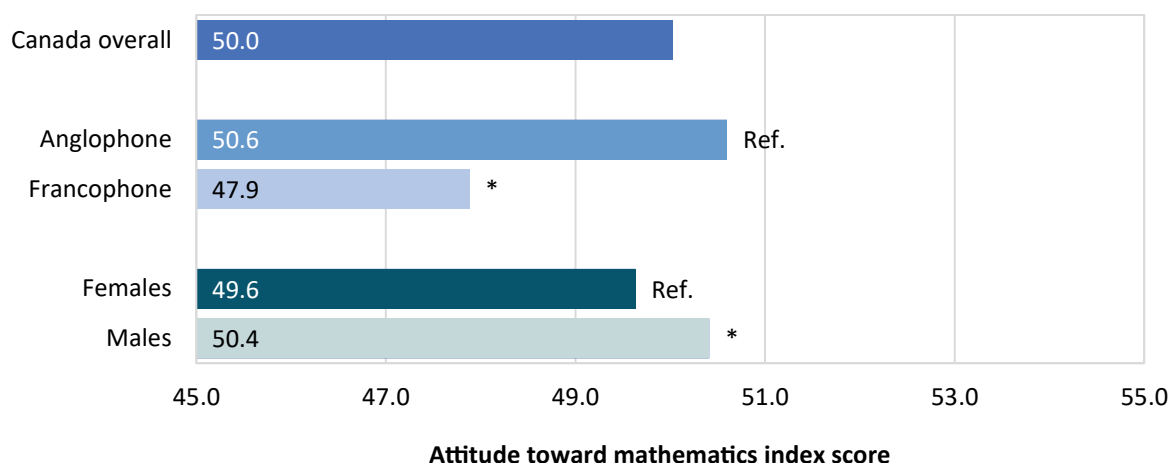
FIGURE 2.1 Percentage of students by their responses to questionnaire items constituting the attitude toward mathematics index



Results for the index

Pan-Canadian results for the attitude toward mathematics index are shown in Figure 2.2. Students in anglophone school systems and boys scored higher on this index than students in francophone school systems or girls (Appendices A.2.1.2, A.2.1.3, A.2.1.4).

FIGURE 2.2 Results for the attitude toward mathematics index



* Significant difference compared to the reference (Ref.) in each category

In this index, the top quarter represents students who tend to have a more positive attitude toward mathematics. These students were more likely to agree or strongly agree with the items in Figure 2.1, while students in the bottom quarter of the index were more likely to disagree or strongly disagree with the items.

Interpreting the index graphs

Asterisks in index graphs comparing quartiles represent a significant difference in achievement compared to a reference quartile. An asterisk following the bottom-quarter bar shows a significant difference between the top and bottom quarters of the index. For the other three bars, the results are compared to the bar for the quartile immediately below it. For example, an asterisk following the top-quarter bar indicates a significant difference compared to the third-quarter bar. The same pattern is used for an asterisk following the third- and second-quarter bars.

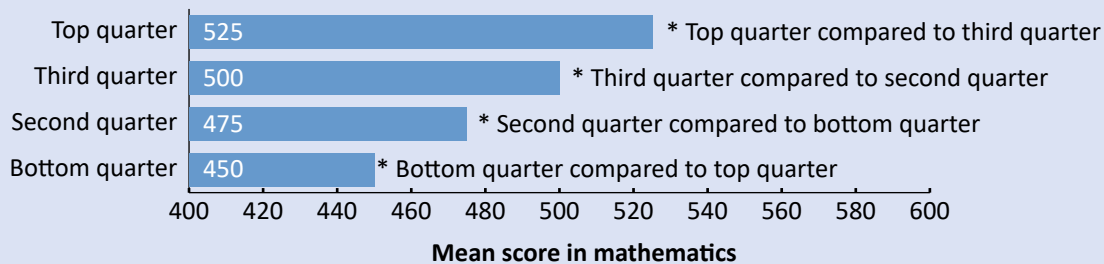
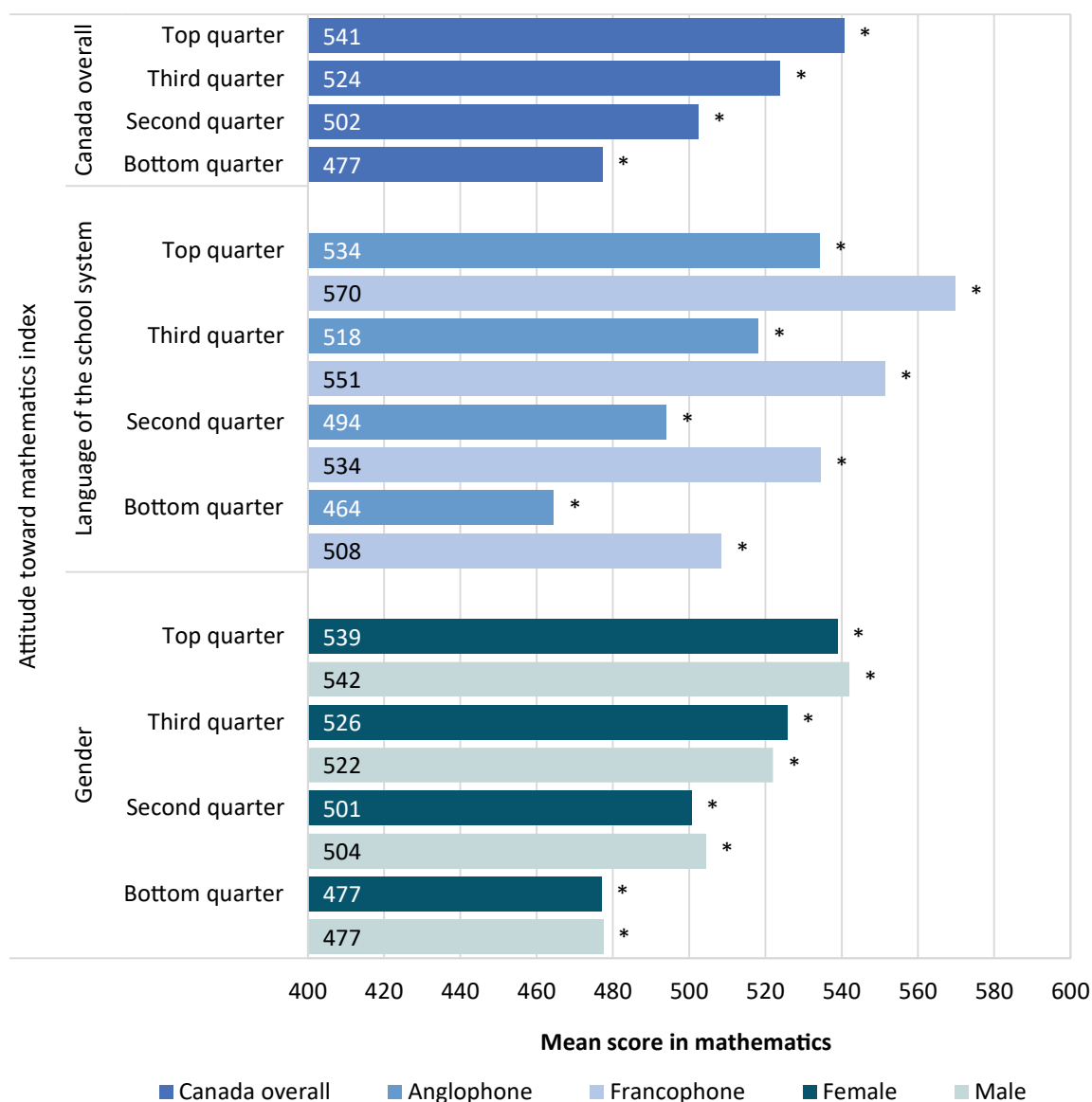


Figure 2.3 shows the relationship between the attitude toward mathematics index and mathematics achievement. Generally, increasingly positive attitudes and beliefs are associated with higher achievement scores. Of the categories shown in Figure 2.3, the largest gap between the top and bottom quarters of the index is among anglophone students, with a difference of 70 points (Appendix A.2.1.5).

FIGURE 2.3 Relationship between the attitude toward mathematics index and mathematics achievement



* Significant difference compared to the adjacent lower quarter (the bottom quarter is compared to top quarter) within each category

As shown in Table 2.1, students in Ontario, Alberta, Saskatchewan, Manitoba, and New Brunswick achieved results similar to or above the Canadian mean on this index, meaning that students in these provinces reported the most positive attitudes toward mathematics (Appendix A.2.1.2).

TABLE 2.1 Comparison of Canadian and provincial results, attitude toward mathematics index

Above* the Canadian mean	Similar to the Canadian mean	Below* the Canadian mean
Ontario	Alberta, Saskatchewan, Manitoba, New Brunswick	British Columbia, Quebec, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

*Denotes significant difference

In Ontario, students in both language systems scored above the respective Canadian means on this index, while French-language students in British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick, and Nova Scotia also scored above the Canadian French mean. Students in anglophone school systems in Saskatchewan and Manitoba scored at the Canadian English mean. The remaining provinces scored below the Canadian means in the respective language systems (Table 2.2, Appendix A.2.1.3).

TABLE 2.2 Comparison of Canadian and provincial results by language of the school system, attitude toward mathematics index

Anglophone school systems		
Above* the Canadian English mean	Similar to the Canadian English mean	Below* the Canadian English mean
Ontario	Saskatchewan, Manitoba	British Columbia, Alberta, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Francophone school systems		
Above* the Canadian French mean	Similar to the Canadian French mean	Below* the Canadian French mean
British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia		Quebec

*Denotes significant difference

Within provinces in which students were sampled in sufficient numbers to provide reliable results by language of the school system, students in francophone schools scored higher than those in anglophone schools on this index in all provinces except Quebec and New Brunswick: in the former, there was no difference between the language systems; in the latter, students in anglophone schools scored higher than those in francophone schools (Table 2.3, Appendix A.2.1.3).

TABLE 2.3 Summary of provincial results by language of the school system, attitude toward mathematics index

Anglophone schools scored significantly higher than francophone schools	Francophone schools scored significantly higher than anglophone schools	No significant difference between school systems
New Brunswick	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia	Quebec

Table 2.4 shows that both girls and boys in Ontario, and girls in Saskatchewan and New Brunswick, had scores on this index that were higher than the respective Canadian means. Results similar to the Canadian means were found for boys in Saskatchewan and both girls and boys in Alberta and Manitoba (Appendix A.2.1.4).

TABLE 2.4 Comparison of Canadian and provincial results by gender, attitude toward mathematics index

Girls		
Above* the Canadian mean for girls	Similar to the Canadian mean for girls	Below* the Canadian mean for girls
Saskatchewan, Ontario, New Brunswick	Alberta, Manitoba	British Columbia, Quebec, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Boys		
Above* the Canadian mean for boys	Similar to the Canadian mean for boys	Below* the Canadian mean for boys
Ontario	Alberta, Saskatchewan, Manitoba	British Columbia, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

*Denotes significant difference

Within provinces, girls reported a more positive attitude than boys toward mathematics in New Brunswick and Newfoundland and Labrador, while boys reported a more positive attitude than girls in British Columbia, Manitoba, Ontario, and Prince Edward Island. No significant gender difference was found in the remaining provinces (Table 2.5, Appendix A.2.1.4).

TABLE 2.5 Summary of provincial results by gender, attitude toward mathematics index

Girls scored significantly higher than boys	Boys scored significantly higher than girls	No significant difference between girls and boys
New Brunswick, Newfoundland and Labrador	British Columbia, Manitoba, Ontario, Prince Edward Island	Alberta, Saskatchewan, Quebec, Nova Scotia

Mathematics self-efficacy

Self-efficacy is a person's belief in their own ability to successfully perform a task (Bandura, 1977). A more detailed definition is offered by the Standards for School Mathematics (National Council of Teachers of Mathematics, 2000): "When challenged with appropriately chosen tasks, students become confident in their ability to tackle difficult problems, eager to figure things out on their own, flexible in exploring mathematical ideas and trying alternative solution paths, and willing to persevere" (p. 21).

Research shows that there is a significant relationship between self-efficacy beliefs and academic performance across a wide variety of subjects, experimental designs, and assessment methods (Kilpatrick et al., 2001; Multon et al., 1991; Pajares & Kranzler, 1995; Pajares & Schunk, 2001). In a meta-analysis on gender differences and academic self-efficacy, Huang (2013) found that the subject was an important factor, with girls displaying higher self-efficacy in language arts, while boys displayed higher self-efficacy in mathematics, computer science, and social science. Sakellariou (2020), in studying the underachievement of girls in mathematics, found that most or all of the gap between girls and boys in that subject in OECD countries in Europe and the more affluent East Asian countries was explained by gender differences in self-belief among students. The relationship was less clear in other regions. Students with lower math self-efficacy have reported less emotional and social engagement during math class than students with higher self-efficacy (Martin & Rimm-Kaufman, 2015). Studies have also shown that children with high self-efficacy complete more problems correctly and rework more of the problems they missed (Collins, 1985; Schoenfeld, 1989).

In PCAP 2019, a set of ten items was designed to gather information on students' self-efficacy with respect to mathematics activities. Through the process of principal component analysis, nine of the items were organized into two components or indices: the *confidence with mathematical processes index* and the *confidence using technology in mathematics index*.

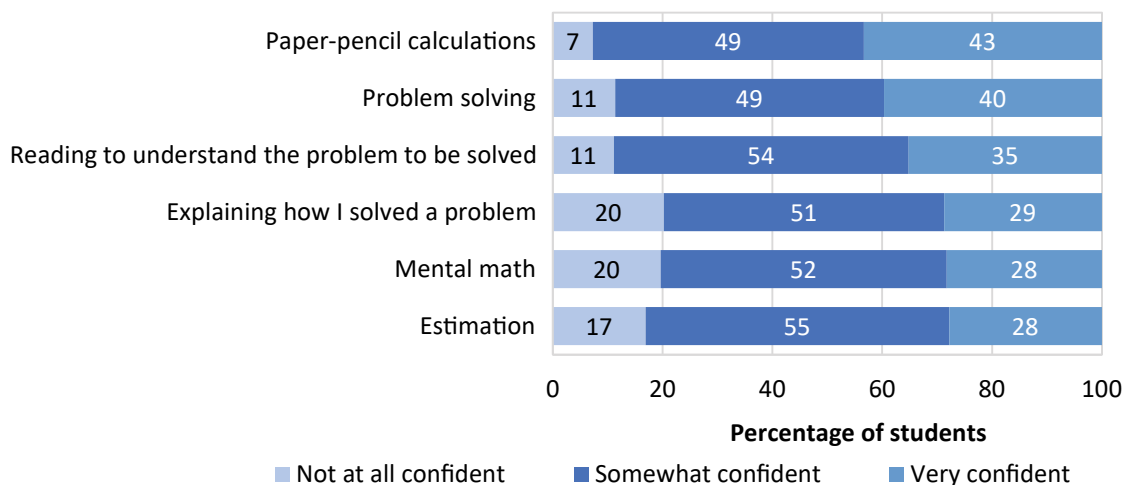
Confidence with mathematical processes

The Common Curriculum Framework (Western and Northern Canadian Protocol, 2006) describes a number of mathematical processes (communication, connections, mental mathematics and estimation, problem solving, reasoning, technology, and visualization) that are foundational to mathematics curriculum across Canada (Alberta Education, 2016; Nova Scotia, 2019; Ontario, 2020–21). One aspect of mathematical processes is mental mathematics, which involves solving mathematical tasks through mental processes without paper and pencil or other material aids (Proulx, 2019). Mental math skills enable students to develop on-the-spot and economical ways of solving problems that are tailored to the tasks at hand (Davis et al., 1996; Lave, 1988; Proulx, 2019). Mathematical thinking is activated by contradiction, tension, and surprise, and is supported by learning environments that are rich with challenging questions and opportunities for reflection (Mason et al. 1982; Pólya, 1957). Providing challenging problems that are relevant to our world and to daily living increases student interest in mathematics (Weidemann, 1995).

Description of the index

Figure 2.4 shows the six items that constitute the *confidence with mathematical processes index*. Students reported the highest level of confidence in doing pencil-and-paper calculations and in problem solving. Lower levels of confidence were reported for explaining problem-solving processes, doing mental math, and estimating (Appendix A.2.2.1).

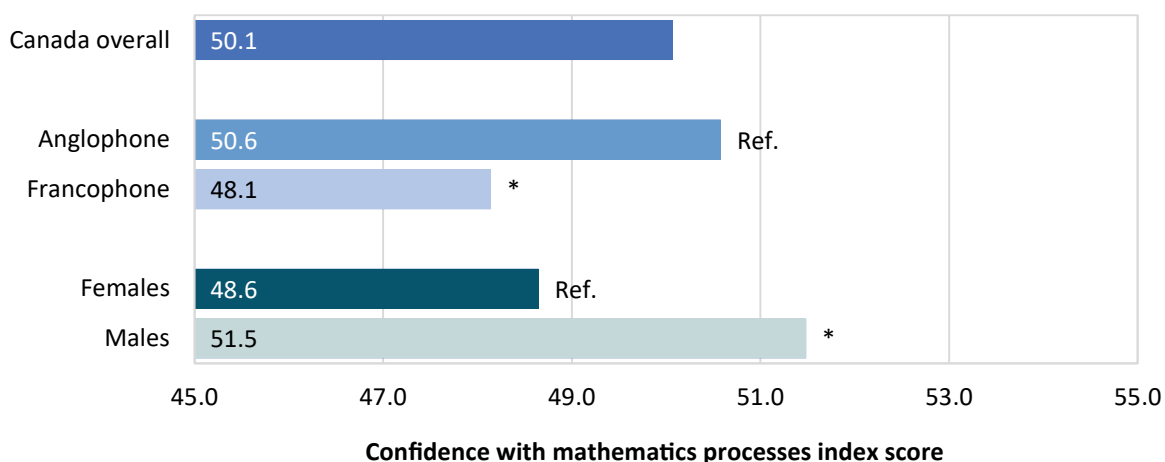
FIGURE 2.4 Percentage of students by their responses to questionnaire items constituting the confidence with mathematical processes index



Results for the index

Pan-Canadian results for the confidence with mathematical processes index are shown in Figure 2.5. Students in anglophone school systems and boys reported significantly higher levels of confidence with mathematics processes than did students in francophone school systems or girls (Appendices A.2.2.2, A.2.2.3, A.2.2.4).

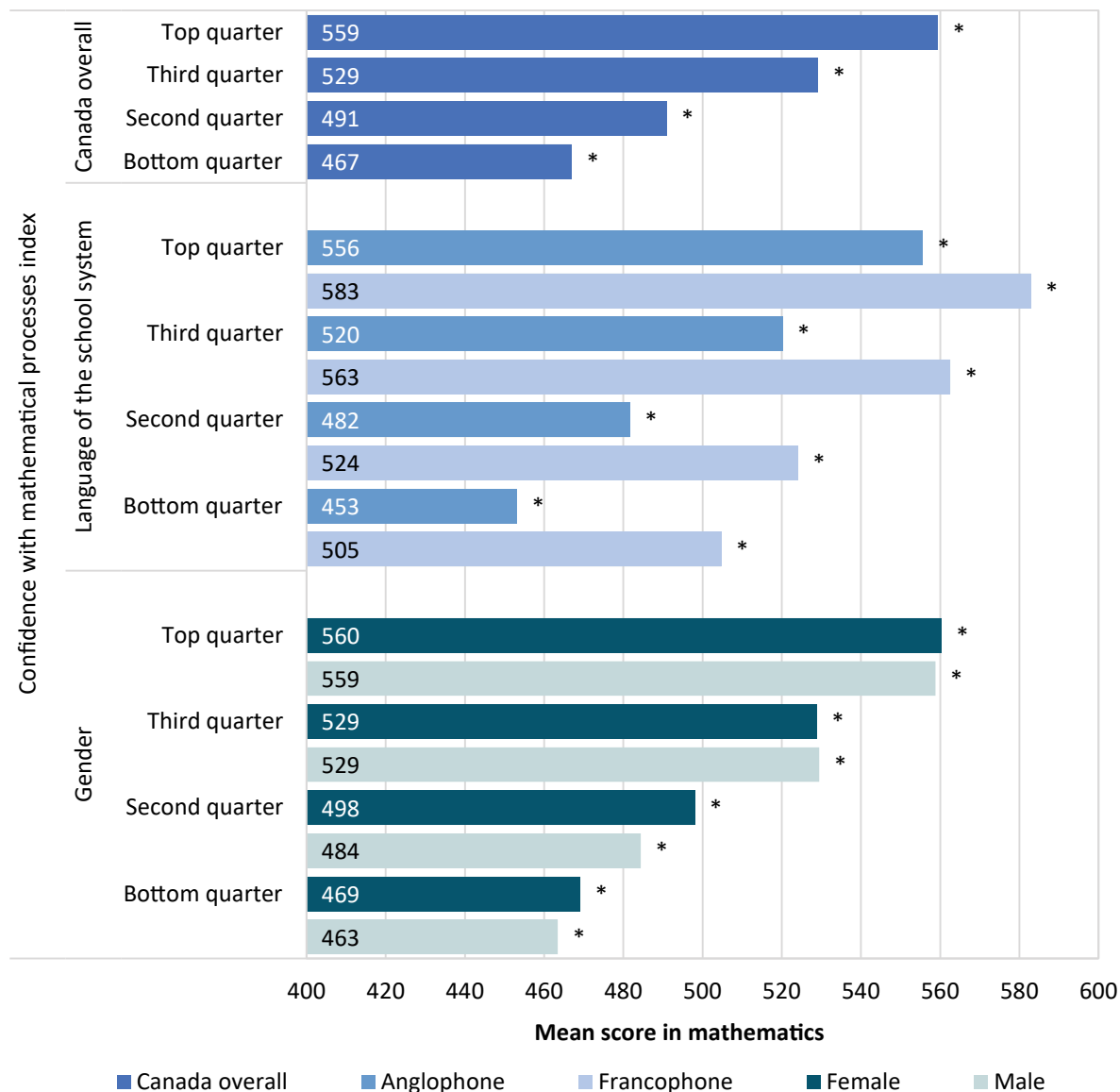
FIGURE 2.5 Results for the confidence with mathematical processes index



* Significant difference compared to the reference (Ref.) in each category

The relationship between confidence with mathematical processes and mathematics achievement is shown in Figure 2.6. The bottom quarter of this index represents students with the least confidence in their ability to do these mathematics processes, while the top quarter represents students with the greatest confidence. The results show a positive relationship between confidence and achievement, with a significant difference in mathematics scores in all quartiles in each category. The greatest difference in mathematics scores between the top and bottom quarter of this index was found in anglophone school systems (102 points), while the smallest difference was found in francophone school systems (78 points) (Appendix A.2.2.5).

FIGURE 2.6 Relationship between the confidence with mathematical processes index and mathematics achievement



* Significant difference compared to the adjacent lower quarter (the bottom quarter is compared to the top quarter) within each category

Students in Ontario had the highest scores on the confidence with mathematical processes index. Students in Quebec, New Brunswick, and Newfoundland and Labrador had the lowest scores, all of which were below the Canadian mean (Table 2.6, Appendix A.2.2.2).

TABLE 2.6 Comparison of Canadian and provincial results, confidence with mathematical processes index

Above* the Canadian mean	Similar to the Canadian mean	Below* the Canadian mean
Ontario	British Columbia, Alberta, Saskatchewan, Manitoba, Nova Scotia, Prince Edward Island	Quebec, New Brunswick, Newfoundland and Labrador

*Denotes significant difference

As shown in Table 2.7, students in both anglophone and francophone school systems in Ontario and francophone school systems in British Columbia, Alberta, Saskatchewan, Manitoba, and Nova Scotia scored above the Canadian average on this index. Within provinces, higher levels of confidence in mathematics were reported by English-language students in Quebec and New Brunswick, compared to their francophone peers. French-language students in Nova Scotia had higher scores on this index than their anglophone counterparts (Table 2.8, Appendix A.2.2.3).

TABLE 2.7 Comparison of Canadian and provincial results by language of the school system, confidence with mathematical processes index

Anglophone school systems		
Above* the Canadian English mean	Similar to the Canadian English mean	Below* the Canadian English mean
Ontario	Alberta, Saskatchewan, Manitoba, Prince Edward Island	British Columbia, Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador
Francophone school systems		
Above* the Canadian French mean	Similar to the Canadian French mean	Below* the Canadian French mean
British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia	New Brunswick	Quebec

*Denotes significant difference

TABLE 2.8 Summary of provincial results by language of the school system, confidence with mathematical processes index

Anglophone schools scored significantly higher than francophone schools	Francophone schools scored significantly higher than anglophone schools	No significant difference between school systems
Quebec, New Brunswick	Nova Scotia	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario

Compared to the Canadian means, both girls and boys in Ontario and girls in Prince Edward Island had the highest scores on the confidence with mathematical processes index, while the lowest scores were found for both genders in Quebec and for boys in New Brunswick, Nova Scotia, and Newfoundland and Labrador (Table 2.9). In all provinces, boys scored significantly higher than girls on this index (Table 2.10, Appendix A.2.2.4).

TABLE 2.9 Comparison of Canadian and provincial results by gender, confidence with mathematical processes index

Girls		
Above* the Canadian mean for girls	Similar to the Canadian mean for girls	Below* the Canadian mean for girls
Ontario, Prince Edward Island	British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Newfoundland and Labrador	Quebec
Boys		
Above* the Canadian mean for boys	Similar to the Canadian mean for boys	Below* the Canadian mean for boys
Ontario	British Columbia, Alberta, Saskatchewan, Manitoba, Prince Edward Island	Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador

*Denotes significant difference

TABLE 2.10 Summary of provincial results by gender, confidence with mathematical processes index

Girls scored significantly higher than boys	Boys scored significantly higher than girls	No significant difference between girls and boys
All provinces		

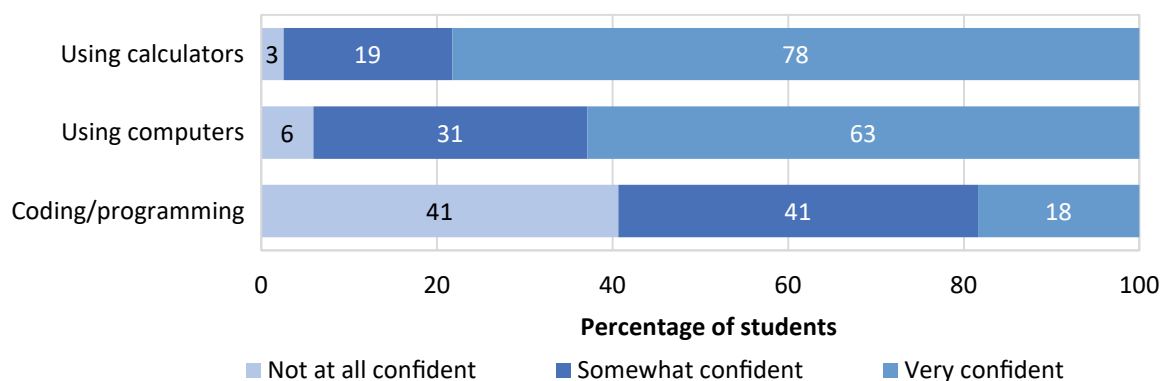
Confidence using technology in mathematics

The impact of technology on teaching and learning and the role of technology in the classroom are topics that have generated considerable research. Various studies have concluded that access to technology has only moderate effects on achievement (Escueta et al., 2017; Q. Li & Ma, 2010; OECD, 2015). In their synthesis of the research on technology in the classroom, Cheung and Slavin (2013) conclude that “educational technology is making a modest difference in learning of mathematics. It is a help, but not a breakthrough” (p. 102). Notwithstanding, technology use is a rapidly evolving field, and increased access to these technologies and changing global conditions surrounding their use are radically transforming classrooms (Devlin, 2019). Grasping all the benefits of technology is among the fundamental challenges that education faces today (OECD, 2018). PCAP 2019 was administered before the global pandemic required a rapid shift to online learning across Canada. In the future, it will be important to look closely at the challenges and opportunities presented by a greater focus on the use of technology in education.

Description of the index

Figure 2.7 shows the three items that constitute the *confidence using technology in mathematics index*. Close to 80 percent of students reported that they are very confident using calculators in mathematics. The proportion decreases to 63 percent for students who are very comfortable with mathematics activities involving computers, while less than 20 percent are very confident in their coding or programming skills (Appendix A.2.3.1). It should be noted that, at the item level, correlations with achievement were found to be weak for two of the three items in this index.

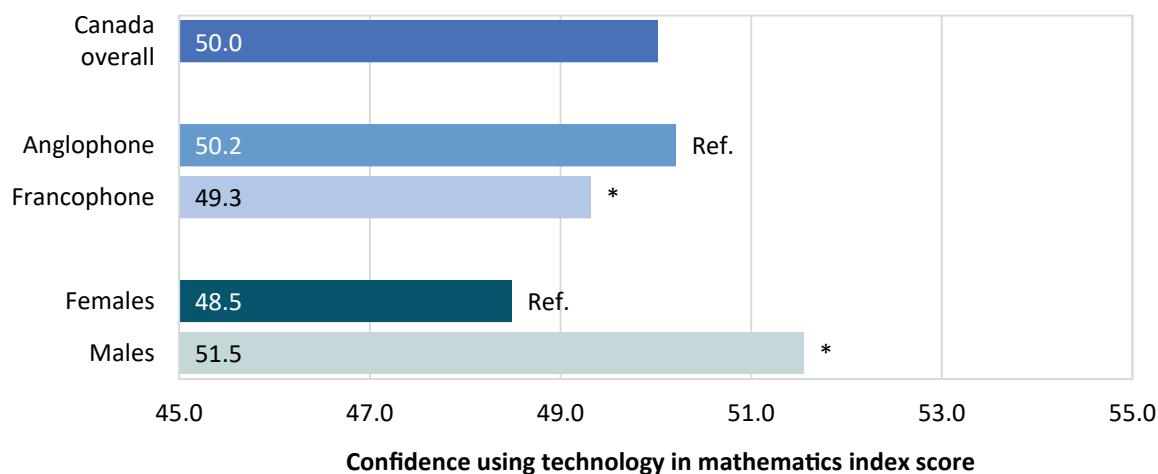
FIGURE 2.7 Percentage of students by their responses to questionnaire items constituting the confidence using technology in mathematics index



Results for the index

At the pan-Canadian level, students in anglophone school systems were more confident using technology than were their counterparts in francophone school systems. Boys achieved significantly higher scores on this index than girls (Figure 2.8, Appendices A.2.3.2, A.2.3.3, A.2.3.4).

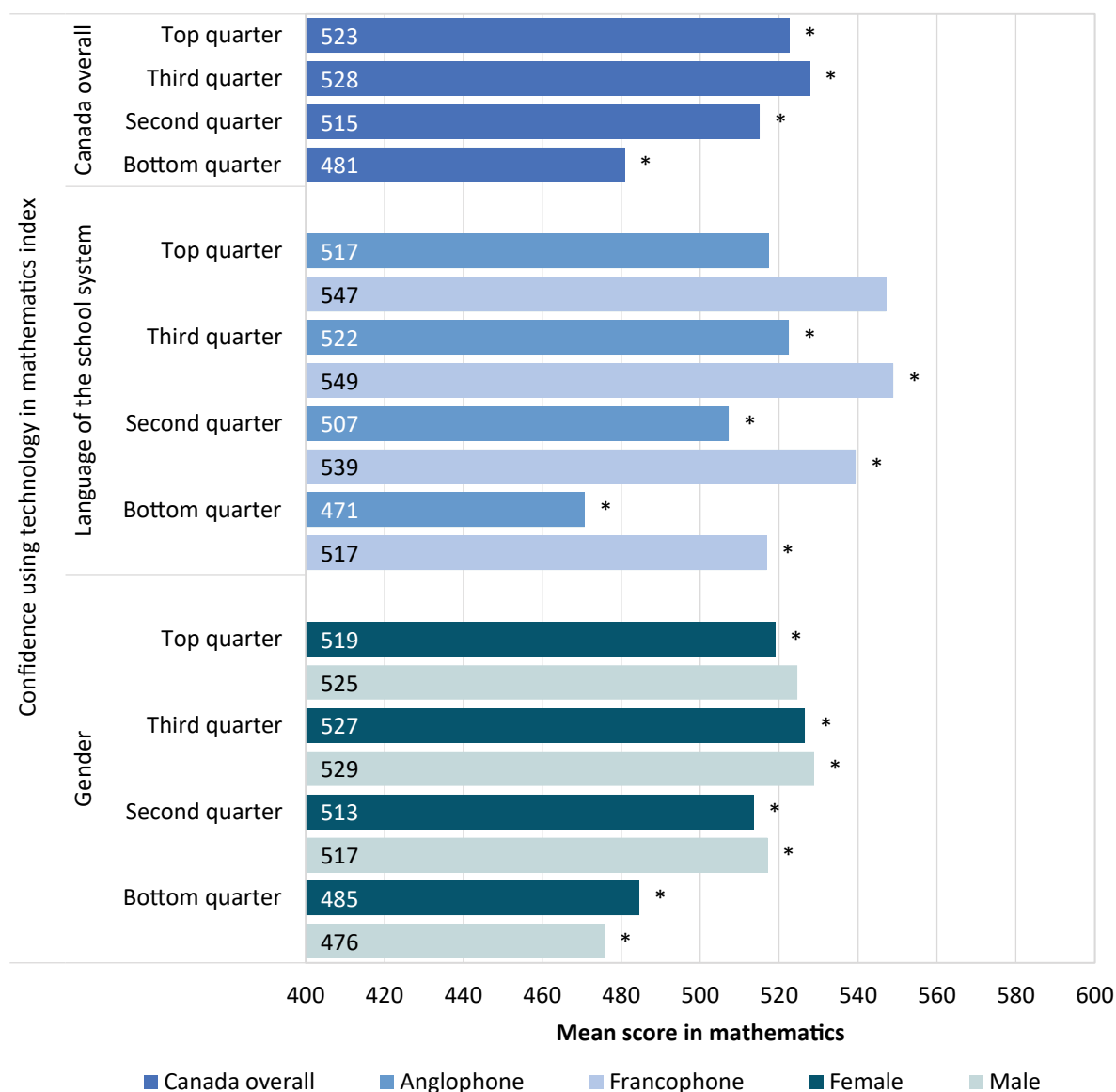
FIGURE 2.8 Results for the confidence using technology in mathematics index



* Significant difference compared to the reference (Ref.) in each category

Figure 2.9 presents the results by quarters of this index for Canada overall, as well as by the categories of language of the school system and gender. The top quarter of the index represents students with the highest level of confidence when doing mathematics activities involving technology. For each category, students in the top quarter of the index consistently had higher scores in mathematics achievement compared to the bottom quarter. There is also significantly higher achievement in all categories when comparing results in the second and bottom quarters as well as in the second and third quarters of the index. Achievement was lower for students in the top quarter compared to the third quarter for Canada overall and for girls; however, no difference was found between these two quarters for either English- or French-language schools or for boys (Appendix A.2.3.5).

FIGURE 2.9 Relationship between the confidence using technology in mathematics index and mathematics achievement



* Significant difference compared to the adjacent lower quarter (the bottom quarter is compared to the top quarter) within each category

When provincial results are compared to the Canadian mean, students in Ontario reported the highest level of confidence in using technology in mathematics, with an index score above the Canadian mean. Scores on this index were similar to the Canadian mean in Alberta, Saskatchewan, Manitoba, and Prince Edward Island. Students in the remaining provinces reported the lowest levels of confidence using technology for activities in mathematics, with scores below the Canadian mean (Table 2.11, Appendix A.2.3.2).

TABLE 2.11 Comparison of Canadian and provincial results, confidence using technology in mathematics index

Above* the Canadian mean	Similar to the Canadian mean	Below* the Canadian mean
Ontario	Alberta, Saskatchewan, Manitoba, Prince Edward Island	British Columbia, Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador

*Denotes significant difference

Anglophone students in Ontario and francophone students in British Columbia reported the highest levels of confidence using technology for activities in mathematics. Levels of confidence similar to those at the pan-Canadian level were reported by both English- and French-language students in Alberta, Quebec, and New Brunswick. Students in anglophone systems in Saskatchewan and Prince Edward Island and in francophone systems in Manitoba, Ontario, and Nova Scotia also reported levels of confidence similar to the respective Canadian means (Table 2.12, Appendix A.2.3.3).

TABLE 2.12 Comparison of Canadian and provincial results by language of the school system, confidence using technology in mathematics index

Anglophone school systems		
Above* the Canadian English mean	Similar to the Canadian English mean	Below* the Canadian English mean
Ontario	Alberta, Saskatchewan, Quebec, New Brunswick, Prince Edward Island	British Columbia, Manitoba, Nova Scotia, Newfoundland and Labrador
Francophone school systems		
Above* the Canadian French mean	Similar to the Canadian French mean	Below* the Canadian French mean
British Columbia	Alberta, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia	Saskatchewan

*Denotes significant difference

Within provinces, the higher scores on this index were found in anglophone schools in Saskatchewan, Ontario, New Brunswick, and Nova Scotia, and in francophone schools in British Columbia. No significant difference between the language systems was found in the remaining provinces (Table 2.13, Appendix A.2.3.3).

TABLE 2.13 Summary of provincial results by language of the school system, confidence using technology in mathematics index

Anglophone schools scored significantly higher than francophone schools	Francophone schools scored significantly higher than anglophone schools	No significant difference between school systems
Saskatchewan, Ontario, New Brunswick, Nova Scotia	British Columbia	Alberta, Manitoba, Quebec

With respect to gender, the highest levels of confidence in using technology in mathematics were reported by girls in Prince Edward Island and boys in Ontario, while the lowest levels were reported by girls in British Columbia and boys in Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador (Table 2.14). Boys scored significantly higher on this index than girls in all provinces except Prince Edward Island, where girls expressed more confidence than boys (Table 2.15, Appendix A.2.3.4).

TABLE 2.14 Comparison of Canadian and provincial results by gender, confidence using technology in mathematics index

Girls		
Above* the Canadian mean for girls	Similar to the Canadian mean for girls	Below* the Canadian mean for girls
Prince Edward Island	Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador	British Columbia
Boys		
Above* the Canadian mean for boys	Similar to the Canadian mean for boys	Below* the Canadian mean for boys
Ontario	British Columbia, Alberta, Saskatchewan	Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

*Denotes significant difference

TABLE 2.15 Summary of provincial results by gender, confidence using technology in mathematics index

Girls scored significantly higher than boys	Boys scored significantly higher than girls	No significant difference between girls and boys
Prince Edward Island	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador	

Student effort

Many students have difficulties understanding the relevance of mathematics (Boaler, 2002; Godfrey Anderson, 2016; Onion, 2004) and do not acknowledge its value (Middleton et al., 2016). Such difficulties are particularly pronounced among girls (Frenzel et al., 2007; Ganley & Lubienksi, 2016; Watt et al., 2012) and minorities (Matthews, 2018; Ng et al., 2018), and could influence the effort they put into learning mathematics. Although a decline in postsecondary graduation rates in science, mathematics, computer science, and engineering in Canada has been reported in the past (Conference Board of Canada, 2013; Natural Science and Engineering Research Council of Canada, 2017), there has been significant growth in the number of STEM graduates in Canada, with an increase of 51 percent from 2010 to 2018. Moreover, there has been a 35 percent increase in enrolment in postsecondary STEM programs during this same period (CMEC, 2021). A key predictor of students' interest in STEM-related careers at the end of high school is their interest in such careers at the start of high school (Sadler et al., 2012). It is concerning, then, that occupational intentions with regard to STEM-related careers decline dramatically between Grades 9 and 11 (Mangu et al., 2015). Math anxiety is considered a potential barrier to success in STEM-related fields and may be linked directly to avoidance of or underperformance in STEM domains in school (Daker et al., 2021). It is important to understand and address factors that contribute to success in STEM-related fields, as these fields are at the forefront of innovation, and qualified people to fill jobs in these areas will continue to be in high demand.

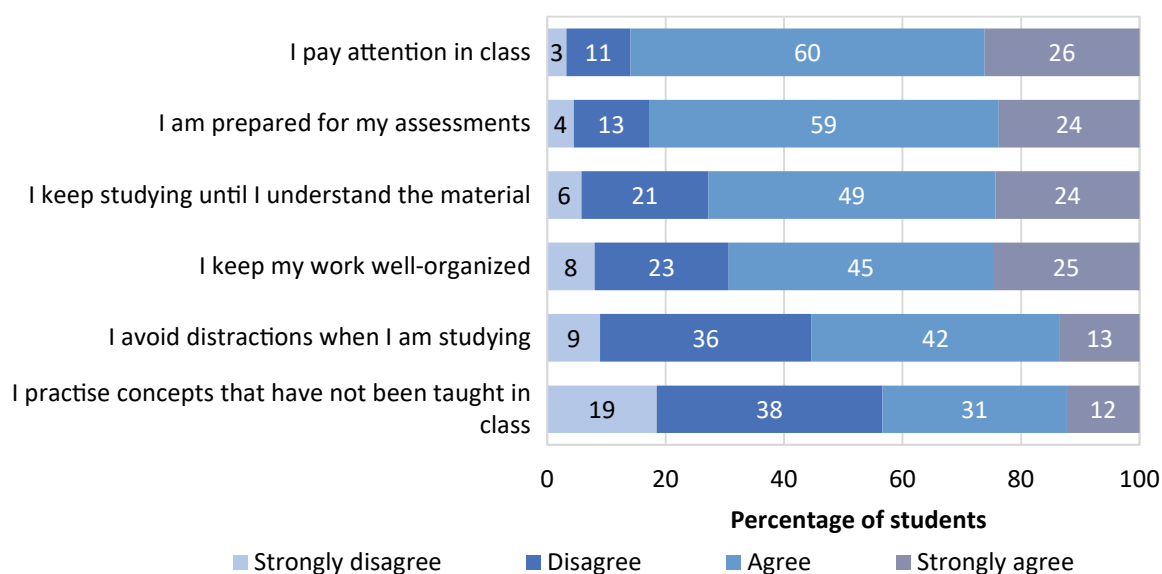
Description of the index

It is difficult to develop precise measures related to student effort because the amount of time and effort actually spent on learning tasks and the efficiency of learning are hard to determine. Despite the challenges associated with studying its effects, learning time remains important when considering students' opportunities to learn and the effort they put into their learning.

In order to characterize their effort in mathematics class, students were asked to indicate, using a four-point scale, the extent to which they agreed with six statements about their behaviour in class. Figure 2.10 presents these items in descending order by the percentage of students who agreed or strongly agreed with them. This set of items constitutes the *student effort index*, which was arrived at through principal component analysis.

Over 80 percent of students reported that they agree or strongly agree with statements about paying attention in class and being prepared for their assessments. Over half of students reported that they avoid distractions when studying; perhaps unsurprisingly, less than half of students reported practising concepts not taught in class (Figure 2.10, Appendix A.2.4.1).

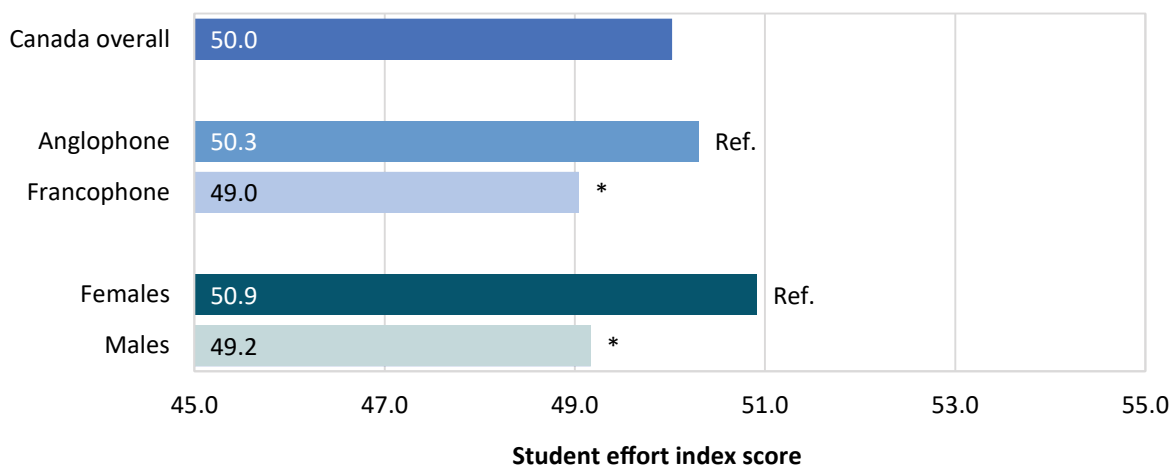
FIGURE 2.10 Percentage of students by their responses to questionnaire items constituting the student effort index



Results for the index

Pan-Canadian results for the student effort index are shown in Figure 2.11. The scores on the index were higher in anglophone school systems than in francophone school systems, and girls had higher scores than boys (Appendices A.2.4.2, A.2.4.3, A.2.4.4).

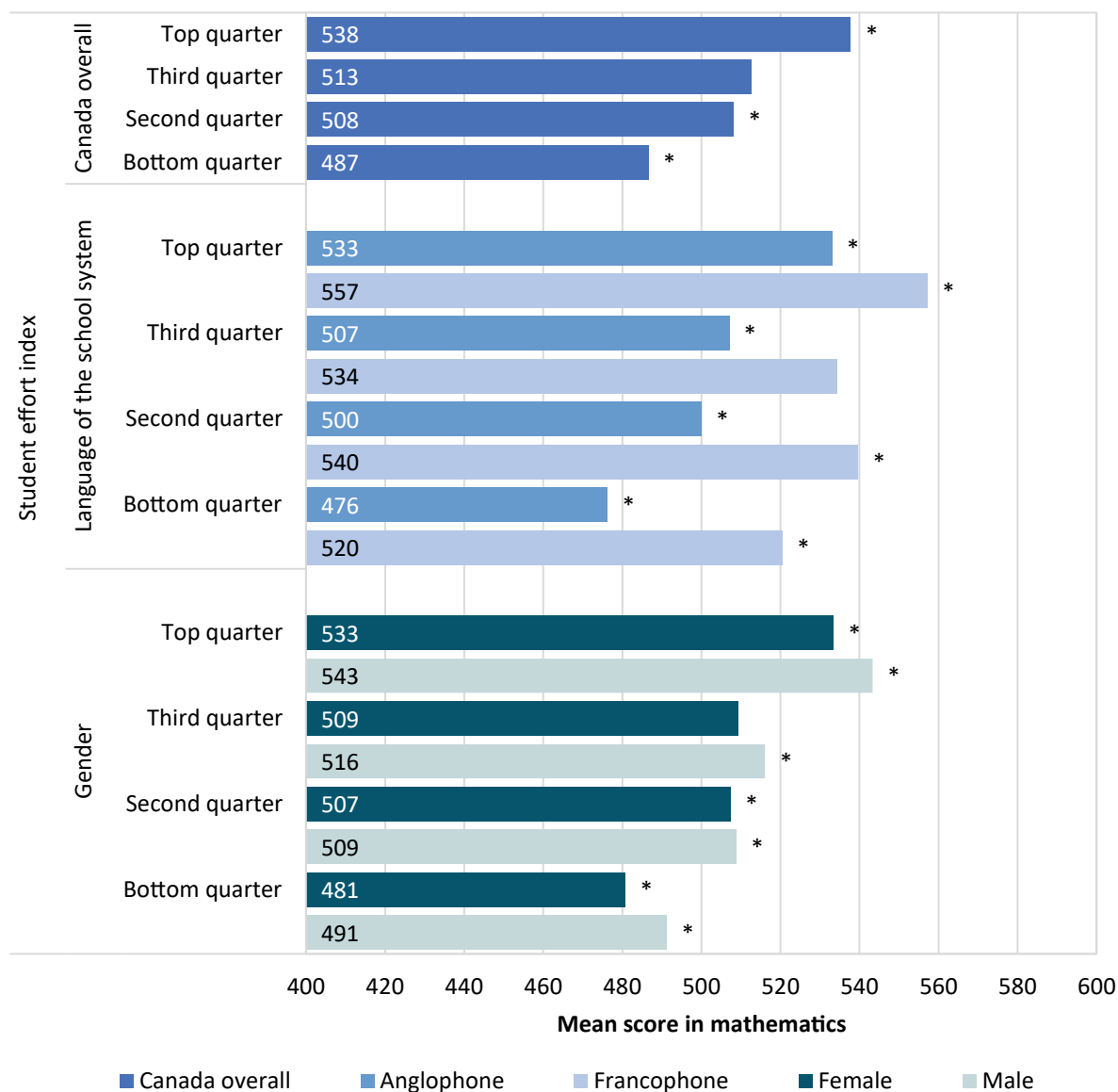
FIGURE 2.11 Results for the student effort index



* Significant difference compared to the reference (Ref.) in each category

Compared to students in the bottom quarter of this index, student in the top quarter reported a greater tendency to pay attention during lessons, be prepared and organized, and focus on understanding the material. For each category shown in Figure 2.12, a significant difference was found between the top and bottom quarters, ranging from 37 points in francophone school systems to 57 points in anglophone school systems. Fewer differences were found between the second and third quarters of the index, where the results were significantly different only for English-language students and boys. Results were similar between these quartiles in the other categories (Appendix A.2.4.5).

FIGURE 2.12 Relationship between the student effort index and mathematics achievement



* Significant difference compared to the adjacent lower quarter (the bottom quarter is compared to the top quarter) within each category

According to the scores for this index, Ontario students put more effort into their mathematics classes than did their counterpart in other provinces. Students in British Columbia, Alberta, Saskatchewan, Manitoba, and New Brunswick were found to have effort levels comparable to those of students in Canada overall, while the lowest effort in mathematics classes was found in the remaining provinces (Table 2.16, Appendix A.2.4.2).

TABLE 2.16 Comparison of Canadian and provincial results, student effort index

Above* the Canadian mean	Similar to the Canadian mean	Below* the Canadian mean
Ontario	British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick	Quebec, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

*Denotes significant difference

In both anglophone and francophone schools, Ontario students were found to have the highest scores on the effort in mathematics index. In English-language schools, students in British Columbia, Alberta, Saskatchewan, and Manitoba reported levels of effort similar to the Canadian English mean. In French-language schools, greater effort compared to the Canadian French mean was reported in all provinces except Quebec, where students scored below the Canadian mean on this index, and Alberta, where the index score was similar to the Canadian mean (Table 2.17, Appendix A.2.4.3).

TABLE 2.17 Comparison of Canadian and provincial results by language of the school system, student effort index

Anglophone school systems		
Above* the Canadian English mean	Similar to the Canadian English mean	Below* the Canadian English mean
Ontario	British Columbia, Alberta, Saskatchewan, Manitoba	Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Francophone school systems		
Above* the Canadian French mean	Similar to the Canadian French mean	Below* the Canadian French mean
British Columbia, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia	Alberta	Quebec

*Denotes significant difference

Within provinces, the index results show that students in francophone schools in Saskatchewan, Manitoba, Ontario, New Brunswick, and Nova Scotia reported putting more effort into their mathematics classes than did their counterparts in anglophone schools. No difference between the language systems was found in the remaining provinces (Table 2.18, Appendix A.2.4.3).

TABLE 2.18 Summary of provincial results by language of the school system, student effort index

Anglophone schools scored significantly higher than francophone schools	Francophone schools scored significantly higher than anglophone schools	No significant difference between school systems
	Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia	British Columbia, Alberta, Quebec

Girls and boys in Ontario and girls in New Brunswick reported the highest levels of effort in mathematics, all of which were above the Canadian mean. Results on this index were similar to the respective Canadian means for both girls and boys in British Columbia, Alberta, Saskatchewan, and Manitoba, and for boys in New Brunswick. Index results were below the respective Canadian means for both girls and boys in the remaining provinces (Table 2.19). In all provinces, girls' scores on this index were higher than those of boys (Table 2.20, Appendix A.2.4.4).

TABLE 2.19 Comparison of Canadian and provincial results by gender, student effort index

Girls		
Above* the Canadian mean for girls	Similar to the Canadian mean for girls	Below* the Canadian mean for girls
Ontario, New Brunswick	British Columbia, Alberta, Saskatchewan, Manitoba	Quebec, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Boys		
Above* the Canadian mean for boys	Similar to the Canadian mean for boys	Below* the Canadian mean for boys
Ontario	British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick	Quebec, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

*Denotes significant difference

TABLE 2.20 Summary of provincial results by gender, student effort index

Girls scored significantly higher than boys	Boys scored significantly higher than girls	No significant difference between girls and boys
All provinces		

Time management

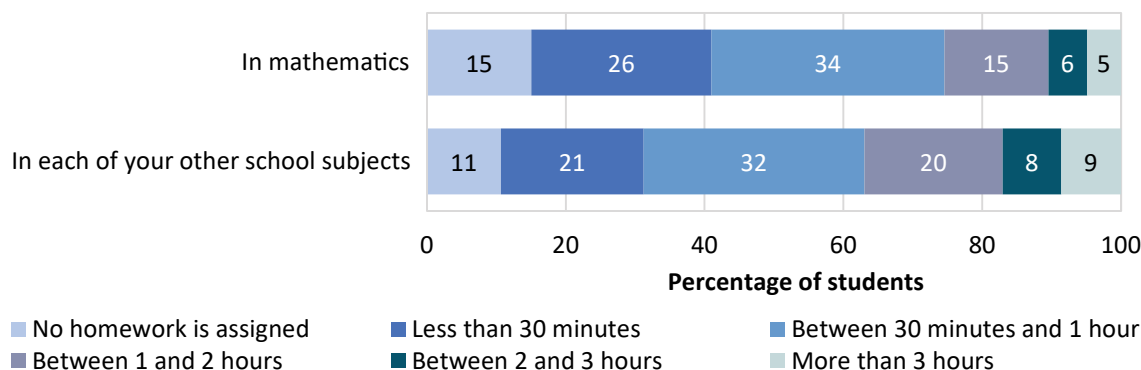
Classroom learning is considered to be the core of student learning. While curricular policies and school resources often set the tone for learning, students' day-to-day classroom activities are likely to have a considerable impact on their mathematics learning. Students are engaged in learning not only inside the classroom but also as they take part in activities outside of school, including homework, sports, and social interactions. To explore issues surrounding students' time management, this section looks at data related to effort invested by students on homework, the loss of learning time resulting from student absenteeism, and time spent on out-of-school activities.

Homework

Despite the emphasis that many teachers place on homework, students sometimes place a higher priority on their out-of-school activities than on completing their homework. Meanwhile, parents have to cope with the family stress that results from monitoring homework completion (Hoover-Dempsey et al., 2001; Warton, 2001). The majority of teachers, students, and parents believe that homework is a valuable, even essential, educational tool (e.g., Cooper et al., 1998; Xu, 2005). Yet it remains difficult to reach a definite conclusion about homework's value, despite the strong arguments the academic literature puts forward both for and against homework. For example, in a summary of research conducted in the United States between 1987 and 2003 on the effect of homework, Cooper, Robinson, and Patall (2006) concluded that there was generally consistent evidence for homework's positive influence on achievement, but they also acknowledged that all these studies had methodological issues. Empirical support for a positive relationship between homework and achievement is not unequivocal (e.g., De Jong et al., 2000; Trautwein & Köller, 2003). However, at least for mathematics in the middle grades, spending no time on homework is related to lower achievement; in contrast, for reading at the Grade 4 level, spending 15 minutes or less on homework is related to higher scores (CMEC, 2014).

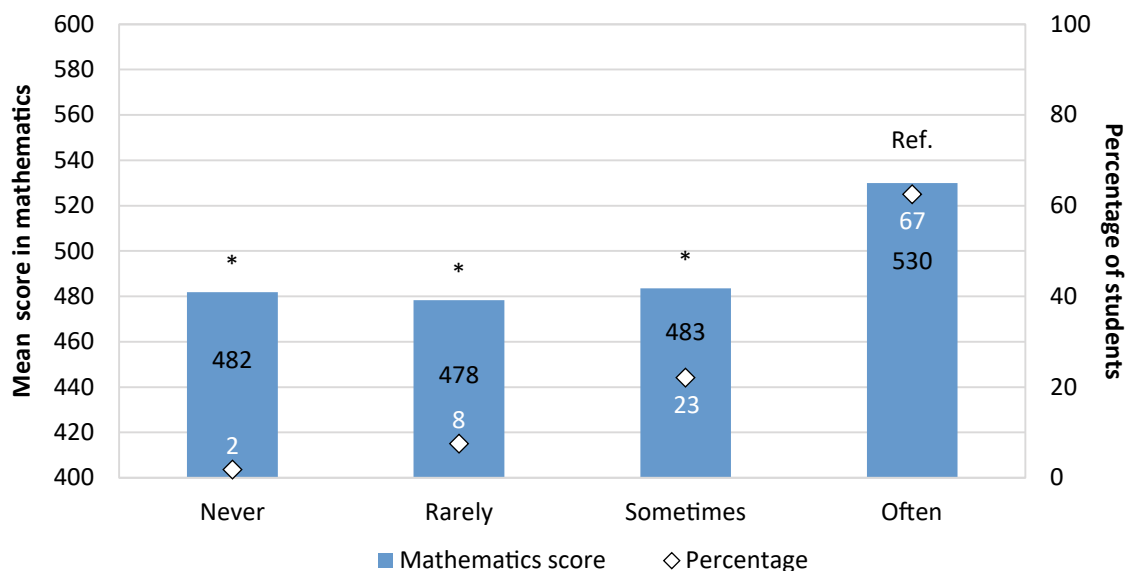
The PCAP 2019 student questionnaire asked students how much time they spent every week on homework. In general, students reported spending more time on homework in each of their other subjects than in mathematics. Close to 75 percent of students reported spending an hour or less on mathematics homework each week (this includes the students who reported that no mathematics homework was assigned). Just over one in four students reported spending over an hour on mathematics homework. Approximately two-thirds of students reported spending an hour or less per week on homework for each of their other school subjects (including 11 percent who reported that no homework was assigned in these subjects). Thirty-seven percent reported spending more than an hour on homework in each of their other school subjects. Just over 10 percent of students reported spending two or more hours on mathematics homework per week, while 17 percent reported doing this amount of homework in each of their other subjects (Figure 2.13, Appendix A.2.4.6).

FIGURE 2.13 Amount of time spent on homework each week



The questionnaire measured homework effort by asking students how often they completed their mathematics homework, using a four-point scale ranging from *never* to *often*. Ten percent of students reported rarely or never completing their homework, while 67 percent reported often completing their homework. As shown in Figure 2.14, student who often complete their homework had higher achievement scores in mathematics than did students who completed their homework less often. Indeed, a difference of more than 50 points in mathematics scores was found between students who reported that they often complete their homework and those who rarely do so (Appendix A.2.4.7).

FIGURE 2.14 Relationship between mathematics homework effort and mathematics achievement



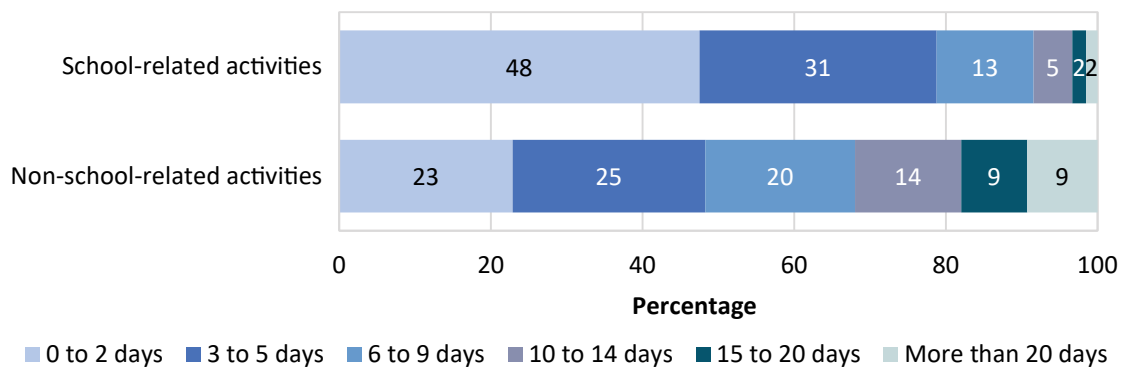
* Denotes significant difference compared to the *often* category

Loss of learning time

Although research in mathematics learning tends to focus on cognitive processes and strategies, students' motivation to learn is an important factor that can influence their academic success. Absence from classes in middle school and high school have been shown to affect both learning in the short term and educational attainment in the long term (Liu et al., 2021). While the negative impact of absenteeism on achievement has been found to be higher in reading than in mathematics (Holmes, 2020), it is clear that students who attend class regularly are more likely to have positive educational outcomes.

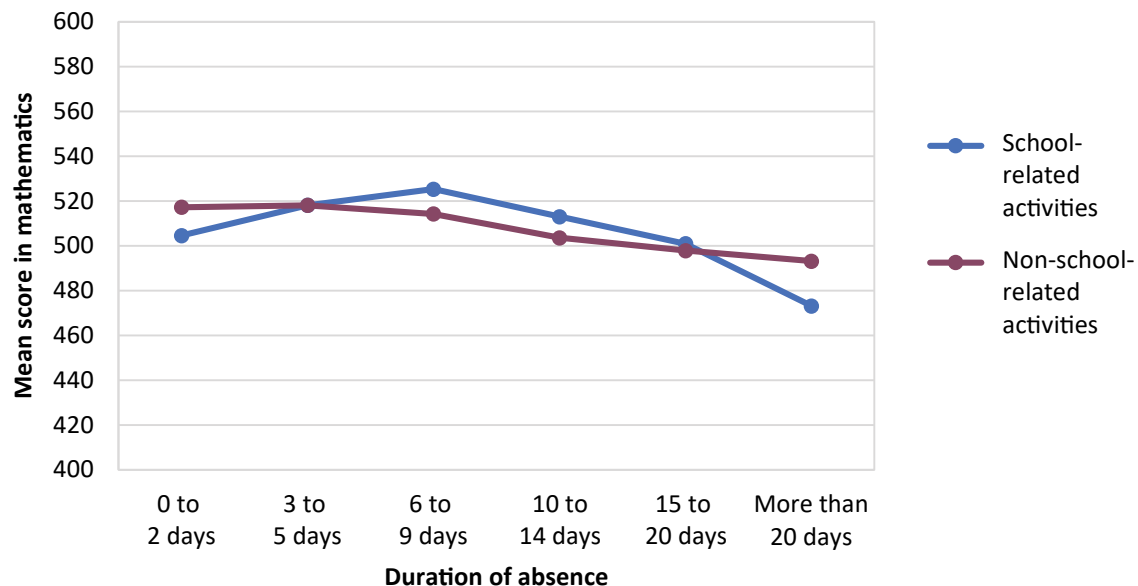
The PCAP student questionnaire asked respondents to report on their absences in the current school year and whether they were for non-school-related reasons (e.g., illness, appointments, travel, non-school sports activities, community events) or the result of school-related activities (e.g., field trips, school sports activities, music or cultural events). Approximately one-third of students reported having been absent from school for 10 days or more in that school year for non-school-related reasons, while 8 percent reported being absent for the same duration for school-related reasons. In general, students who reported being absent for five or fewer days were more likely to be away for school-related activities, whereas absences of six or more days tended to be more for non-school-related reasons (Figure 2.15, Appendix A.2.4.8).

FIGURE 2.15 Student-reported school absences



With respect to students' reports of absenteeism, the relationship between absence and mathematics achievement depends on the type of absence, as shown in Figure 2.16. There was a steady decline in mathematics scores as the number of absences for reasons that were not related to school increased. For school-related activities, results suggest that some involvement in activities such as field trips, sports, music, and so on, may be desirable, but that, at extreme levels, such absences may negatively influence achievement (Appendix A.2.4.8).

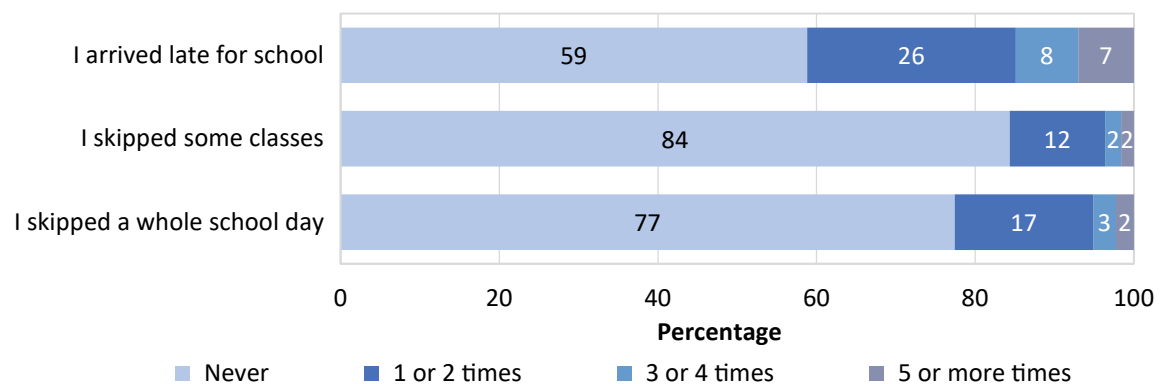
FIGURE 2.16 Relationship between student absences and mathematics achievement



Students may skip individual classes, or days of school, for a variety of reasons. Difficult home circumstances, poor relationships at school, substance abuse, and mental health problems are among the risk factors associated with chronic skipping of school.

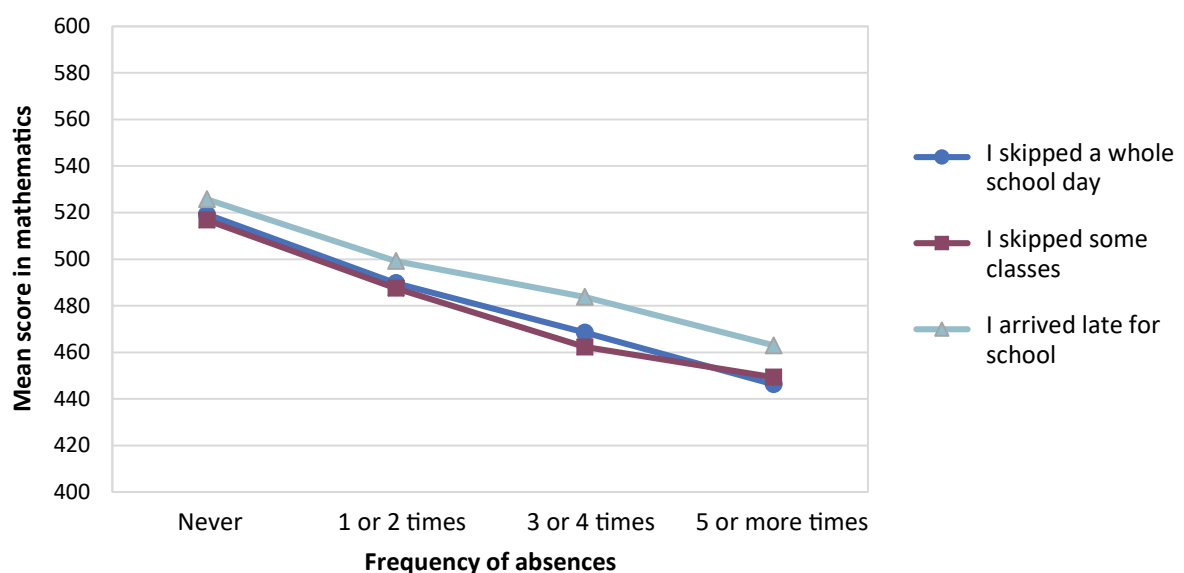
Students were asked whether, over the two weeks preceding the PCAP 2019 assessment, they had skipped either full days of school or some classes or had been late for classes. As shown in Figure 2.17, the majority of students were never absent or late during that period. For students who were late or absent, tardiness occurred more often than skipping school. For the minority that skipped one or more times during the two-week period, it is noteworthy that this group was more likely to miss entire days of school rather than just individual classes. As shown in Figure 2.18, students who were never tardy and never skipped classes or school days achieved the highest scores in mathematics, with scores declining as the frequency of missing classes or school days or arriving late increased (Appendix A.2.4.9).

FIGURE 2.17 Student-reported skipping and tardiness



Note: Students provided information on the two weeks prior to the PCAP administration.

FIGURE 2.18 Relationship between students' skipping and tardiness and mathematics achievement



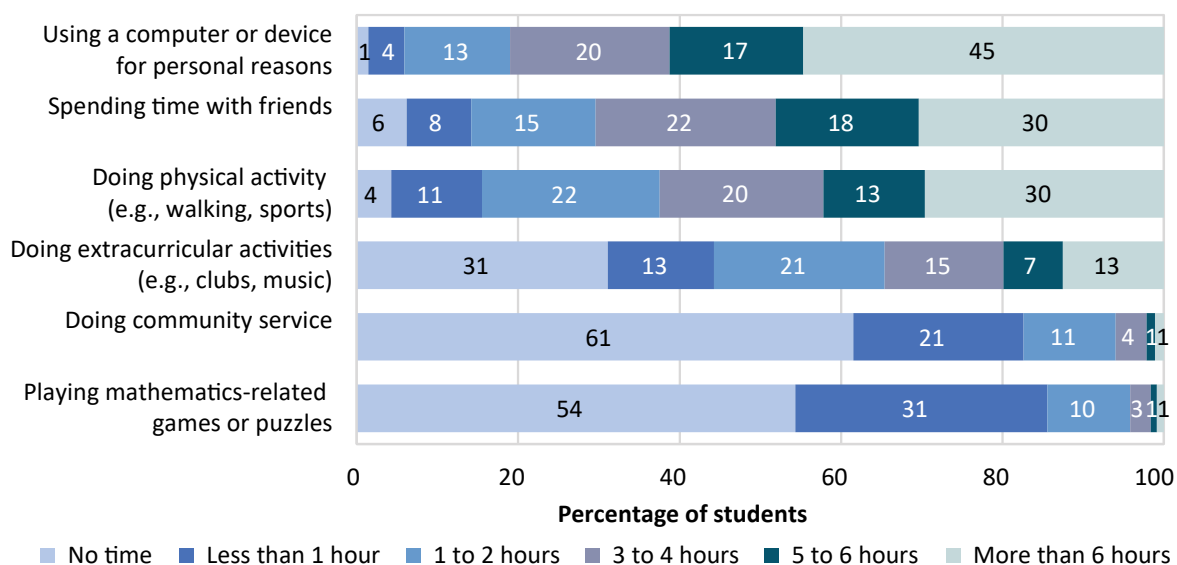
Note: Students provided information on the two weeks prior to the PCAP administration.

Out-of-school activities

Student's use of time outside of the classroom reflects their interests and priorities. Time outside the classroom can also provide learning opportunities through structured out-of-school activities such as sports or community activities as well as social interactions and technology-based entertainment. Studies have found that structured extracurricular activities have a positive relationship with students' school engagement and academic achievement (Galloway et al., 2013; Knifsend & Graham, 2012).

Although out-of-school activities were not shown to have a significant relationship with achievement in mathematics in PCAP 2019, it is interesting to discover how students in this age group use their time when they are not in the classroom. Students were asked to report on a six-point scale, from *no time* to *more than 6 hours*, the number of hours in an average week that they usually spend doing a variety of activities. As Figure 2.19 shows, most students reported that they spend many hours using technology for personal reasons, and 45 percent of students reported that they engage in such activities for more than six hours a week. Close to one in three students reported spending more than six hours a week with friends or doing physical activities, and more than 60 percent of all students reported that they participated in such activities three or more hours per week. More than two-thirds of students were involved in extracurricular activities, such as clubs or music, and about 40 percent of students reported that they were involved with community service for at least some time each week. The activity that they engaged in the least frequently involved playing mathematics-related games or puzzles: only 14 percent of students engaged in this activity for one or more hours per week (Appendix A.2.4.10).

FIGURE 2.19 Time spent by students per week on activities outside of school hours



Students' learning experiences

The classroom is where most formal learning takes place. Since students spend several hours each day in classes, PCAP focused on a number of factors that can influence classroom learning. This section explores two areas relevant to classroom learning, through indices related to understanding the language of mathematics and activities to support learning in mathematics.

Understanding the language of mathematics

The ability to communicate mathematically is a fundamental process in curriculum across Canada (see, e.g., Alberta Education, 2016; Nova Scotia, 2019; Ontario, 2020–21). The communication process is a way of sharing ideas and clarifying understanding, and helps to build meaning and permanence for ideas (National Council of Teachers of Mathematics, 2000; Pimm, 1991). According to the Western and Northern Canadian Protocol (2006), “Communication can help students make connections among concrete, pictorial, symbolic, verbal, written and mental representations of mathematical ideas” (p. 6). Communicating mathematically allows students to understand mathematical ideas and take part in the process of mathematical thinking (Pimm, 1991; Stein et al., 1996).

In order to explore their knowledge of mathematics terms found in the Grade 8/Secondary II curricula in Canada, students were asked about their level of familiarity with 16 mathematics terms, which they ranked on a four-point scale, from *never heard of it* to *know this concept well*. Through the process of principal component analysis, these items were organized into three components, which are described in Table 2.21. Component 1 (general mathematics terms) and Component 2 (geometry and measurement terms) were found to have a correlation above .2 with mathematics achievement, which is the threshold value for reporting. Component 3 did not reach the correlation threshold for reporting. For information purposes, that component, along with four items that were loaded onto more than one component, are listed in Table 2.21, but they are not included in this analysis.

TABLE 2.21 Principal component analysis of mathematics terms

Analysis of items listed in question “How familiar are you with the following mathematical terms?”		
Results of principal component analysis	Mathematics terms	Related subdomain(s)
Component 1: General mathematics terms Correlation: .4	• Percentage • Factors • Square root • Perimeter • Equation • Ratio	• Numbers and operations • Geometry and measurement • Patterns and relationships
Component 2: Geometry and measurement terms Correlation: .3	• Cartesian plane • Quadrant	• Geometry and measurement
Component 3 Correlation: < .2 Not included in report	• Histogram • Median • Mode • Sampling	• Patterns and relationships • Data management and probability
Items loaded onto multiple components Removed from analysis	• Percentage increase • Polygon • Integer • Quadrilateral	• Numbers and operations • Geometry and measurement

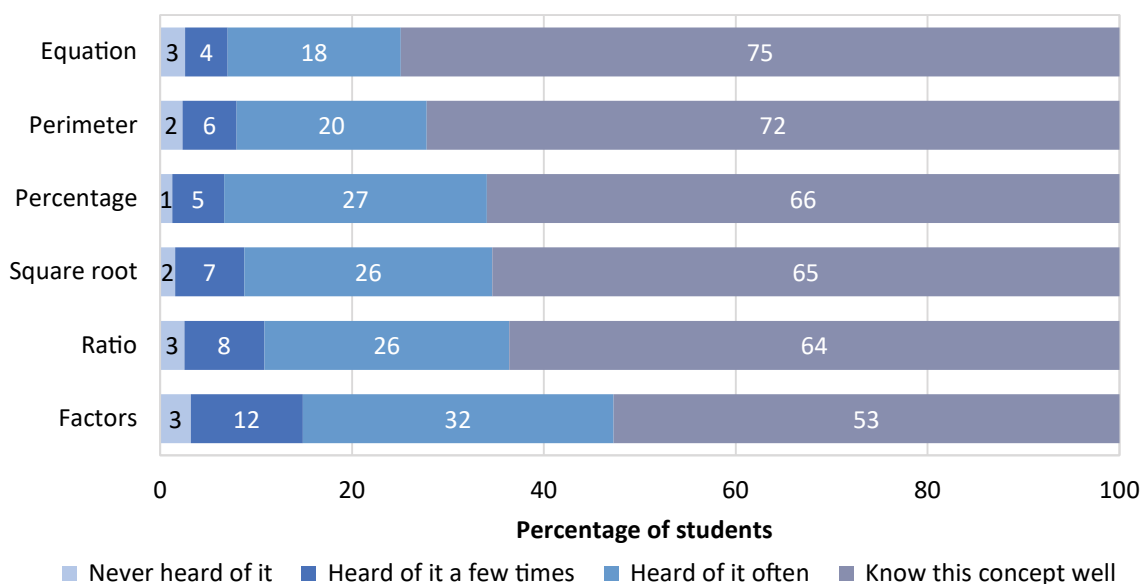
Knowledge of general terms in mathematics

Description of the index

Component 1 comprises six mathematics terms: *percentage*, *factors*, *square root*, *perimeter*, *equation*, and *ratio*. In this report, this component is referred to as the *knowledge of general terms in mathematics index* because the terms are found in three of the four subdomains described in the PCAP 2019 assessment framework: numbers and operations, geometry and measurement, and pattern and relationships (CMEC, 2020).

As shown in Figure 2.20, the majority of students reported that they know each of these concepts well. The most familiar terms to students were *equation* and *perimeter*, while the least familiar term was *factors*, with only about half of students reporting that they knew this term well. Approximately 10 percent of Grade 8/Secondary II students who participated in PCAP 2019 reported that they had never heard of these terms or had heard of them only a few times (Appendix A.2.5.1).

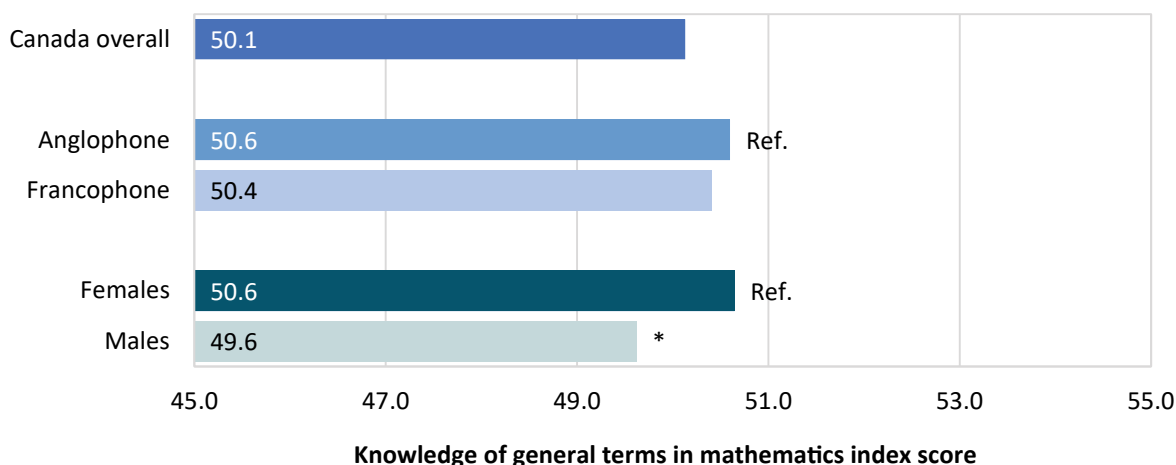
FIGURE 2.20 Percentage of students by their responses to questionnaire items constituting the knowledge of general terms in mathematics index



Results for the index

As shown in Figure 2.21, results for this index were similar for the two language groups, with no significant difference found between English- and French-language school systems at the pan-Canadian level. Some variation by language was evident at the provincial level (Appendix A.2.5.3). Girls had higher index scores than boys at the pan-Canadian level; this was also the case in all provinces except Ontario, where no gender gap was found (Appendix A.2.5.4).

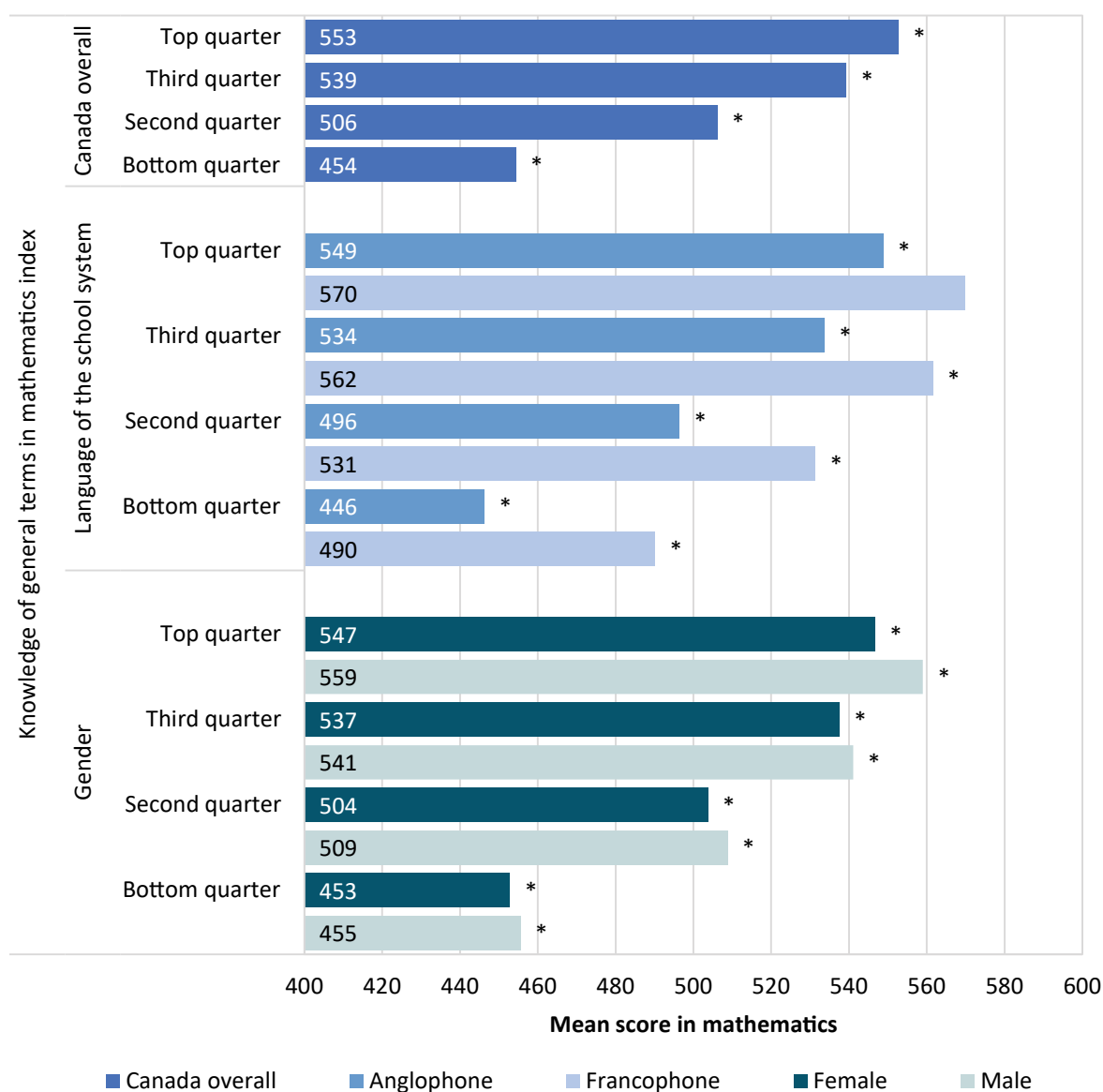
FIGURE 2.21 Results for the knowledge of general terms in mathematics index



* Significant difference compared to the reference (Ref.) in each category

Figure 2.22 shows the relationship between mathematics achievement and the knowledge of general terms in mathematics index. Students in the bottom quarter of the index were most likely to report that they had never heard of the six mathematics terms in this index or had heard of them only a few times. The top quarter of the index represents students who reported that they knew these terms well, which could reflect a greater understanding of mathematics concepts at this grade level. For each category in this index, a significant difference in mathematics achievement was found between the top and bottom quarters of the index. The largest difference was found for boys, with 104 point between the top and bottom quarters of the index, while the smallest difference was in francophone school systems, where 80 points separated students in the top and bottom quarters of this index (Appendix A.2.5.5).

FIGURE 2.22 Relationship between the knowledge of general terms in mathematics index and mathematics achievement



* Significant difference compared to the adjacent lower quarter (the bottom quarter is compared to the top quarter) within each category

Ontario students reported the highest level of knowledge of general mathematics terms, while students in Alberta, Saskatchewan, Quebec, and Nova Scotia reported levels of knowledge similar to that of Canadian Grade 8/Secondary II students as a whole. Students in the remaining provinces reported lower levels of knowledge of general mathematics terms than the Canadian average (Table 2.22, Appendix A.2.5.2).

TABLE 2.22 Comparison of Canadian and provincial results, knowledge of general terms in mathematics index

Above* the Canadian mean	Similar to the Canadian mean	Below* the Canadian mean
Ontario	Alberta, Saskatchewan, Quebec, Nova Scotia	British Columbia, Manitoba, New Brunswick, Prince Edward Island, Newfoundland and Labrador

*Denotes significant difference

The results for this index by language of the school system are summarized in Table 2.23. Ontario students reported higher knowledge of general mathematics terms in both language systems, compared to the respective Canadian means, while francophone students in Manitoba and New Brunswick scored higher than the Canadian French mean. Results similar to the respective English and French means at the pan-Canadian level were obtained by students in both language system in Alberta and Nova Scotia, by English-language students in Saskatchewan and Quebec, and by French-language students in British Columbia.

TABLE 2.23 Comparison of Canadian and provincial results by language of the school system, knowledge of general terms in mathematics index

Anglophone school systems		
Above* the Canadian English mean	Similar to the Canadian English mean	Below* the Canadian English mean
Ontario	Alberta, Saskatchewan, Quebec, Nova Scotia	British Columbia, Manitoba, New Brunswick, Prince Edward Island, Newfoundland and Labrador
Francophone school systems		
Above* the Canadian French mean	Similar to the Canadian French mean	Below* the Canadian French mean
Manitoba, Ontario, New Brunswick	British Columbia, Alberta, Nova Scotia	Saskatchewan, Quebec

*Denotes significant difference

Within provinces, francophone students scored higher than anglophone students in British Columbia, Manitoba, and New Brunswick, while no significant difference was found between the two systems in the remaining provinces (Table 2.24, Appendix A.2.5.3).

TABLE 2.24 Summary of provincial results by language of the school system, knowledge of general terms in mathematics index

Anglophone schools scored significantly higher than francophone schools	Francophone schools scored significantly higher than anglophone schools	No significant difference between school systems
	British Columbia, Manitoba, New Brunswick	Alberta, Saskatchewan, Ontario, Quebec, Nova Scotia

When scores on this index are examined by gender, only boys in Ontario scored above the overall mean score for Canada. Results similar to the respective Canadian means were found for both girls and boys in Alberta, Saskatchewan, and Quebec, and for girls in Manitoba, Ontario, Nova Scotia, and Newfoundland and Labrador (Table 2.25). At the provincial level, girls in all provinces except Ontario were more likely than boys to report that they knew general mathematics terms well (Table 2.26, Appendix A.2.5.4).

TABLE 2.25 Comparison of Canadian and provincial results by gender, knowledge of general terms in mathematics index

Girls		
Above* the Canadian mean for girls	Similar to the Canadian mean for girls	Below* the Canadian mean for girls
	Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Nova Scotia, Newfoundland and Labrador	British Columbia, New Brunswick, Prince Edward Island
Boys		
Above* the Canadian mean for boys	Similar to the Canadian mean for boys	Below* the Canadian mean for boys
Ontario	Alberta, Saskatchewan, Quebec	British Columbia, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

*Denotes significant difference

TABLE 2.26 Summary of provincial results by gender, knowledge of general terms in mathematics index

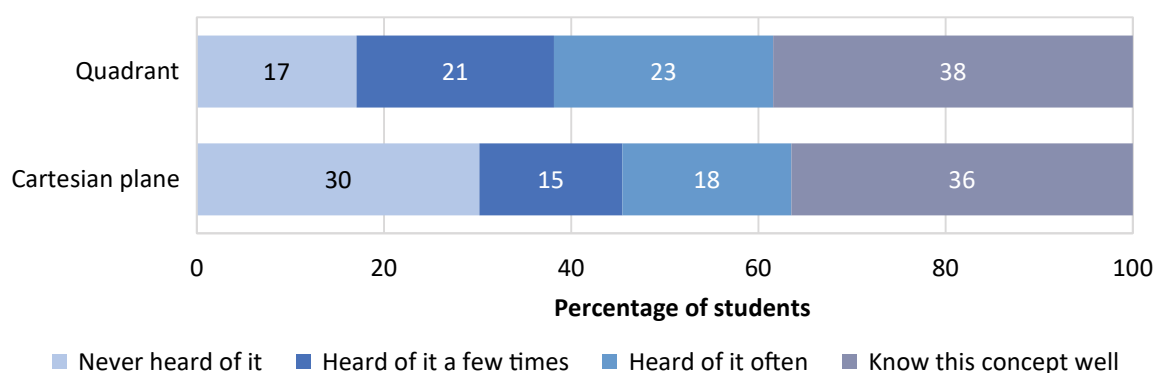
Girls scored significantly higher than boys	Boys scored significantly higher than girls	No significant difference between girls and boys
British Columbia, Alberta, Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador		Ontario

Knowledge of geometry and measurement terms

Description of the index

The second component that was found to be correlated with mathematics achievement includes two mathematics terms: *Cartesian plane* and *quadrant*. The terms in Component 2 are included in the subdomain of geometry and measurement in Grade 8/Secondary II; thus, the index is called the *knowledge of geometry and measurement terms index*. Students who participated in PCAP 2019 reported less familiarity with these terms than with those in the knowledge of general terms index. Whereas more than 50 percent of students reported that they knew the concepts in the general mathematics terms index well (see Figure 2.20), less than 40 percent reported the same level of knowledge with respect to the two terms specific to geometry and measurement. Indeed, 30 percent of students reported that they have never heard of the term *Cartesian plane*, and 17 percent reported that they had never heard of the term *quadrant* (Figure 2.23, Appendix A.2.6.1). Given that the PCAP assessment is administered in April and May, it may be possible that at least some of these students had not yet been taught these topics in their mathematics class.

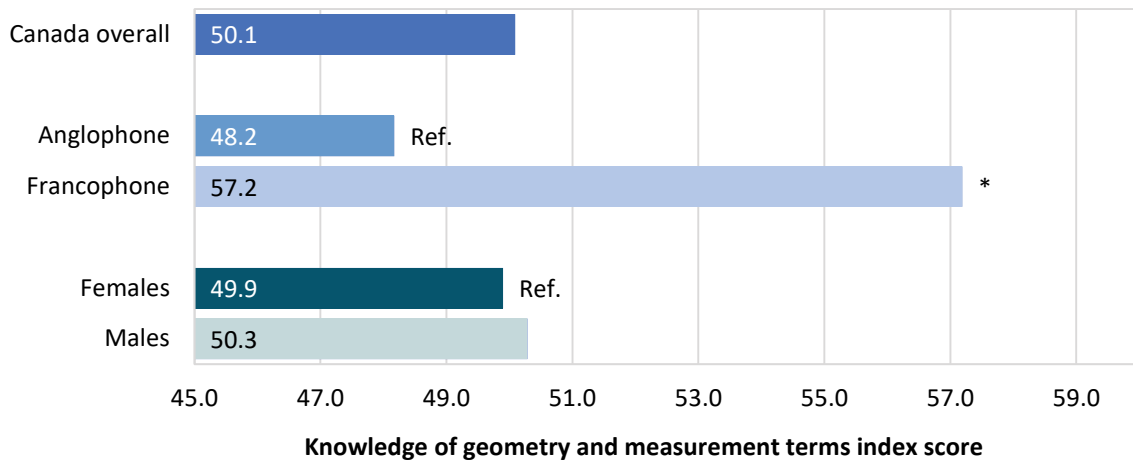
FIGURE 2.23 Percentage of students by their responses to questionnaire items constituting the knowledge of geometry and measurement terms index



Results for the index

As with the previous index, students in the top quarter of the geometry and measurement terms index were most likely to report that they know these concepts, while students in the bottom quarter are most likely to report that they have never heard of the terms. As shown in Figure 2.24, students in francophone schools had much higher scores on this index than did their peers in anglophone schools, while there was no difference by gender. Results for this index at the provincial level can be found in Appendices A.2.6.2, A.2.6.3, and A.2.6.4.

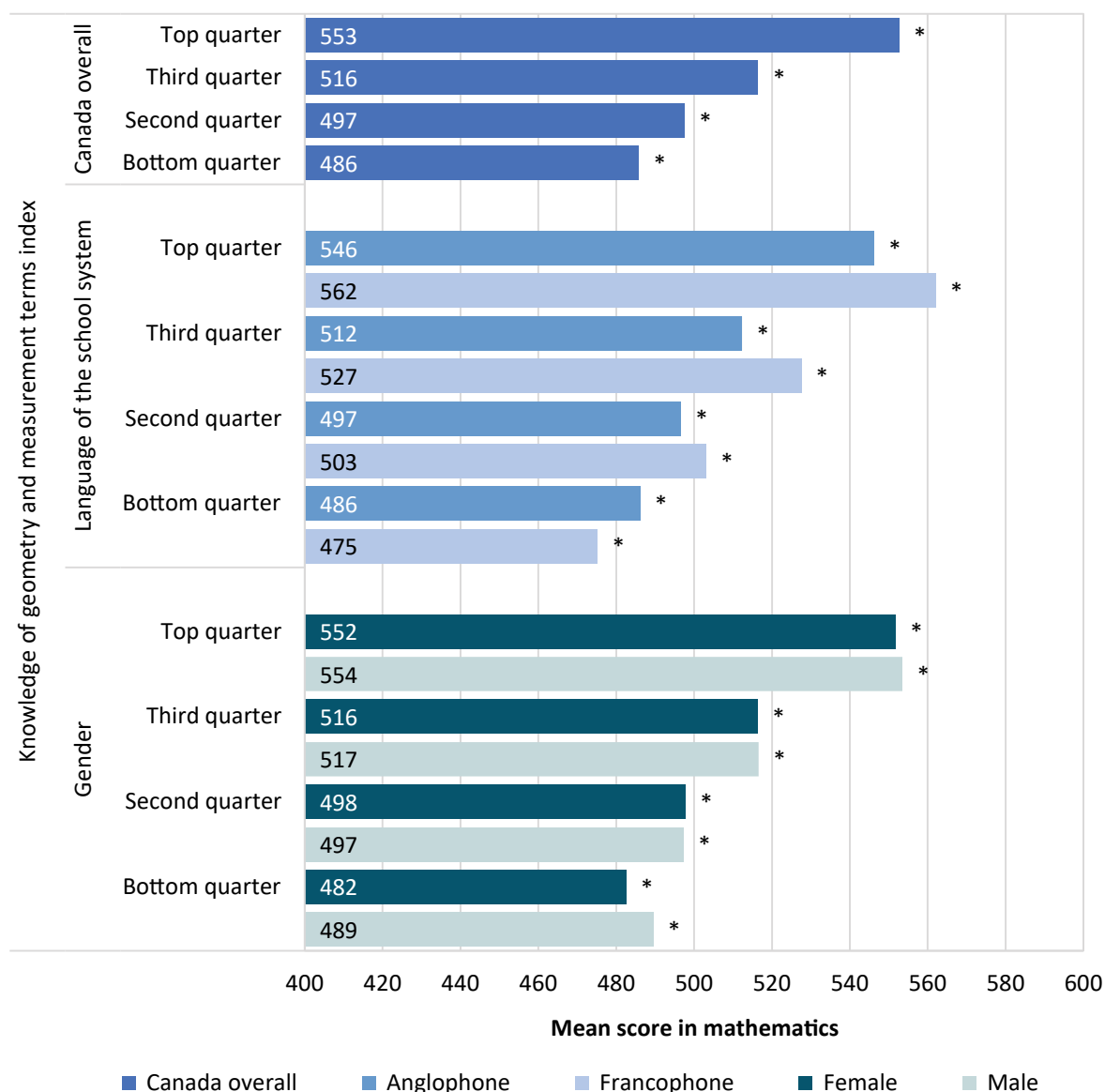
FIGURE 2.24 Results for the knowledge of geometry and measurement terms index



* Significant difference compared to the reference (Ref.) in each category

The relationship between this index and mathematics achievement is clear: greater knowledge of these terms is associated with higher scores in mathematics, and there are significant increases in scores between all quartiles in all categories (Figure 2.25, Appendix A.2.6.5).

FIGURE 2.25 Relationship between the knowledge of geometry and measurement terms index and mathematics achievement



* Significant difference compared to the adjacent lower quarter (the bottom quarter is compared to the top quarter) within each category

Students in Alberta, Quebec, and Prince Edward Island had scores at or above the Canadian mean for the knowledge of geometry and measurement terms index (Table 2.27, Appendix A.2.6.2). Students in both language systems in Quebec and in anglophone school systems in Alberta and Prince Edward Island scored above the respective Canadian means on this index. Ontario anglophone students achieved results similar to their peers in English-language schools in Canada overall (Table 2.28).

TABLE 2.27 Comparison of Canadian and provincial results, knowledge of geometry and measurement terms index

Above* the Canadian mean	Similar to the Canadian mean	Below* the Canadian mean
Quebec, Prince Edward Island	Alberta	British Columbia, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Newfoundland and Labrador

*Denotes significant difference

TABLE 2.28 Comparison of Canadian and provincial results by language of the school system, knowledge of geometry and measurement terms index

Anglophone school systems		
Above* the Canadian English mean	Similar to the Canadian English mean	Below* the Canadian English mean
Alberta, Quebec, Prince Edward Island	Ontario	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Newfoundland and Labrador
Francophone school systems		
Above* the Canadian French mean	Similar to the Canadian French mean	Below* the Canadian French mean
Quebec		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia

*Denotes significant difference

As shown in Table 2.29, in all provinces that oversampled to obtain results by language, students in francophone systems had higher scores than their anglophone counterparts on this index (Appendix A.2.6.3).

TABLE 2.29 Summary of provincial results by language of the school system, knowledge of geometry and measurement terms index

Anglophone schools scored significantly higher than francophone schools	Francophone schools scored significantly higher than anglophone schools	No significant difference between school systems
	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia	

When the results for this index are examined by gender, both girls and boys in Alberta, Quebec, and Prince Edward Island scored at or above the respective Canadian means, while the score for Ontario boys was similar to the Canadian mean for boys (Table 2.30).

TABLE 2.30 Comparison of Canadian and provincial results by gender, knowledge of geometry and measurement terms index

Girls		
Above* the Canadian mean for girls	Similar to the Canadian mean for girls	Below* the Canadian mean for girls
Quebec, Prince Edward Island	Alberta	British Columbia, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Newfoundland and Labrador
Boys		
Above* the Canadian mean for boys	Similar to the Canadian mean for boys	Below* the Canadian mean for boys
Quebec, Prince Edward Island	Alberta, Ontario	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Newfoundland and Labrador

*Denotes significant difference

Within provinces, gender equity on this index was found in Alberta. Girls achieved higher scores than boys in Quebec and Prince Edward Island, while boys scored higher than girls in the remaining provinces (Table 2.31, Appendix A.2.6.4).

TABLE 2.31 Summary of provincial results by gender, knowledge of geometry and measurement terms index

Girls scored significantly higher than boys	Boys scored significantly higher than girls	No significant difference between girls and boys
Quebec, Prince Edward Island	British Columbia, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Newfoundland and Labrador	Alberta

Activities used to support learning in mathematics

Teachers are expected to engage students by creating classrooms that encourage positive social interaction, active engagement in learning, and self-motivation (Danielson, 2007). Research in social science in the past several decades has come to recognize that learning is a collaborative, social process. This process involves situated learning that leads to the acquisition of knowledge and skills (Cobb, 1986; Cobb & Yackel, 2011; Lave & Wenger, 1991). For example, Lave, Murtaugh, and de la Rosa (1984) argue that reasoning with and about quantities should be understood as an achievement jointly created by individuals and resources in the environment, not just as operations involving symbols and mental representations. Mathematics classrooms are environments where, ideally, students encounter engaging, worthwhile, and challenging tasks (National Council of Teachers of Mathematics, 2000) and where “students can share their ideas, improve on each other’s ideas, challenge and be challenged, seek advice from peers, explain their thinking, provide evidence for their solutions, and explore evolving ideas and conjectures” (Learn Alberta, 2008). Yet in the report

on PISA 2012, the OECD (2013a) reported that only 25 percent of 15-year-olds help their friends with mathematics, and only 18 percent of students on average across the OECD reported that they regularly talk about mathematics problems with their friends (p. 106).

Description of the index

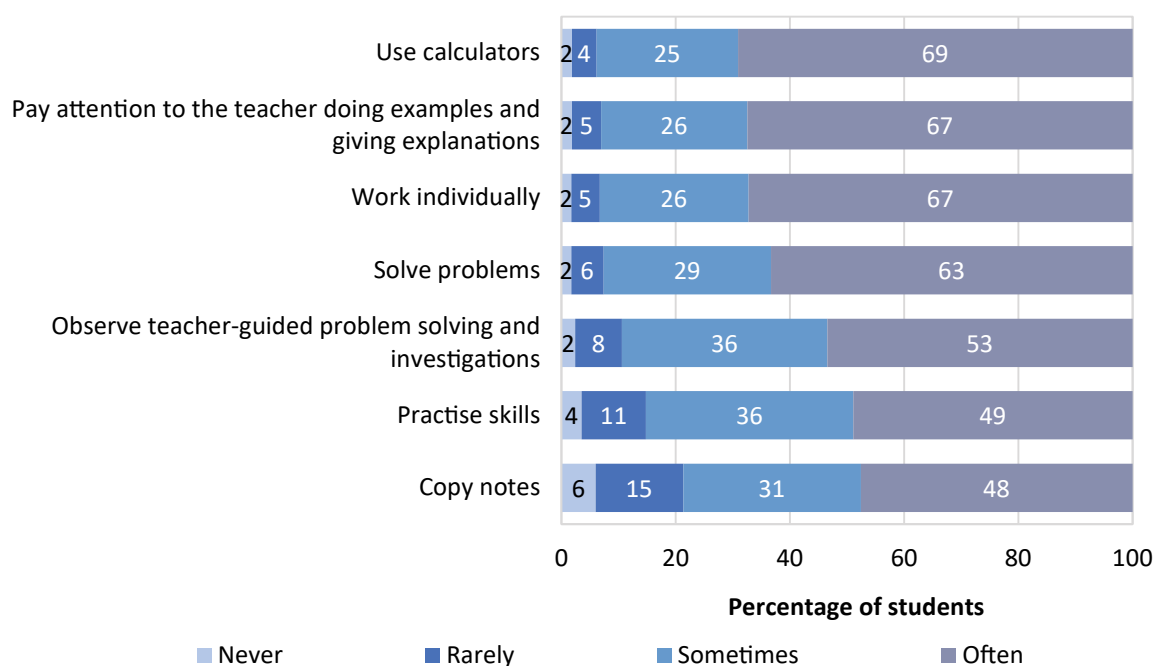
In order to explore the types of activities used in classrooms to support the learning of mathematics, a set of 15 items, listed in Table 2.32, was presented to students. A four-point scale (*never, rarely, sometimes, often*) was used to collect information on how often student did these activities in mathematics class. Through the process of principal component analysis, these items were organized into three components; however, only one of these correlated with mathematic achievement above the .2 threshold.

TABLE 2.32 Questionnaire items about activities in mathematics class

Items listed in question “How often do you do the following in your mathematics class?”		
Correlation with achievement ($\geq .2$)	Weak or no correlation with achievement ($< .2$)	
Component 1	Component 2	Component 3
• Pay attention to the teacher doing examples and giving explanations • Observe teacher-guided problem solving and investigations • Solve problems • Copy notes • Practise skills • Work individually • Use calculators	• Reflect on what was learned • Justify your reasoning • Use an alternative strategy to solve problems • Create your own mathematical problems	• Work in groups • Share solutions with others • Use concrete or virtual manipulatives (e.g., base-ten blocks, colour tiles, geometric solids) • Use computer software

This component includes seven items, as shown in Figure 2.26, which together constitute the *teacher-directed mathematics activities index*. Results reveal that approximately two-thirds of students often use calculators, pay attention to the teacher doing examples and giving explanations, work individually, and solve problems. About half of students reported that they often practise skills, copy notes, or observe teacher-guided problem solving and investigations. (Correlations between individual items and achievement can be found in Appendix A.2.7.1.)

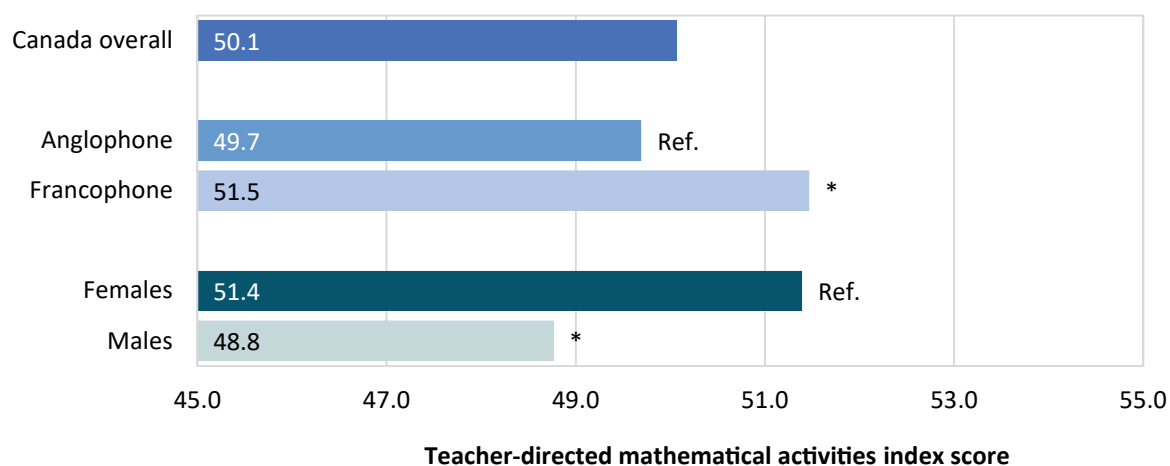
FIGURE 2.26 Percentage of students by their responses to questionnaire items constituting the teacher-directed mathematics activities index



Results for the index

Scores at the pan-Canadian level for the teacher-directed mathematics activities index are shown in Figure 2.27. French-language students scored higher on this index than English-language students, and girls obtained higher scores than boys (Appendices A.2.7.2, A.2.7.3, A.2.7.4).

FIGURE 2.27 Results for the teacher-directed mathematics activities index

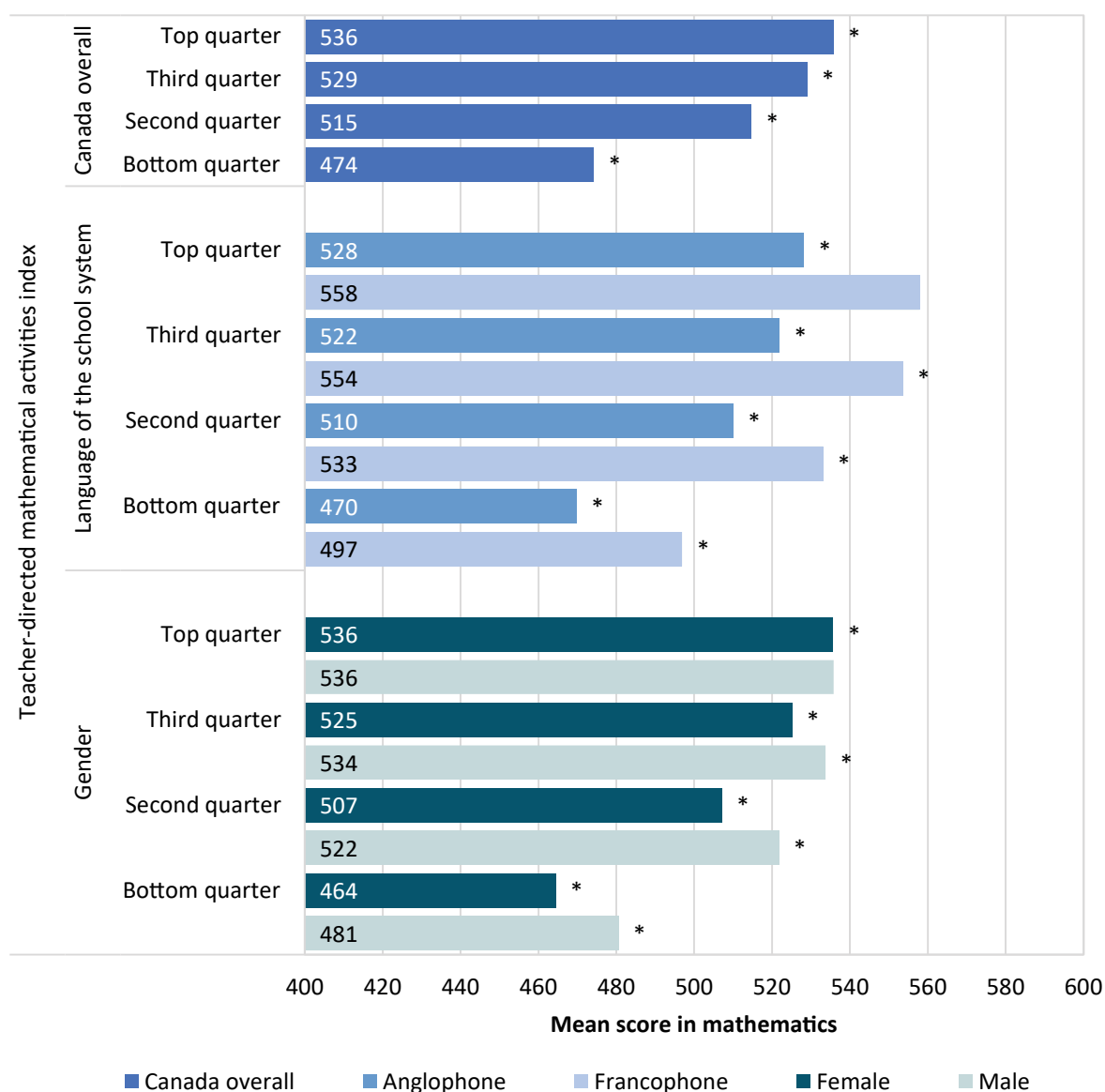


* Significant difference compared to the reference (Ref.) in each category

Students were divided into four quarters, based on the self-reported frequency with which they engaged in teacher-directed activities in their mathematics classrooms. The top quarter represents students who indicated that they often did the seven activities listed in Figure 2.26; the bottom quarter represents students who were most likely to report that they rarely or never did such activities.

Figure 2.28 shows the relationship between the teacher-directed mathematics activities index and mathematics achievement. It shows a general pattern in which mathematics performance improves as the frequency of doing teacher-directed activities increases. Although there is a significant increase in mathematics achievement between most quarters in the various categories, the point difference between the bottom and second quarters is greater than the difference in points between the second and third as well as the third and top quarters of the index (Appendix A.2.7.5).

FIGURE 2.28 Relationship between the teacher-directed mathematics activities index and mathematics achievement



* Significant difference compared to the adjacent lower quarter (the bottom quarter is compared to the top quarter) within each category

Students in Quebec were most likely to report that they often did the activities that constitute this index, and their score on this index is above the Canadian mean. All other provinces were either at or below the Canadian mean (Table 2.33, Appendix A.2.7.2).

TABLE 2.33 Comparison of Canadian and provincial results, teacher-directed mathematics activities index

Above* the Canadian mean	Similar to the Canadian mean	Below* the Canadian mean
Quebec	British Columbia, Alberta, Saskatchewan, Ontario, Nova Scotia, Newfoundland and Labrador	Manitoba, New Brunswick, Prince Edward Island

*Denotes significant difference

When scores are examined by language of the school system, index scores in Quebec were found to be above the Canadian mean in both anglophone and francophone schools. Results for the remaining provinces were similar to or below the respective Canadian means (Table 2.34, Appendix A.2.7.3).

TABLE 2.34 Comparison of Canadian and provincial results by language of the school system, teacher-directed mathematics activities index

Anglophone school systems		
Above* the Canadian English mean	Similar to the Canadian English mean	Below* the Canadian English mean
Quebec	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, Newfoundland and Labrador	New Brunswick, Prince Edward Island
Francophone school systems		
Above* the Canadian French mean	Similar to the Canadian French mean	Below* the Canadian French mean
Quebec	British Columbia, Alberta, Manitoba, Nova Scotia	Saskatchewan, Ontario, New Brunswick

*Denotes significant difference

Results on this index within provinces by language of the school system are shown in Table 2.35. Students in anglophone schools in Saskatchewan and in francophone schools British Columbia, Manitoba, and New Brunswick had higher scores on this index than their peers in the other language system. No significant difference between language systems was found for this index in the remaining provinces.

TABLE 2.35 Summary of provincial results by language of the school system, teacher-directed mathematics activities index

Anglophone schools scored significantly higher than francophone schools	Francophone schools scored significantly higher than anglophone schools	No significant difference between school systems
Saskatchewan	British Columbia, Manitoba, New Brunswick	Alberta, Ontario, Quebec, Nova Scotia

With respect to gender, girls in Quebec had higher index scores than the Canadian mean, while girls in Alberta, Saskatchewan, Ontario, Nova Scotia, and Newfoundland and Labrador had scores similar to that mean. Results similar to the Canadian average for boys were found in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and Newfoundland and Labrador (Table 2.36, Appendix A.2.7.4). Interestingly, girls in all provinces were more likely than boys to report that they often did the activities that constitute this index (Table 2.37).

TABLE 2.36 Comparison of Canadian and provincial results by gender, teacher-directed mathematics activities index

Girls		
Above* the Canadian mean for girls	Similar to the Canadian mean for girls	Below* the Canadian mean for girls
Quebec	Alberta, Saskatchewan, Ontario, Nova Scotia, Newfoundland and Labrador	British Columbia, Manitoba, New Brunswick, Prince Edward Island
Boys		
Above* the Canadian mean for boys	Similar to the Canadian mean for boys	Below* the Canadian mean for boys
	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Newfoundland and Labrador	New Brunswick, Nova Scotia, Prince Edward Island

*Denotes significant difference

TABLE 2.37 Summary of provincial results by gender, teacher-directed mathematics activities index

Girls scored significantly higher than boys	Boys scored significantly higher than girls	No significant difference between girls and boys
All provinces		

It could be useful to look at the individual activities that make up this index. Three activities showed a correlation with mathematics achievement above the .2 threshold: solving problems, practising skills, and working individually. Weak correlations, below the threshold of .2, were found for the remaining four activities. The positive relationship between achievement and doing these activities frequently may reflect the need for students to develop strong skills in mathematics through individual practice and problem solving.

Supporting student learning

A supportive learning environment is important for fostering a love of mathematics in students. Research consistently shows that students who feel supported in their efforts to learn are most likely to become confident and competent learners. PCAP 2019 focused on a number of topics that can influence student learning. This section explores six areas relevant to classroom learning: cross-curricular integration of mathematics, homework activities, assessment, frequency of use of rubrics, provision of feedback and support, and students' sense of belonging.

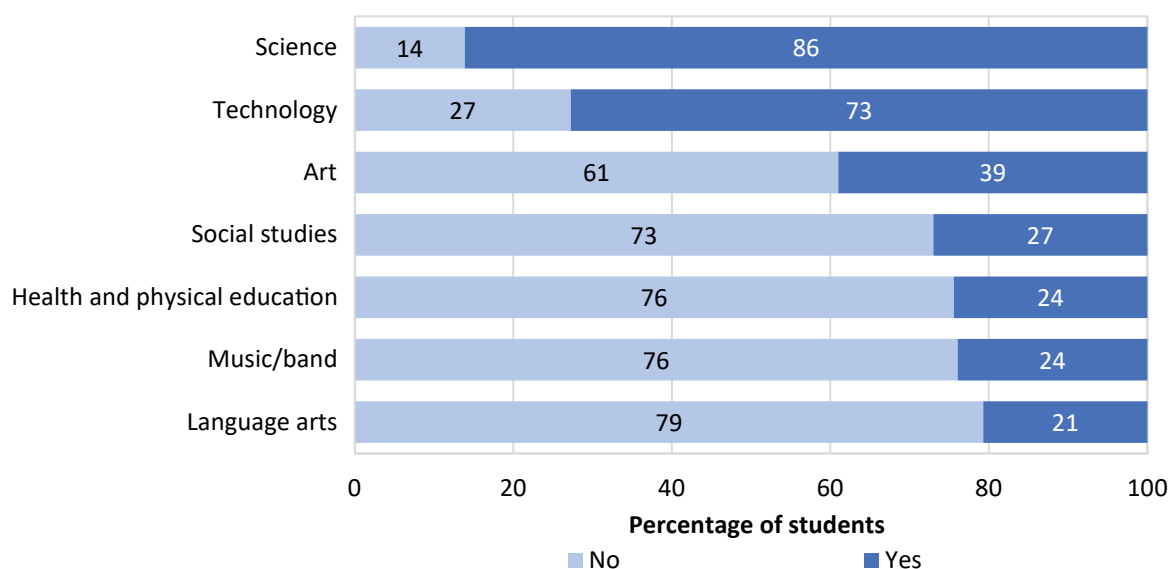
Cross-curricular integration of mathematics

The PCAP 2019 assessment framework describes common curricular concepts for Grade 8/Secondary II mathematics in Canada (CMEC, 2020). In addition to the four content subdomains (numbers and operations, geometry and measurement, patterns and relationships, and data management and probability), five processes are recognized as important aspects of learning mathematics. The mathematical processes of problem solving, reasoning and proof, communication, connections, and representation highlight ways of acquiring and using content knowledge.

In mathematics, students are asked to make connections between different representations (written, graphical, numerical, and algebraic) of mathematical ideas. However, a broader application of this process of connection is to recognize and connect mathematical concepts and procedures to contexts outside of mathematics, such as other curricular areas, personal life, current events, sports, technology, arts and culture, and media. Teachers who intentionally bring math into other subject areas, or who bring other subjects into math, can increase the motivation of students to learn mathematics by highlighting some of its real-world applications. Students who participated in context-based learning during cross-curricular theme weeks reported high levels of enjoyment and interest, with increased engagement in their learning (Birchinall, 2013). Integration of art with science and mathematics curricula at the postsecondary level has been found to contribute to students' motivation, understanding, and ability to apply knowledge (Rachford, 2011).

In order to explore whether students experienced mathematics in cross-curricular ways, the student questionnaire asked students if they have used what they learn in mathematics in seven other subjects, as shown in Figure 2.29. Given the focus on STEM education, it is unsurprising that students reported that mathematics is most frequently used in science (86 percent) and technology (73 percent) classes. In addition, close to 40 percent of students reported that they have used what they learned in mathematics in art class, while about one in four students reported using their knowledge of mathematics in the remaining four subjects (Appendix A.2.8).

FIGURE 2.29 Percentage of students who reported using what they learned in mathematics in other school subjects

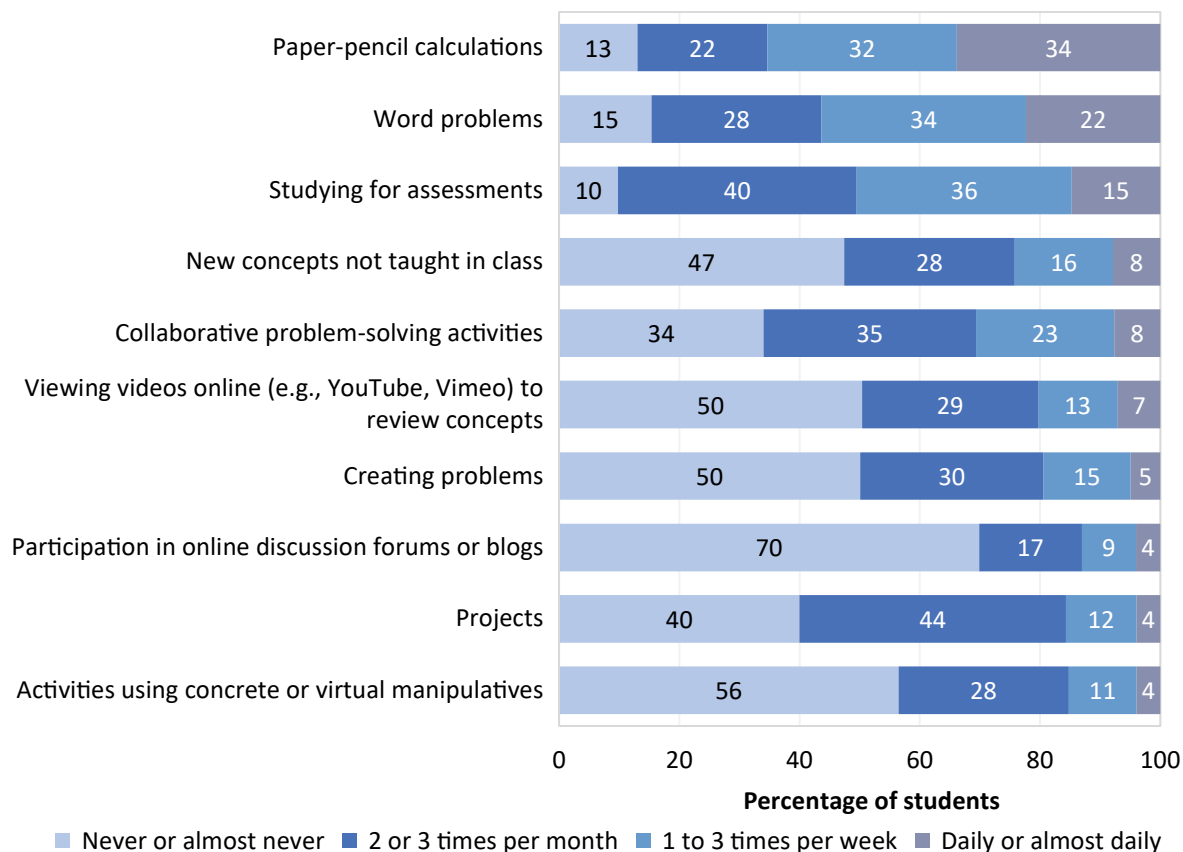


Homework activities

Teachers assign mathematics homework for various purposes, such as ensuring comprehension of the subject, knowledge retention, and use of the subject-related concepts in daily life. Homework is one of the most commonly used tools in classrooms (e.g., Trautwein et al., 2006) and has been shown to be useful in promoting students' agency and autonomy in their own learning (Ramdass & Zimmerman, 2011). Positive relationships have been found between homework completion and self-regulated learning skills (e.g., planning and monitoring) and self-efficacy beliefs in elementary and high school (Zimmerman & Kitsantas, 2005). A large body of research provides evidence of the value of homework for students' school engagement and academic success (e.g., Cooper, Robinson, et al., 2006; Fan et al., 2017; Núñez et al., 2013).

In the PCAP 2019 student questionnaire, 10 items were included in the question about the types of homework that was assigned in mathematics class. Students were asked to respond on a four-point scale (ranging from *never or almost never* to *daily or almost daily*). Figure 2.30 presents student responses. Students reported that the most common homework assigned was paper-and-pencil calculations, with 65 percent of students indicating that they were assigned this type of homework at least once per week. About half of students reported that word problems or studying for assessments were assigned for homework at least once per week. The least commonly assigned homework involved participation in online discussion forums or blogs and activities using concrete or virtual manipulatives (Appendix A.2.9). It is important to note that this assessment was administered in 2019 and does not reflect the shift to online learning that was a necessary safety precaution in response to the global pandemic.

FIGURE 2.30 Types of homework assigned in mathematics class, as reported by students

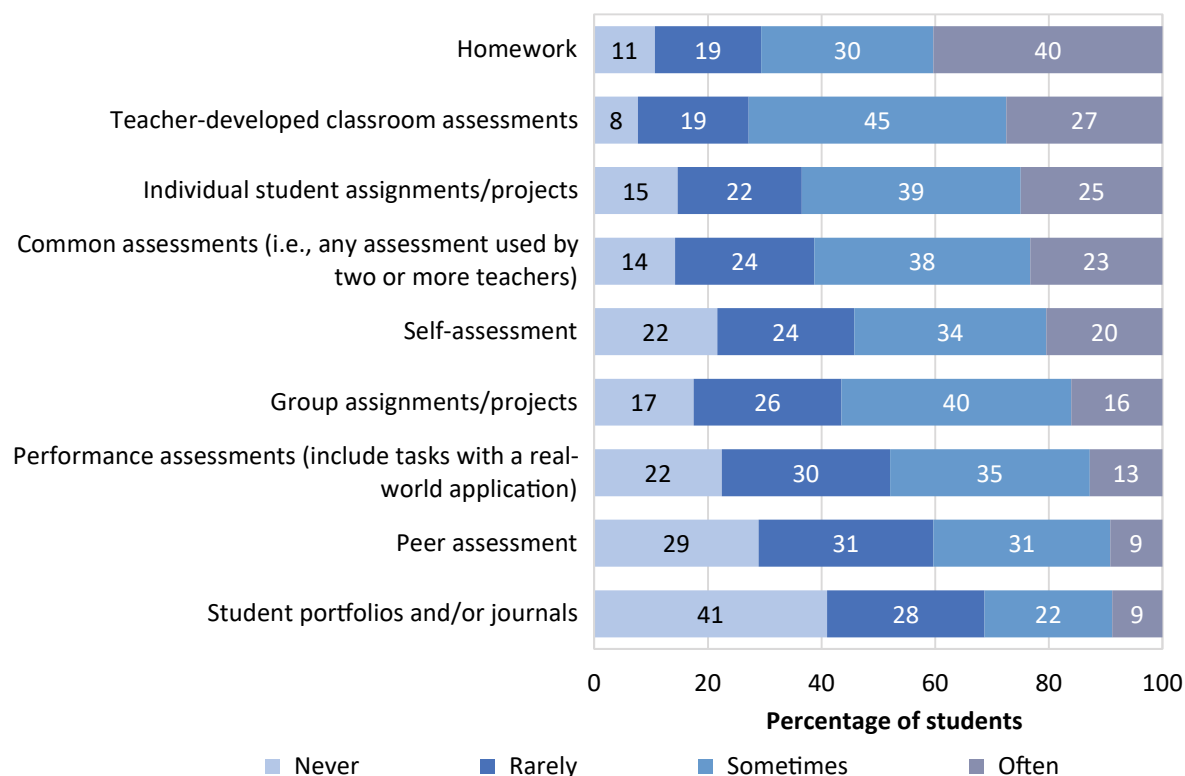


Assessment

Teachers use assessment to gain insight into students' current ideas, gaps in understanding, and reasoning processes. This information can then be used to adapt instructional and assessment strategies to student needs. The power of assessment to reveal and support learning depends on how well students' responses authentically reflect their thinking and understanding (Shepard, 2005). Students were asked about how they were assessed, as well as about the use of rubrics and feedback in their classes.

To explore how they are assessed in mathematics, the student questionnaire asked students to rank the frequency (on a four-point scale from *never* to *often*) with which nine different types of assessments were used in their mathematics classes. As shown in Figure 2.31, at least 70 percent of students reported that they are sometimes or often assessed using homework or teacher-developed classroom assessments. Students are more likely to be assessed on individual, rather than group, assignments or projects; this approach may reflect the difficulty of fairly assessing individual contribution to work done by multiple students. The least common types of assessments used in mathematics class were student portfolios and/or journals, and peer assessment (Appendix A.2.10.1).

FIGURE 2.31 Types of assessment in mathematics classes, as reported by students



Rubrics

Assessment is integral to learning (Gronlund & Waugh, 2009); effective assessment requires a systematic, planned process to collect data and can result in improvements in both teaching and learning. To make the assessment of learning more transparent for students, and to communicate goals and expectations, teachers are increasingly providing them with information both before and after an assignment.

Rubrics provide students with a shared understanding of the specific, pre-established criteria that will be used to evaluate their work. Huba and Freed (2000) describe how “a rubric reveals, if you will, the scoring ‘rules.’ It explains to students the criteria against which their work will be judged ... [and] it makes public key criteria that students can use in developing, revising, and judging their own work” (p. 155).

Students were asked if they were familiar with a scoring rubric and if they used such a rubric when starting an assignment. Although about three-quarters of students reported knowing what a rubric is, only half of students reported that they sometimes use a rubric when starting an assignment in mathematics class (Figure 2.32, Appendix A.2.10.2). As shown in Figure 2.33, students who reported that their teachers often use a rubric when marking assignments have higher scores in mathematics than those in classrooms where rubrics were used less frequently (Appendix A.2.10.3).

FIGURE 2.32 Use of scoring rubrics in mathematics, as reported by students

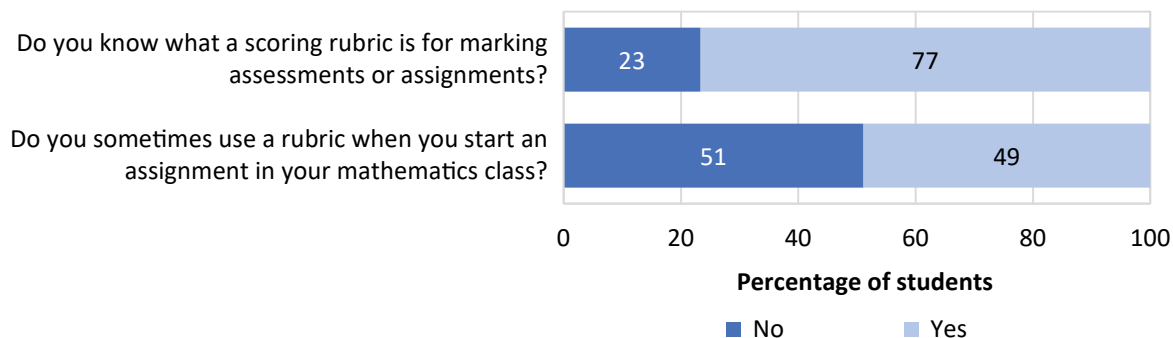
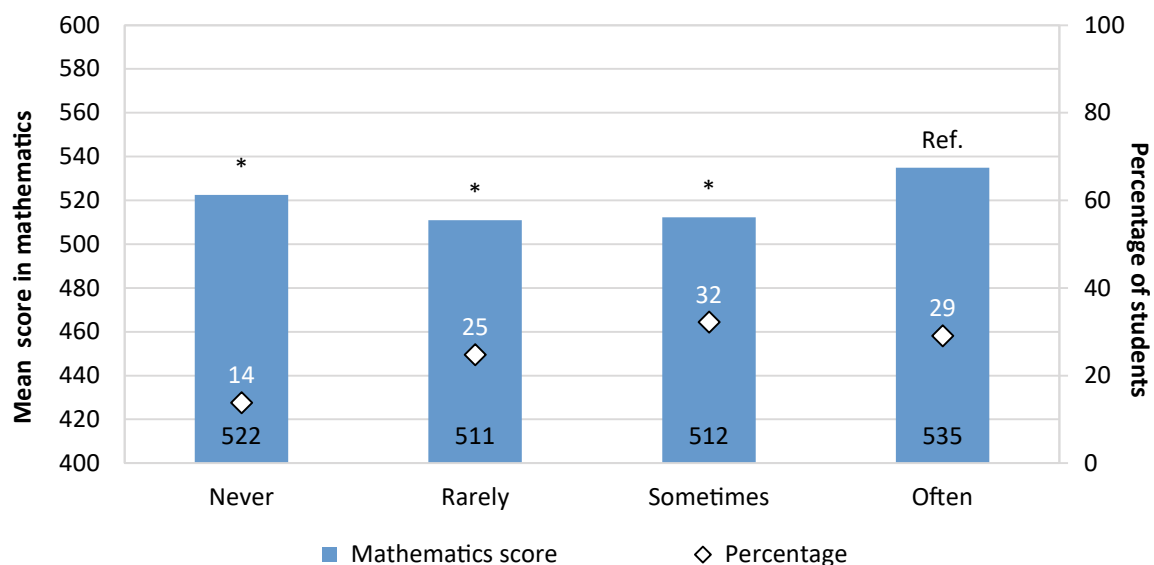


FIGURE 2.33 Relationship between the frequency with which teachers use scoring rubrics and mathematics achievement



* Significant difference compared to the *often* category

Feedback and support

While a scoring rubric provides students with information about how their work will be assessed before beginning their assignments, feedback provides students with information afterwards to help them improve their learning. Researchers have suggested that providing feedback might foster improved learning, motivation, and achievement. However, to be effective, feedback has to be timely and focused on understanding and improvement or comparative performance, or both (Muis et al., 2013).

Students were asked about the frequency with which they received four types of feedback and support in mathematics class, as shown in Figure 2.34 (Appendix A.2.11.1). Over 75 percent of students reported that they sometime or often receive support in the form of information to help them solve a problem, details on marking criteria, and regular feedback to improve their learning.

FIGURE 2.34 Types of teacher feedback and support given in mathematics class, as reported by students

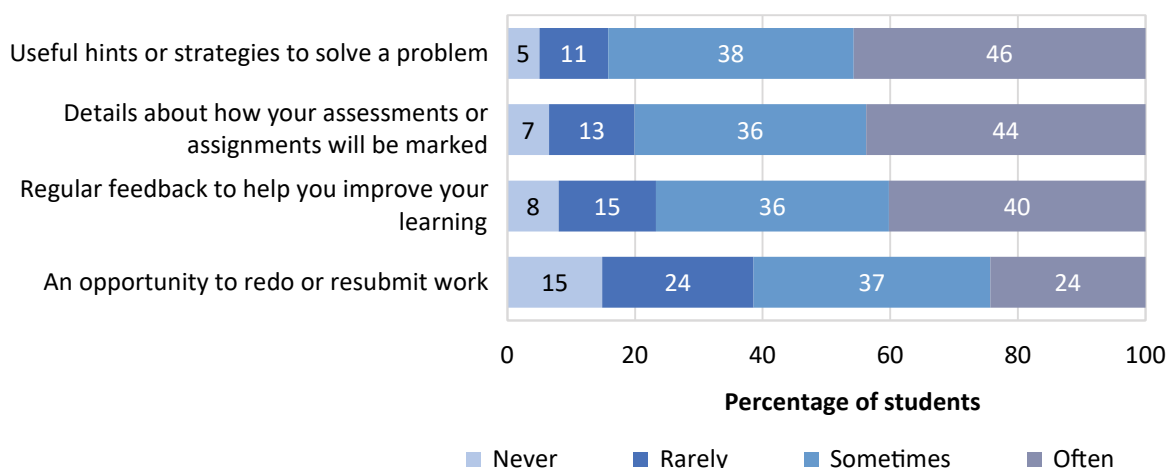
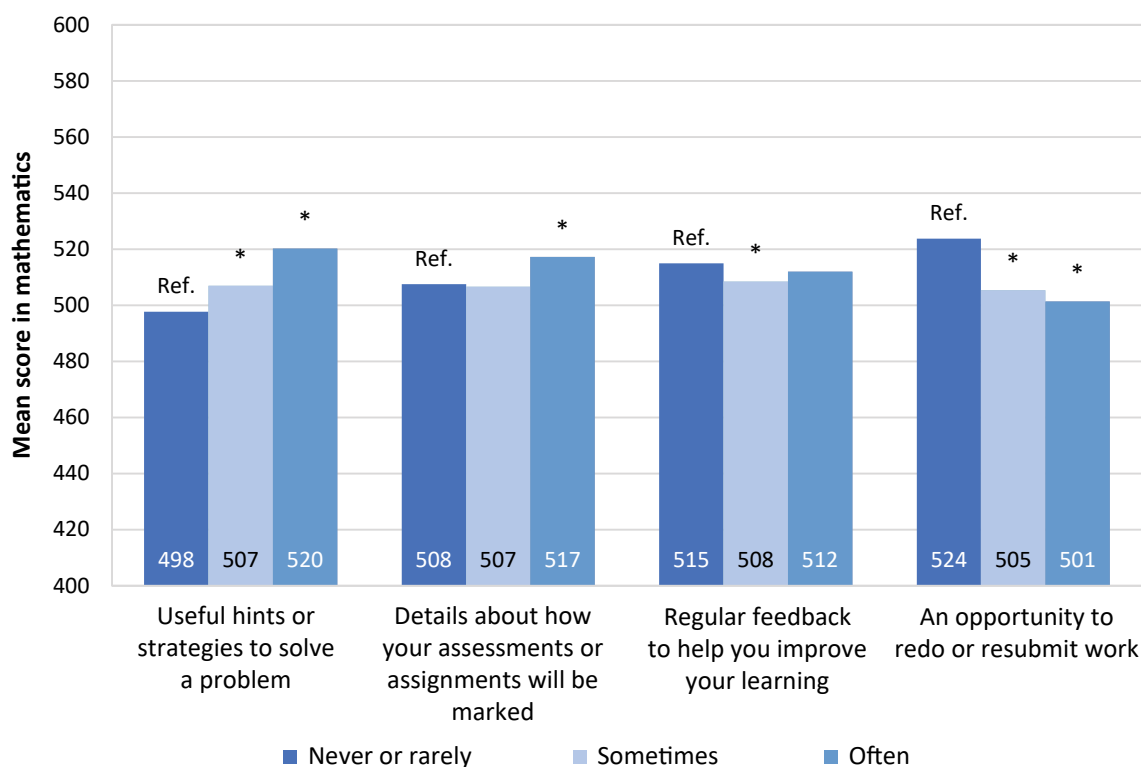


Figure 2.35 presents the relationship between the frequency with which these types of supports are provided and achievement in mathematics (Appendix A.2.11.2). Increasing the frequency of providing hints or strategies to solve a problem had the strongest positive relationship with achievement, with a 23-point difference between the *never or rarely* and *often* categories. Providing details about marking was associated with higher mathematics scores only when it was done often. Surprisingly, increasing the frequency of regular feedback to improve learning was not associated with higher scores in mathematics. Providing students with opportunities to redo or resubmit work had a negative relationship with achievement, with a 22-point decrease in achievement between the *never or rarely* and *often* categories (Figure 2.35, Appendix A.2.11.2). It is important to exercise caution when interpreting this finding, as providing an opportunity to redo or resubmit work is not necessarily associated with lower achievement. More information about both the student and classroom contexts is needed to more fully understand this relationship.

FIGURE 2.35 Relationship between the frequency with which teachers provide feedback and support and mathematics achievement



* Significance difference compared to the *never or rarely* category

Students' sense of belonging

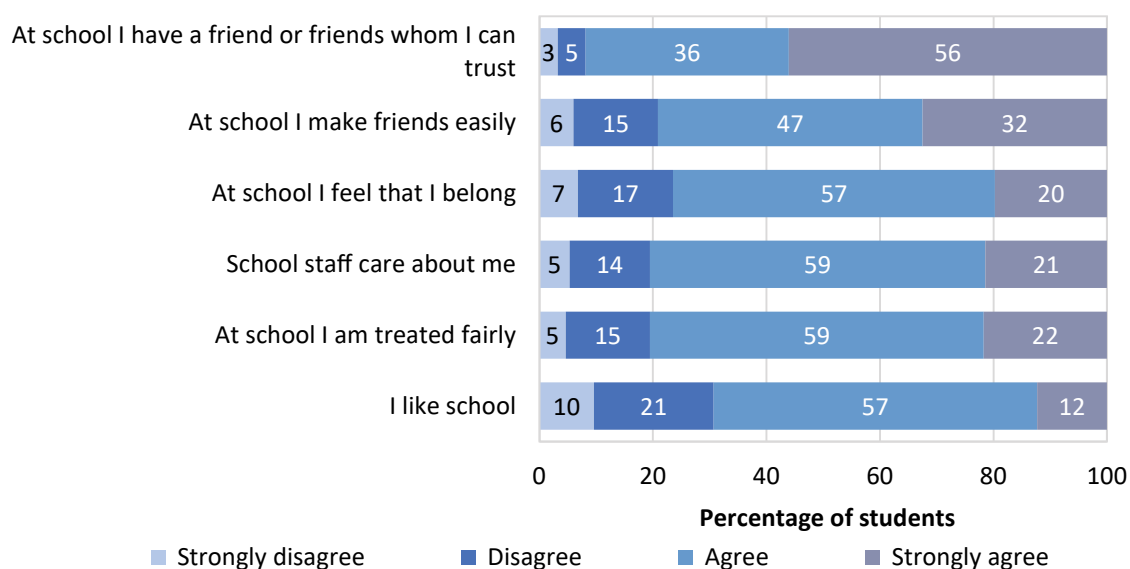
The relationship between students and teachers holds an important place within the research literature on students' sense of belonging or school connectedness. Students who experience school connectedness tend to like school, feel that they belong, believe teachers care about them and their learning, believe that education matters, have friends at school, believe that discipline is fair, and have opportunities to participate in extracurricular activities (Blum, 2005). A student's sense of belonging has a powerful influence over how they feel about school and whether they feel safe at school, and it is pivotal in producing academic success, emotional health and well-being, social development, and long-term productivity (Whitlock, 2003).

There is an abundance of research on the different impacts of student attitudes, confidence, and participation on their mathematics performance but, as Hattie (2009) points out, "correlates are not to be confused with the cause" (p. 3). Research exploring the contextual character of learning shifts the focus from individual, cognitive notions of ability to investigations into the importance of social interaction in learning situations (Lerman, 2000). More recently, research in mathematics is confronting issues of social justice (e.g., with respect to gender, ethnicity, class, linguistic background), recognizing that society can constrain student agency and participation (Black et al., 2009; Herbel-Eisenmann et al., 2012).

In PCAP 2019, students were asked to indicate the extent to which they agreed with statements about their sense of belonging in school. The overwhelming majority agreed or strongly agreed with all statements related to their sense of belonging (Figure 2.36). For example, over 90 percent of

students stated that they have a friend or friends at school whom they can trust, and approximately 80 percent of students reported that they make friends easily at school and feel that they belong. However, about one in three students reported that they disagreed with the statement “I like school” (Appendix A.2.12).

FIGURE 2.36 Students’ sense of belonging in school



The differences in mathematics achievement between students who strongly agree and those who strongly disagree with the respective statements related to sense of belonging in school are shown in Figure 2.37. The data show the largest difference for “At school, I am treated fairly” (60 points) and the smallest difference for “At school, I make friends easily” (20 points) (Appendix A.2.12).

FIGURE 2.37 Relationship between students' sense of belonging in school and mathematics achievement

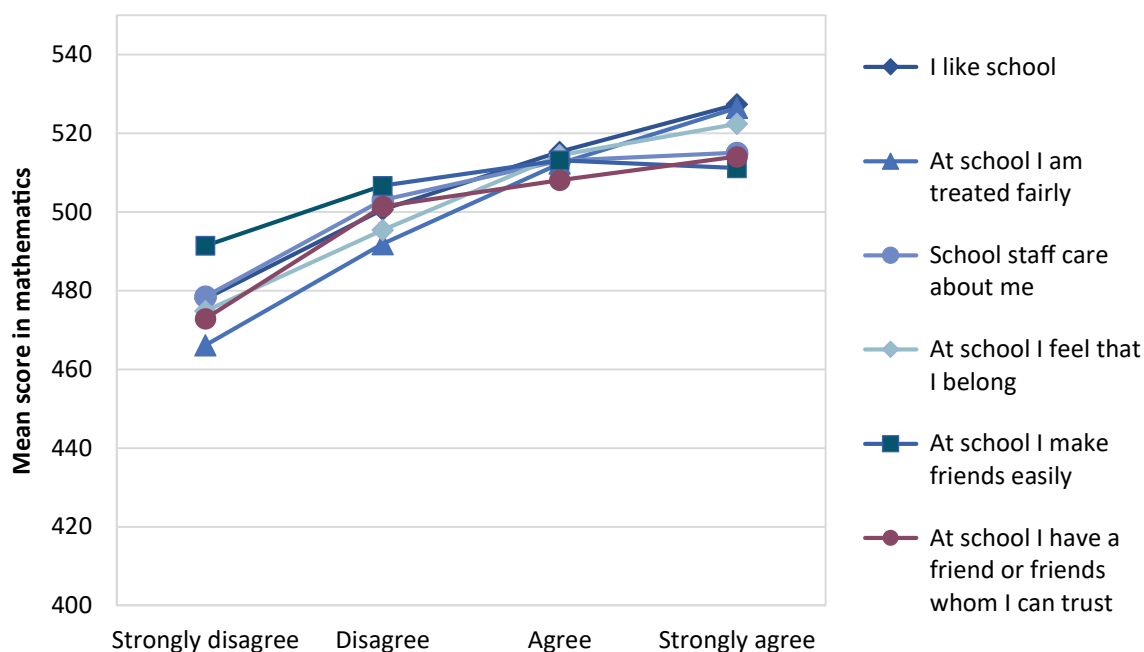
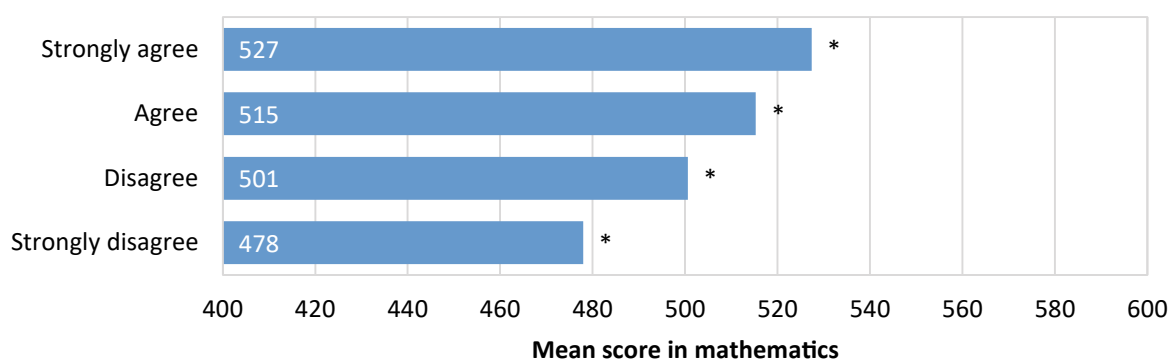


Figure 2.38 highlights the results for the item “I like school.” More positive responses to this statement are associated with higher achievement in mathematics — a significant finding, as close to one-third of students reported that they disagreed with the statement. As school is a social endeavour, positive interactions with teachers and peers are an important component in motivating students to learn and to appreciate the value of mathematical knowledge both in school and in future career opportunities.

FIGURE 2.38 Relationship between students' response to the statement “I like school” and mathematics achievement



* Significant difference compared to the adjacent lower quarter (and bottom quarter compared to top quarter) within each category

Cognitive demand in mathematical tasks

There is a drive by policy-makers, educators, and assessment developers to increase the cognitive demands of tasks used in classrooms and assessed on large-scale assessments in order to support competencies required for postsecondary education and careers (e.g., Darling-Hammond et al., 2013; OECD, 2018). Webb's depth of knowledge (DOK) framework is a tool that can be used to organize questions into different levels of cognitive complexity (Webb, 2002). Webb's framework lays out descriptions for four DOK levels. In mathematics, these can be summarized as follows: Level 1, recall; Level 2, skills and concepts; Level 3, strategic thinking; and Level 4, extended thinking (Webb, 2002). Darling-Hammond et al. (2013), in their *Criteria for High-quality Assessments*, recommend that at least two-thirds of the items in an assessment be at Level 2 or higher, and that, in mathematics, at least one-third of assessments items should be at Level 3 or 4.

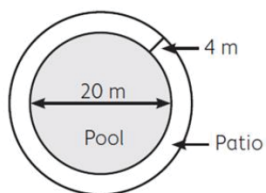
Level 1 problems

Some mathematics problems describe scenarios and provide all the information required to solve them. The two examples given below are considered to be Level 1 questions.

Example 1:

The diameter of a circular swimming pool is 20 m.

This pool has a circular concrete patio around it.



What is the circumference of the outside edge of the patio?

Example 2:

The price of a video game increased from \$30 to \$45.

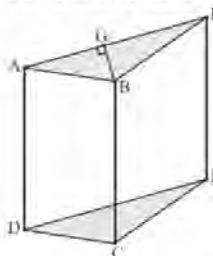
What is the percentage increase in the price of the video game?

Level 3 problems

Some mathematics problems do not describe scenarios but require the use of mathematical knowledge to form conclusions. The two examples given below are considered to be Level 3 questions.

Example 1:

The volume of this right triangular base prism is 124.8 cm^3 . The length of AE is 6.5 cm.



Explain what additional information would be needed in order to determine the height of the prism.

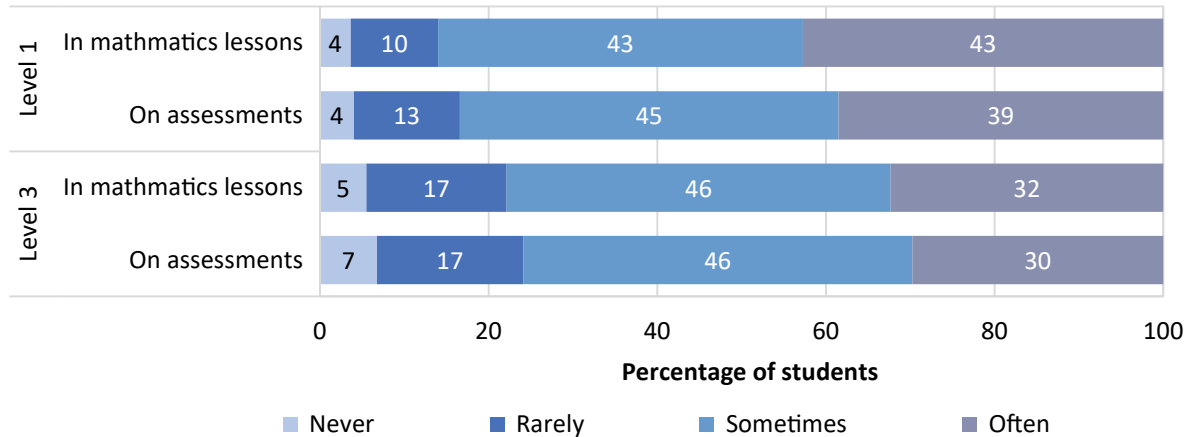
Example 2:

If n is any even number: can $3n$ be an odd number?

Cognitive demand of questions used in mathematics class

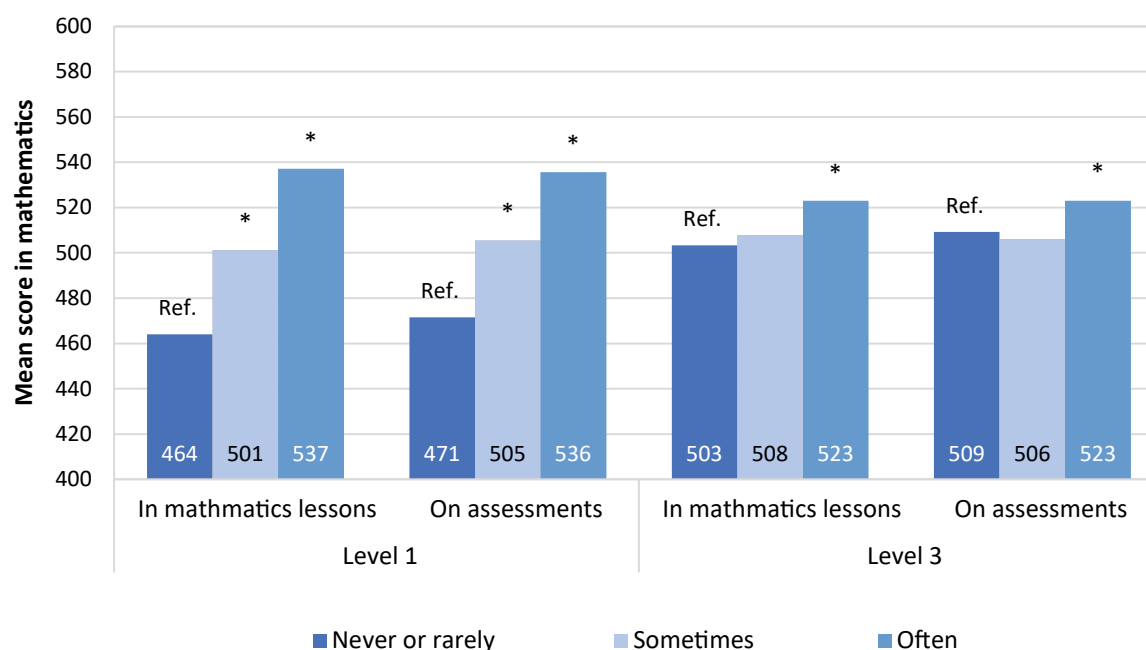
In the PCAP 2019 student questionnaire, students were given the examples of the Level 1 and Level 3 questions shown above and asked how often they encountered these types of questions in their mathematics lessons and assessments. As shown in Figure 2.39, students reported that both levels of questions were given more frequently in lessons than in assessments. Responses indicate that 43 percent of students have often encountered Level 1 questions in lessons, while 39 percent have often encountered them on assessments. A lower proportion of students (about 30 percent) reported that they had often encountered Level 3 tasks, either during a lesson or on an assessment (Appendix A.2.13.1). These proportions reflect the range for Level 3 and 4 tasks recommended by Darling-Hammond et al. (2013) for the design of high-quality assessments; however, the findings do not reflect their recommendation for Level 1 tasks — as noted above, their research proposed that no more than one-third of tasks should be at Level 1.

FIGURE 2.39 Cognitive demand of questions used in mathematics



As shown in Figure 2.40, mathematics achievement increased for students who reported that their teachers assigned Level 1 cognitive tasks with increasing frequency in their mathematics lessons, with a 73-point difference between students who never or rarely encountered tasks at this level and those who often encountered such tasks. The difference was much smaller for tasks at Level 3: there was only a 20-point difference in mean scores between students who reported that Level 3 questions were often assigned in mathematics lessons and those who reported that they were rarely or never assigned, and no significant difference was found between the *never or rarely* and *sometimes* categories (Appendix A.2.13.2). These results seem to indicate that, although it is recommended that, in high-quality assessments, at least two-thirds of the items be at Level 2 or higher (Darling-Hammond et al., 2013), the more frequent use of Level 1 items was related to a greater gain in students' mathematics scores compared to more frequent use of Level 3 items. More information at the local level is needed to fully understand this pattern.

FIGURE 2.40 Relationship between the cognitive demand of mathematics questions and mathematics achievement



* Significance difference compared to the *never or rarely* category

While students need exposure to tasks at every level of cognitive demand, teachers need skills to evaluate what is and is not cognitively demanding, and they must be critical consumers of the mathematics resources available. Although low-level cognitive tasks are needed to scaffold student learning in mathematics, the highest-level problems require students to explore mathematical concepts. Such exploration develops competencies such as self-monitoring, critical thinking, and making connections, important skills that are required if students are to take advantage of future educational and professional opportunities.

Summary

This chapter was organized around three broad themes related to students' learning and achievement in mathematics: attitudes and beliefs, students' learning experiences, and supporting student learning. Within each theme, indices and variables related to responses to the PCAP 2019 student questionnaire and cognitive test were analyzed.

The first theme, which explored students' attitudes and beliefs related to mathematics, comprised four topics: attitudes toward mathematics, mathematics self-efficacy, student effort, and time management. With regard to the first item, increasingly positive attitudes toward mathematics are linked to higher scores in the PCAP 2019 mathematics assessment. At the pan-Canadian level, students in anglophone schools reported more positive attitudes than their peers in francophone schools, and boys were more positive than girls about mathematics.

Mathematics self-efficacy involved two components: confidence with mathematical processes and confidence using technology in mathematics. For both indices, students with greater self-efficacy in mathematics had higher achievement scores in mathematics. At the pan-Canadian level, anglophone

students and boys were found to have higher confidence with respect to both mathematical processes and using technology in mathematics compared to francophone students or girls.

Students who had high scores on the student effort index were most likely to report paying attention in class and being prepared for their assessments. Index scores were higher in anglophone than in francophone school systems, and girls achieved higher scores than boys on this index.

Students' time management was explored by looking at data related to the effort students invested in homework, the loss of learning time resulting from student absenteeism, and students' out-of-school activities. Over 10 percent of students reported spending two or more hours on mathematics homework per week, while close to 20 percent reported doing this amount of homework in each of their other subjects. Over 10 percent of students stated that they were not assigned homework in any subject. Those students who reported that they most often completed their homework had significantly higher achievement scores in mathematics compared to those who were less likely to complete their homework assignments.

With respect to absenteeism, about one-third of students reported having been absent from school for 10 days or more in that school year for non-school-related reasons, while 8 percent reported being absent for the same duration for school-related reasons. Most students neither skipped school nor were late for class in the two weeks prior to the assessment; for students who were late or did skip classes, tardiness occurred more often than skipping school. Students who had regular attendance tended to achieve higher scores in mathematics, and increasing frequency of missing or arriving late for classes is associated with poorer outcomes in mathematics.

When asked about their out-of-school activities, students reported that they spend many hours using technology for personal reasons: 45 percent of students reported that they engage in such activities for more than six hours a week. In addition, more than 60 percent of all students reported spending time with friends or doing physical activities three or more hours per week. More than two-thirds of students were involved with extracurricular activities, such as clubs or music, and about 40 percent of all students reported that they were involved with community service for at least some time each week.

The second theme of this chapter was students' learning experiences. This section looked at students' understanding of the language of mathematics and at activities used to support their learning in this subject. Unsurprisingly, students who had a good grasp of mathematical terms had better assessment outcomes than their peers. Although no difference was evident between language systems with respect to the knowledge of general terms in mathematics index, francophone students had much higher scores than anglophone students on the index of knowledge of terms related to geometry and measurement. At the pan-Canadian level, girls had higher scores than boys on the general terms in mathematics index, while no gender gap was found in the geometry and measurement terms index.

Students were asked about a broad range of activities used to help them learn mathematics, but many of these had little to no correlation with student achievement. Only those items that constitute the teacher-directed mathematics activities index were found to be correlated with student achievement, and students who had the highest scores on this index had the highest level of achievement on the mathematics assessment. The activities that make up this index tend to be teacher directed and to involve students practising their skills. Francophone students and girls scored higher on this index than did anglophone students and boys.

The third theme of this chapter was how student learning in mathematics was supported and assessed, and also how students' sense of belonging affected their learning. Teachers who intentionally bring math into other subject areas, or who bring other subjects into math, can increase the motivation of students to learn mathematics by highlighting its real-world applications. Given the focus on STEM education, it is unsurprising that students reported that mathematics is most frequently used in science (86 percent) and technology (73 percent) classes; yet close to 40 percent of students reported using what they had learned in mathematics in art class.

This section also analyzed what types of homework students reported being assigned. The most common form of mathematics homework was paper-and-pencil calculations, with two-thirds of students indicating that they were assigned this type of homework at least once per week. About half of students reported that word problems or studying for assessments were assigned for homework at least once per week. The least common homework assignments involved participating in online forums or blogs or using concrete or virtual manipulatives.

The student questionnaire asked about types of assessment used by teachers to determine student progress in mathematics. Students reported that teachers most frequently used homework or teacher-developed classroom assessments to assess learning. The least common type of assessments was that based on portfolios and journals. Students are more likely to be assessed on individual, rather than group, assignments or projects; this approach may reflect the difficulty of fairly assessing individual students' contribution to work done by multiple students. Students were also asked about the use of rubrics in assignments. Although about three-quarters of students know what a rubric is, only half of students reported that they use a rubric when starting an assignment in mathematics class. The frequent use of rubrics was associated with higher math achievement.

Over 75 percent of students reported that they sometime or often receive support from teachers in their mathematics class in the form of information to help them solve a problem, details on marking criteria, and regular feedback to improve their learning. An increase in the frequency with which teachers provided hints or strategies to solve a problem had the strongest positive relationship with achievement.

The relationship between students and teachers holds an important place within the research literature on students' sense of belonging or connectedness at school. The overwhelming majority of students who participated in PCAP 2019 agreed or strongly agreed with all statements related to their sense of belonging. For example, over 90 percent of students stated that they have a friend or friends at school whom they can trust, and approximately 80 percent of students reported that they make friends easily at school and feel that they belong. A sense of belonging or connectedness at school was positively related to student outcomes in mathematics. The more strongly that students agreed with the statement "I liked school," the higher their mathematics scores; however, about one in three students reported that they disagreed with that statement.

The chapter ended with information about the cognitive demands of tasks used in classrooms and on assessments. Generally, students reported that they have encountered a larger proportion of questions with lower, rather than higher, cognitive demands, both in their lessons and on assessments. Nonetheless, close to one-third of students reported that they often encounter questions at higher cognitive levels.

This chapter presents findings on the characteristics of Canadian Grade 8/Secondary II teachers and classrooms, and highlights meaningful relationships between these characteristics and student achievement in mathematics. The drivers of educational attainment are becoming a significant focus of research, given the increasing importance of STEM skills in the labour force in this age of automation and artificial intelligence. With the goal of exploring some of these drivers, this chapter will explore four broad topics: classroom characteristics, teacher characteristics, classroom practices, and challenges to teaching.

Classroom characteristics

Canadian classrooms vary in size and composition; there is no such thing as a “typical” or average classroom in Canada. Large schools may have many Grade 8/Secondary II classes, while smaller schools may have multiple grades within a single classroom. In order to better understand the complexities of classroom environments in Canada, the PCAP teacher questionnaire asked teachers about the characteristics of their classrooms.

Class size

The effects of class size on achievement have been widely studied, from the perspective of both education and economics. Class size refers to the number of students in a class with a teacher. The issue of class size is of particular significance among educational stakeholders, as it is a key determinant of provincial education budgets. Class-size reduction is costly, as it requires hiring more teachers, which results in budget increases to cover their salaries and benefits. Parents prefer having their children in smaller classes, as they believe that having fewer students in a classroom leads to more personalized attention from teachers. Teachers, teachers’ unions, and school administrators agree that students in smaller classes receive more individualized attention and that smaller class size has a positive impact of managing student behaviour and stabilizing teacher workload.

Class size has been a widely debated topic (overviews of the debate on the role of class size on achievement can be found in Hanushek (2003) and Rivkin et al. (2005)). Although decades of available evidence indicate that smaller class sizes have little-to-no impact on student achievement, other studies have reported that reduced class size has a positive impact in some settings (Chingos & Whitehurst, 2011). Either way, class size is not a singular determinant of high-quality instruction.

Although large-scale surveys such as PCAP can identify patterns in the relationship between class size and achievement, determining the reasons behind such relationships requires further study — often at the local level, where the effects of increased and decreased class size can be examined in a more meaningful way.

Table 3.1 shows the class sizes reported by mathematics teachers in schools sampled for PCAP 2019. It is important to note that, in the majority of provinces, fewer than 30 teachers reported classes with fewer than 15 students, 15 to 19 students, or 30 or more students. Based on teachers’ responses, the most common class sizes ranged from 20 to 29 students (Appendix A.3.1.1). Although

a 56-point achievement gap was found in the PCAP 2019 mathematics assessment between the largest and smallest class-size categories (Figure 3.1), this information must be interpreted with caution, given the low number of teachers reporting in these categories. This limitation is due, in part, to the school-based sampling process used for PCAP. Typically, one class was selected per school, and the mathematics teacher for that class completed the teacher questionnaire.⁹ However, for small populations, a representative sample size was sometimes drawn from a small number of schools. For example, although 165 anglophone schools were sampled in British Columbia, only 13 francophone schools were sampled to reach the same level of coverage of francophone students. Thus, for smaller populations, it was not always possible to have 30 observations in each category for class size.

TABLE 3.1 Percentage of teachers by size of Grade 8/Secondary II mathematics classes

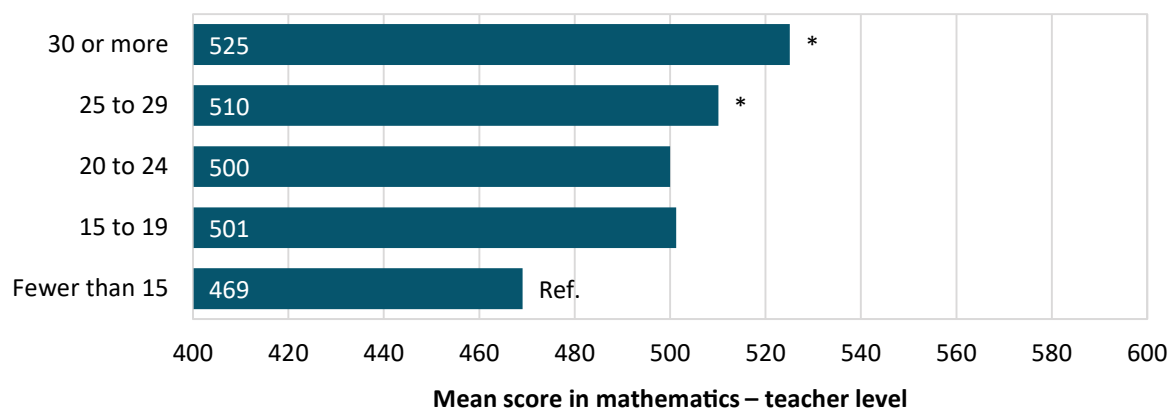
	Fewer than 15	15 to 19	20 to 24	25 to 29	30 or more
BC	3‡	10‡	36	40	11‡
AB	4‡	10‡	19‡	39	28
SK	14‡	22	24	27	12‡
MB	9‡	21	39	23	8‡
ON	7‡	5‡	30	43	14‡
QC	5‡	9‡	15‡	54	17‡
NB	8‡	16	29	35	11‡
NS	6‡	18‡	36	37	2‡
PE	8‡	8‡	56‡	27‡	0
NL	20	8‡	18‡	47‡	7‡
CAN	7	9	27	42	15

‡ There are fewer than 30 observations.

At the pan-Canadian level, the highest scores in mathematics were achieved by students in classes with 30 or more students. The largest gap in mathematics achievement was found between students in the smallest (fewer than 15) and largest (30 or more) class-size categories. No statistically significant differences were found between classes of fewer than 15 students and classes of 15 to 19 or 20 to 24 students (Figure 3.1, Appendix A.3.1.2). It is important to exercise caution when interpreting these findings, as class size may be confounded with many other factors, such as school size, school location, and school resources.

⁹ Student, teacher, and school response rates can be found in Appendix A in the PCAP 2019 public report (O’Grady, Houme, et al., 2021).

FIGURE 3.1 Relationship between class size and mathematics achievement



* Significant difference compared to the *fewer than 15* category

Note: “Mean score in mathematics – teacher level” refers to the mean student score in a teacher’s classroom. The scores shown are the Canadian averages of those means.

In PCAP 2019, as in earlier PCAP cycles, responses from teachers confirm the wide range of class sizes by province and by language of the school system. In Canada overall, the modal category of class size of Grade 8/Secondary II mathematics classes in 2019 was between 25 and 29 students, a figure consistent with the previous administration of PCAP in 2016 (O’Grady, Fung, Servage, et al., 2019). Table 3.2 presents class sizes by province for both language systems. In PCAP 2019, the proportion of classes with 25 or more students was higher in francophone schools than in anglophone school (69 percent and 55 percent, respectively). In Canada overall, the proportion of small classes (fewer than 15 students) was smaller in francophone schools than in anglophone ones (5 percent and 7 percent, respectively). At the provincial level, the trend was reversed: the proportion of classes with fewer than 15 students was higher in francophone schools compared to anglophone schools in all provinces except Quebec. Within anglophone school systems, Alberta has the highest proportion of classes with 30 or more students (28 percent); within francophone systems, the highest proportion was in New Brunswick (21 percent) (Appendix A.3.1.3).

TABLE 3.2 Percentage of teachers by size of Grade 8/Secondary II mathematics classes and language of the school system

	Number of participating teachers*	Fewer than 15	15 to 19	20 to 24	25 to 29	30 or more
Anglophone school systems						
BC	205	3‡	10‡	36	40	11‡
AB	140	4‡	10‡	19‡	39	28
SK	166	14‡	22‡	25	28	12‡
MB	162	9‡	21‡	39	23	8‡
ON	221	7‡	5‡	30	44	14‡
QC	70	19‡	14‡	27‡	35‡	5‡
NB	89	7‡	16‡	28‡	41‡	8‡
NS	116	6‡	18‡	37	36	2‡
PE	23	5‡	7‡	60‡	28‡	0
NL	116	20	8‡	18‡	47‡	7‡
CAN	1,308	7	9	29	40	14
Francophone school systems						
BC	16	22‡	33‡	22‡	22‡	0
AB	15	36‡	0	36‡	28‡	0
SK	7	57‡	29‡	14‡	0	0
MB	19	39‡	11‡	28‡	11‡	11‡
ON	123	10‡	6‡	37	32‡	15‡
QC	147	3‡	8‡	13‡	57	19‡
NB	62	11‡	19‡	32‡	18‡	21‡
NS	11	14‡	7‡	21‡	50‡	7‡
CAN	406	5	9	17	51	18

* Numbers of participating teachers are from O'Grady, Houme, et al. (2021, Table A.4, p. 207).

‡ There are fewer than 30 observations.

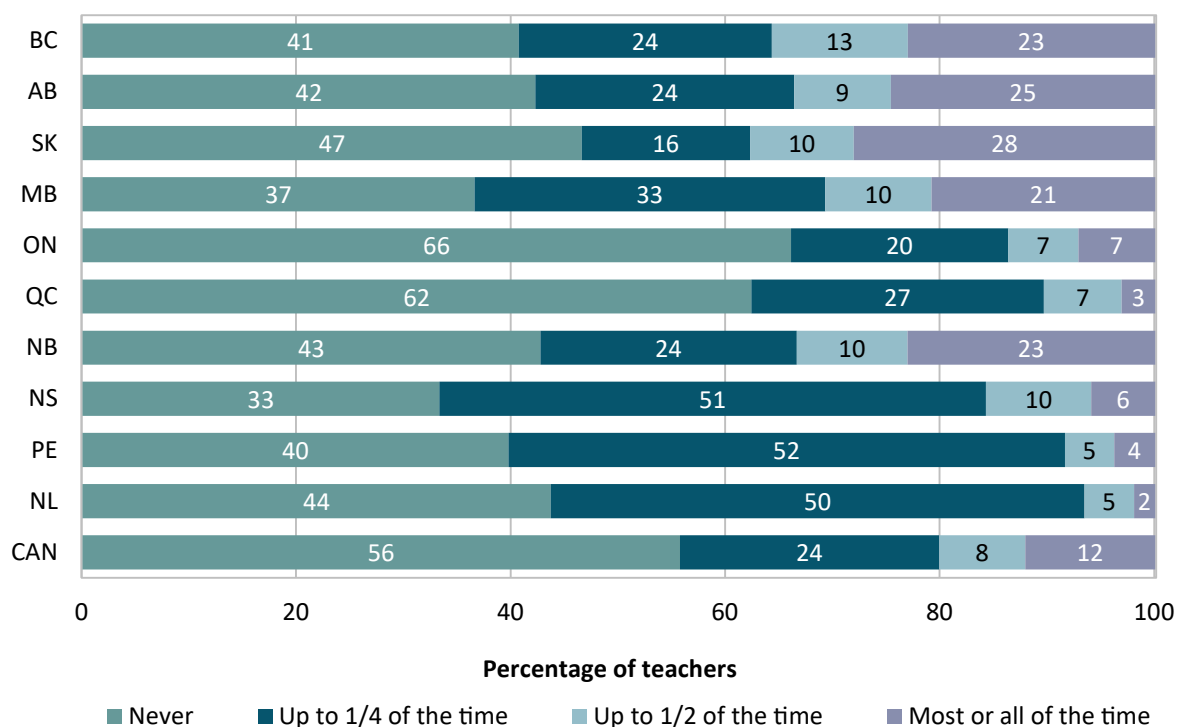
Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Meeting the needs of all students

Presence of another adult

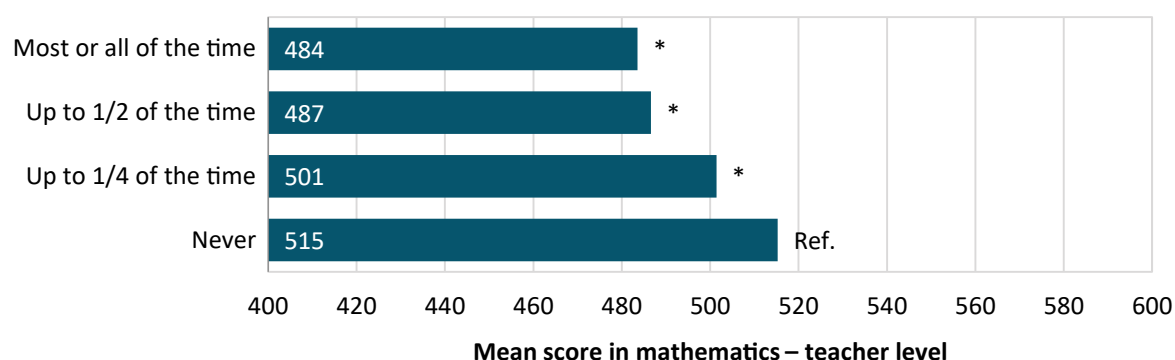
Inclusive classrooms aim to meet the needs of each student, irrespective of their ability and skills. Often, students and teachers in inclusive classrooms require the support of educational assistants to accomplish this goal. Class-size information alone may misrepresent the actual number of educators within a classroom. In Canada, many Grade 8/Secondary II mathematics classrooms have additional adults to support student learning: as presented in Figure 3.2, 12 percent of Grade 8/Secondary II mathematics teachers had another adult with them most or all of the time. However, more than half of teachers had no additional adults in their classroom. There is much variation across provinces: more than 60 percent of teachers in Ontario and Quebec reported never having another adult in their classrooms, compared to one-third of teachers in Nova Scotia. At least 1 in 5 teachers in British Columbia, Alberta, Saskatchewan, Manitoba, and New Brunswick stated that another adult was in their classroom most or all of the time, compared to fewer than 1 in 10 in the other provinces (Appendix A.3.2.1).

FIGURE 3.2 Percentage of teachers indicating that other adults were present in their mathematics class



As shown in Figure 3.3, the average scores of students in mathematics classrooms where there was never another adult besides the classroom teacher were higher than those where another adult was present for part or all of the school day (Appendix A.3.2.2). As was the case with class size, caution is needed in interpreting this finding, as causal relationships cannot be drawn from large-scale survey data. With respect to this factor, schools may assign additional educational staff to classrooms in order to better support the needs of students with academic or behavioural challenges or special education needs, although further research would be needed within provinces and territories to explore this question.

FIGURE 3.3 Relationship between the presence of another adult in the mathematics classroom and mathematics achievement



* Significant difference compared to the *never* category

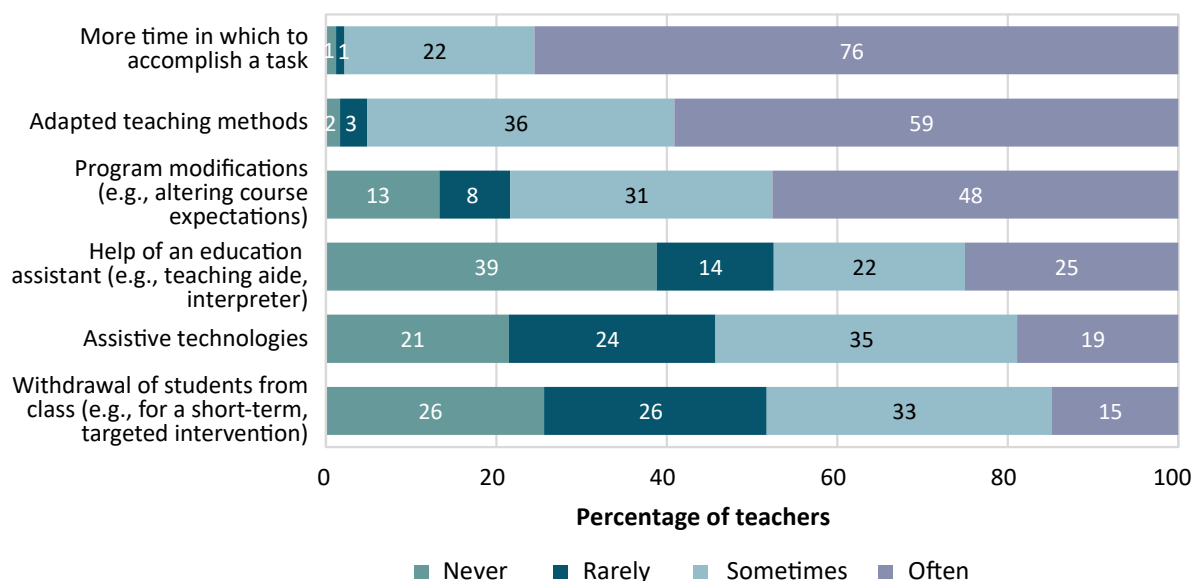
Note: “Mean score in mathematics – teacher level” refers to the mean student score in a teacher’s classroom. The scores shown are the Canadian averages of those means.

Modifying teaching to meet student needs

Meeting all students’ needs is a growing priority for ministries of education across the country. A growing challenge for teachers is to meet the diverse needs in student-centred classrooms. Differentiated instruction takes into consideration that all students must build on previous knowledge and skills, and that not all students in a classroom have the same foundation. A lesson related to a particular skill may be challenging and complex for some students but familiar, even boring, for others. Teachers strive to meet the needs of their students in a wide variety of ways, including using help from other professionals and modifying or adapting lessons and resources to accommodate the variety of needs they encounter (Tomlinson, 2017).

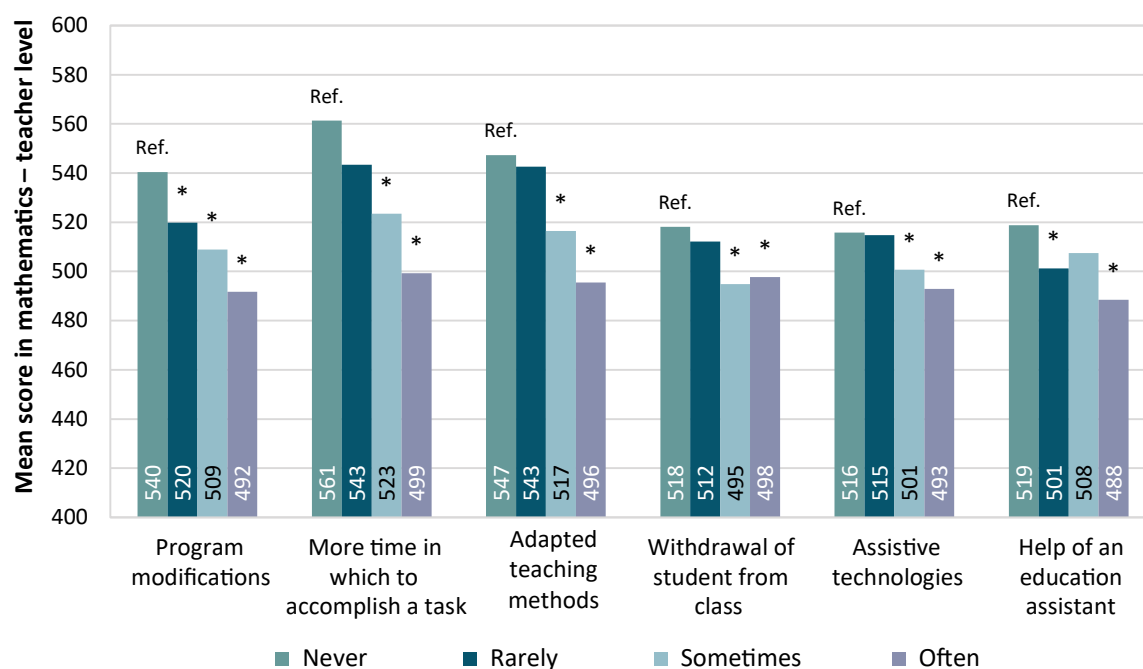
The PCAP teacher questionnaire asked teachers how often they used six types of accommodations to meet the needs of their students (Figure 3.4). The list was not intended to be exhaustive, and there was no attempt to link this information to specific classroom composition, but it serves to probe ways in which teachers strive to support their students. The two modifications that teachers were most likely to use often in their classrooms were allowing more time to accomplish a task (76 percent) and adapting teaching methods (59 percent). About half of teachers reported that they sometimes or often have help from an educational assistant in their classroom, use assistive technologies, or withdraw students from class for targeted intervention (Appendix A.3.3).

FIGURE 3.4 Accommodations and modifications used in mathematics classrooms



The data show that more frequent use of accommodations was associated with lower achievement in mathematics, as the average scores of students in classrooms where accommodations were never used tended to be higher than those in classrooms where accommodations were sometimes or often used (Figure 3.5, Appendix A.3.3). However, when interpreting such relationships, it is important to consider classroom composition at the school or student level, an analysis that is beyond the purview of large-scale assessment projects such as PCAP.

FIGURE 3.5 Relationship between the frequency of accommodations and modifications for students and mathematics achievement



* Significant difference compared to the *never* category

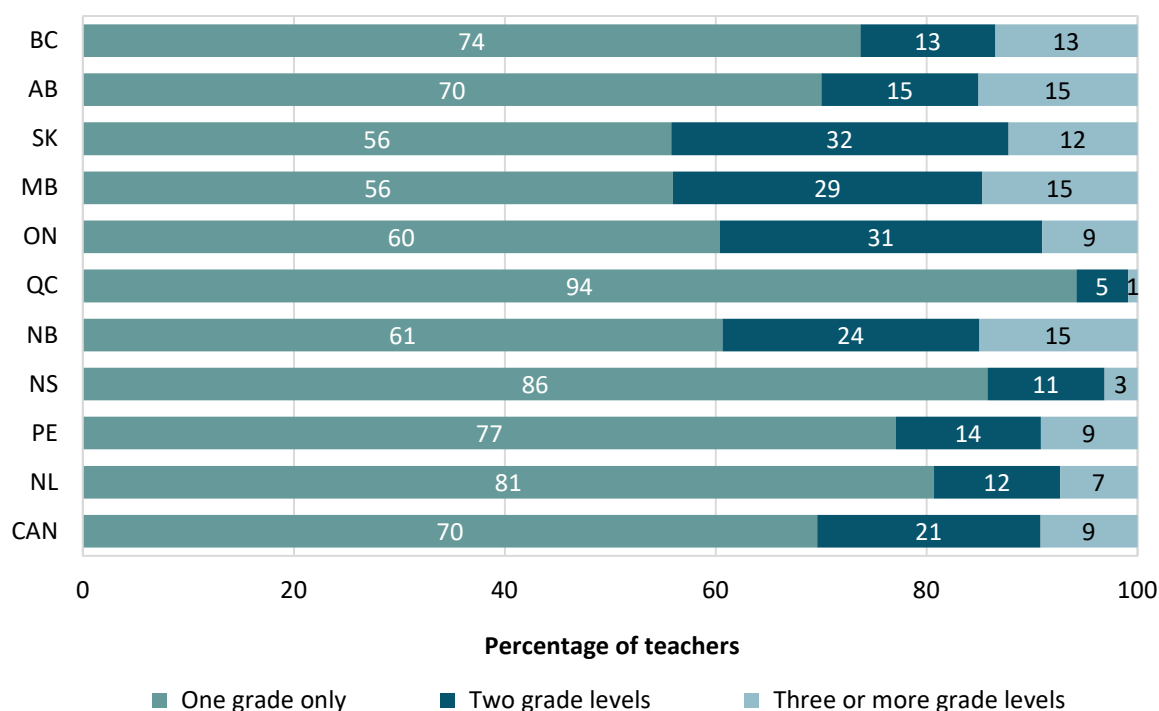
Note: "Mean score in mathematics – teacher level" refers to the mean student score in a teacher's classroom. The scores shown are the Canadian averages of those means.

Class composition

Canada is recognized as one of the most diverse countries in the world. Canadian classrooms include students with varied socioeconomic and cultural backgrounds, languages, religions, and sexual orientations, as well as students with academic and behavioural challenges. Students within these classrooms have diverse learning needs, and the abilities of students in a given classroom may span several grade levels. The complexity of class composition can be compounded in classrooms that have multiple grades — that is, classrooms in which teachers are tasked to deliver grade-specific curricula to two or more grade levels within the same classroom. The additional challenge for teachers in such classrooms is that they need to be experts in two or more levels of curricula across many subject areas. Out of administrative necessity, small schools, rural schools, and dual-track immersion schools often opt for multi-grade classrooms to balance teacher-student allocations. Many studies have found that multi-grade classrooms are not detrimental to student achievement and offer a learning environment that is more similar to the real world (Burns & Mason, 2002; Abalde, 2014).

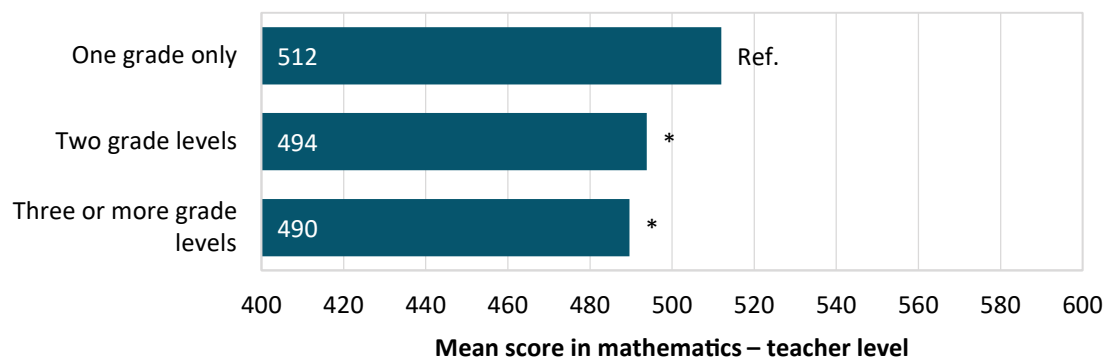
Figure 3.6 presents teachers' responses on the number of grades in their mathematics classrooms. At the pan-Canadian level, 30 percent of classrooms have multiple grades. Teachers in Saskatchewan, Manitoba, Ontario, and New Brunswick reported the most multi-grade classrooms, while teachers in Quebec, Nova Scotia, and Newfoundland and Labrador reported the fewest. Fifteen percent of teachers in Alberta, Manitoba, and New Brunswick reported having three or more grade levels within a classroom (Appendix A.3.4.1).

FIGURE 3.6 Number of grade levels in mathematics classrooms



The data from PCAP 2019 show that students who learn in a classroom with one grade achieved higher scores in mathematics than their peers in multi-grade classrooms. Results for students in classes with two grades and those in classes with three or more grades were similar to each other (Figure 3.7, Appendix A.3.4.2). Although there may be no achievement difference in mathematics in various multi-grade classrooms, the increased teacher workload associated with such configurations would be an important factor to consider when interpreting this information at the local level. In Canada, we value many kinds of diversity in classrooms, and teaching in a multi-grade classroom is but one example. But teachers with two or more grade levels within a classroom may lack specific training, classroom resources, or the time required to meet the various needs of a heterogeneous and multi-age group of students. Nonetheless, some positive aspects of multi-grade classroom configurations have been identified. In a study of Catholic schools facing declining enrolments in the United States, Proehl et al. (2013) found that, in multi-grade classrooms, “the students were more likely to nurture other students and be nurtured by them; assume shared responsibility and leadership in the classroom and at home; were involved in fewer disciplinary incidents; and were more respectful of their classmates” (p. 417). Although there have been efforts to promote schools without designated grade levels (e.g., Anderson, 1992) and to champion multi-age education (Pardini, 2005), the most common classroom configuration remains single grade.

FIGURE 3.7 Mathematics achievement in single-grade and multi-grade classrooms



* Significant difference compared to the *one grade only* category

Note: "Mean score in mathematics – teacher level" refers to the mean student score in a teacher's classroom. The scores shown are the Canadian averages of those means.

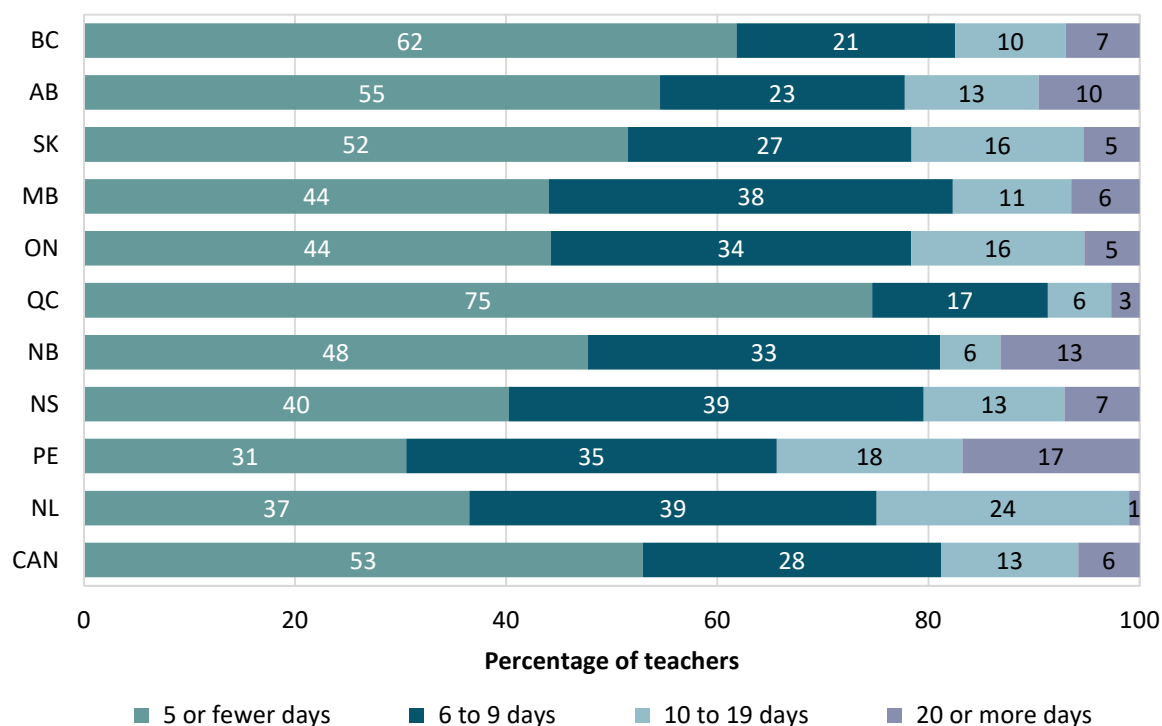
Substitute teachers

There are occasions when a teacher is absent and, consequently, a substitute teacher is necessary. Teachers may, among other things, need to attend personal and family appointments, stay home while ill, or engage in professional development opportunities. Yet such interruptions to regular instructional time may cause disruptions to students' regular routines and interfere with maintaining high academic expectations.

Substitute teachers have education credentials and licensing requirements within provinces to qualify them to fill in for regular classroom teachers who are not able to be present. Despite their qualifications, substitute teachers may be unfamiliar with the curriculum, the routines of the school, or the classroom routines of the teachers whom they are replacing. Moreover, qualified substitutes are challenging to find in some subject areas; for example, there continues to be a shortage of French-language teachers (Office of the Commissioner of Official Languages, 2019).

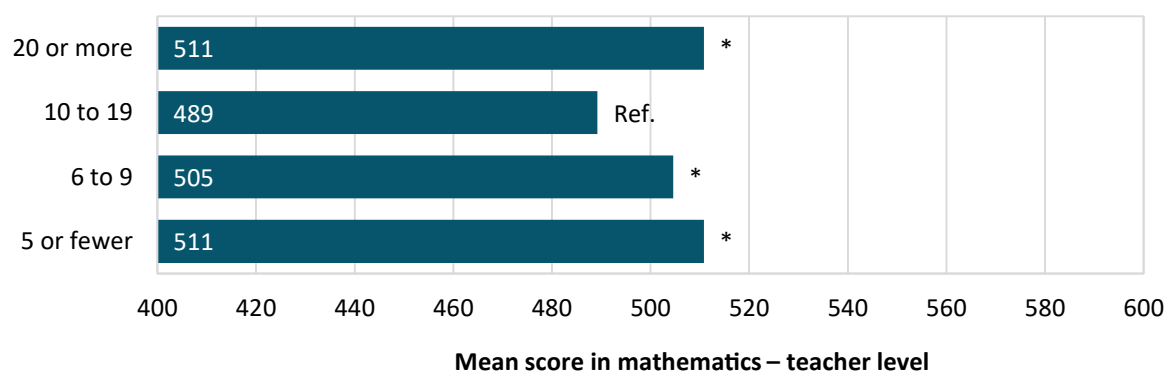
At the pan-Canadian level, the majority (53 percent) of teachers who participated in PCAP 2019 reported that their classes were taught by a substitute teacher for five or fewer days out of the school year (Figure 3.8). At the upper range, at least 10 percent of teachers in Alberta, New Brunswick, and Prince Edward Island reported that a substitute teacher had taught their class for 20 or more days in the 2018–2019 school year (Appendix A.3.5.1).

FIGURE 3.8 Number of days in the current school year taught by a substitute teacher



The data on the frequency of the use of substitute teachers show a non-linear relationship with achievement. Students in classrooms in which the teacher was absent between 10 and 19 days had the lowest achievement compared to the other three categories (Figure 3.9, Appendix A.3.5.2). Although it seems surprising that longer teacher absences may have limited impact on student achievement, this may be because substitute teachers are becoming more productive over the course of a longer assignment, or administrators may be seeking out more productive (or experienced) teachers for extended job assignments (Herrmann & Rockoff, 2010).

FIGURE 3.9 Relationship between the number of days taught by a substitute teacher and mathematics achievement



* Significant difference compared to the 10 to 19 category

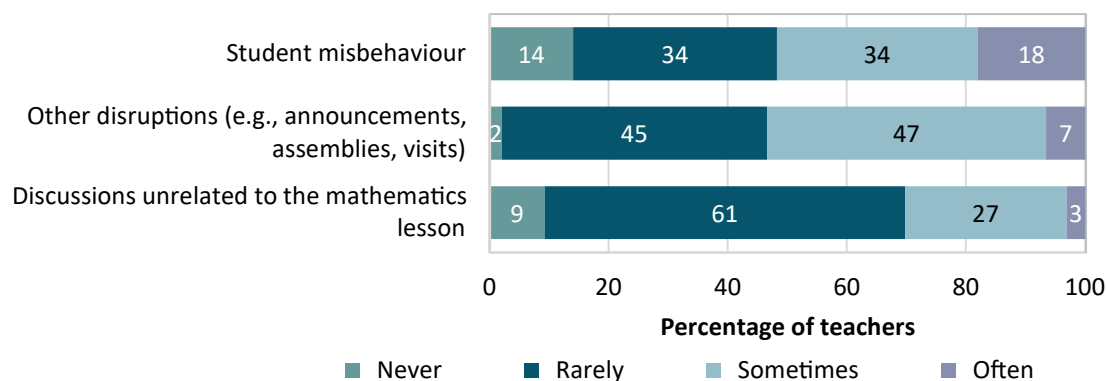
Note: “Mean score in mathematics – teacher level” refers to the mean student score in a teacher’s classroom. The scores shown are the Canadian averages of those means.

Lost instructional time

Time is an important school resource, and the amount of time available for students to learn has a direct impact on teachers' opportunities to teach and students' opportunities to learn. Instructional time, and the continuity of learning time, may be disrupted by both planned events such as assemblies and unplanned events such as school closures due to bad weather.

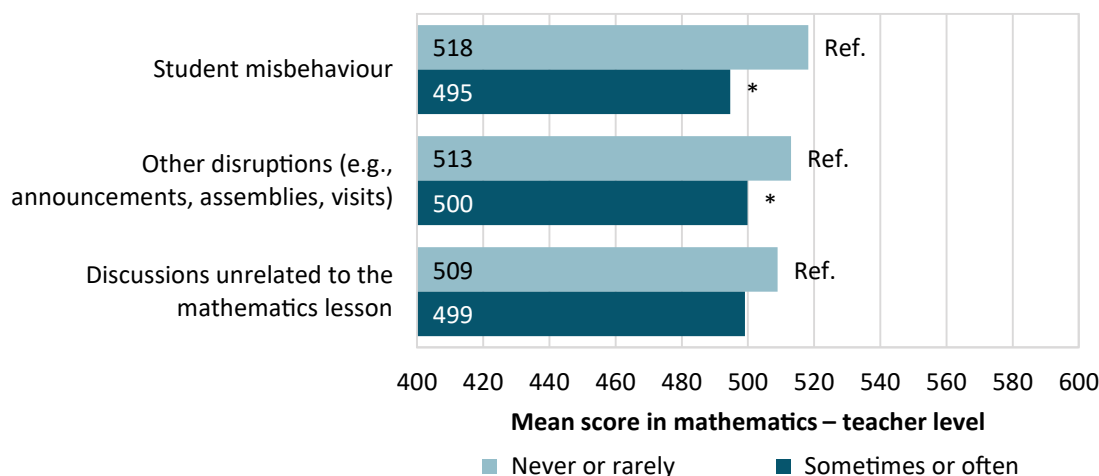
In PCAP 2019, more than half of mathematics teachers said that instructional time was sometimes or often lost due to student misbehaviour or other disruptions such as announcements, assemblies, and visits. Discussion unrelated to the mathematics lesson was the least likely reason for loss of instructional time, as more than two-thirds of teachers said that such discussions rarely or never caused time to be lost in their classroom (Figure 3.10, Appendix A.3.6.1). This suggests that instructional time is most frequently lost for reasons that are outside the control of teachers.

FIGURE 3.10 Reasons for lost instructional time



As shown in Figure 3.11, the average mathematics scores of students in classrooms where instructional time was sometimes or often lost due to student misbehaviour or other disruptions were lower than those in classrooms where instructional time was never or rarely lost due to these reasons. Time lost when mathematics classroom discussion went off-track seems to have the weakest relationship with mathematics scores (Appendix A.3.6.2). Caution must be taken in interpreting these results, as classroom disruptions and student misbehaviours may be confounded with many other factors, such as classroom composition, school climate, students' socioeconomic status, and students' attitudes toward learning.

FIGURE 3.11 Relationship between lost instructional time and mathematics achievement



* Significant difference compared to the *never or rarely* category

Note: “Mean score in mathematics – teacher level” refers to the mean student score in a teacher’s classroom. The scores shown are the Canadian averages of those means.

Teacher characteristics

In PCAP 2019, teachers were asked to self-report on several demographic traits, as well as their pedagogical practices, training, and attitudes. This section will explore a number of these teacher traits in order to support an understanding of student achievement in mathematics. Specifically, this section describes trends with respect to teachers’ gender, years of experience, teaching assignment, understanding of vertical articulation, and confidence in teaching.

Gender

As a response to achievement gaps by gender in a number of subjects, researchers have been considering the association between teachers’ gender and student achievement. Andersen and Reimer (2019) have explored same-gender advantage, noting three broad theoretical explanations for this advantage: 1) teachers prefer students of the same gender, resulting in a “discrimination effect,” with stronger expectations and evaluations for students of the same gender; 2) students respond more positively to teachers of the same gender through a “role-model effect”; and/or 3) teachers’ pedagogical approaches and students’ learning processes change as a result of a gendered “interaction effect” between the teacher and student. In their study of the relationship between teacher and student gender and student achievement in Denmark, the authors found evidence that students of the same gender as their teachers had higher performance in mathematics and literacy, and that this advantage was greater for girls than boys (Andersen & Reimer, 2019). Similarly, in their study of 10 francophone countries in West and Central Africa, Lee et al. (2019) found that girls with female teachers showed stronger mathematics and reading performance than those with male teachers, while no advantage was found for boys with male teachers. At the same time, some studies have noted reports of poorer mathematics results for girls than boys in elementary classrooms with female teachers. Some researchers have related these results to math anxiety among female teachers, which could reinforce gender stereotypes related to the proficiency of boys and girls in mathematics; however, other researchers argue that such gaps are related more to the level of background knowledge of the teacher than to gender (Antecol et al., 2012).

In Canada overall, 98 percent of Grade 8/Secondary II mathematics teachers who completed the PCAP teacher questionnaire identified themselves as female or male. A small proportion of teachers identified themselves in another way (0.03 percent) or preferred not to say (1.6 percent). Mathematics teachers at this level are more likely to be male than female (60 to 38 percent). This pattern differs from the general distribution of educators by gender in public elementary and secondary schools reported by Statistics Canada (2021b) in 2019–20, in which 75 percent of teachers were female and 25 percent were male. The pattern that mathematics teachers were more likely to be men held across all provinces, although percentages varied: Manitoba (65 percent) and Quebec (66 percent) reported the highest proportions of male teachers, while the smallest proportions were reported in British Columbia (52 percent) and Newfoundland and Labrador (51 percent). The proportion of teachers who chose to identify themselves in another way was generally too small to be reported reliably, while, in provinces with sufficient numbers to be reported reliably, the proportion of teachers who chose not to self-identify by gender ranged from 1 to 5 percent (Table 3.3, Appendix A.3.7.1).

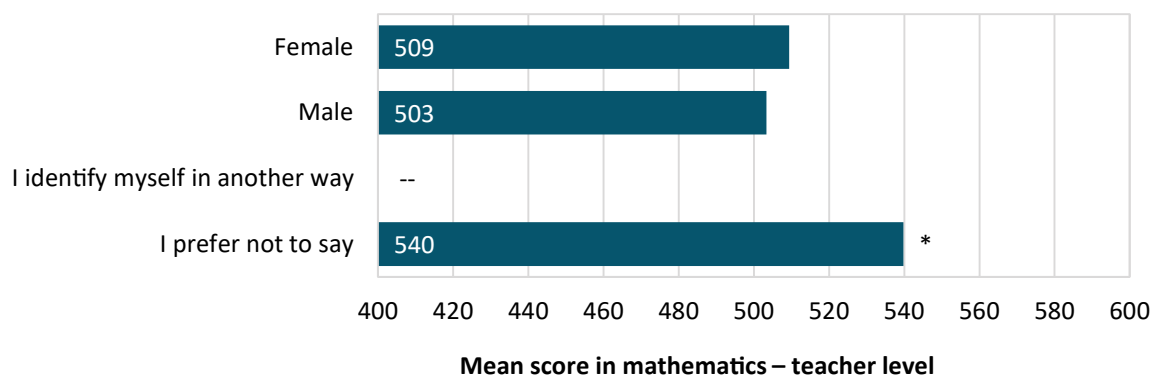
TABLE 3.3 Percentage of mathematics teachers by gender

	Female	Male	Another way	I prefer not to say
BC	47.4	51.7	0	0.9‡
AB	37.5	57.6	0	4.9‡
SK	42.3	56.5	0	1.2‡
MB	32.8	65.3	0	1.9‡
ON	37.8	60.8	0	1.4‡
QC	33.3	66.0	0	0.7‡
NB	35.1	63.7	1.2‡	0
NS	37.1	61.8	0	1.1‡
PE	44.3‡	55.7‡	0	0
NL	49.1	50.9	0	0
CAN	38.0	60.3	0.0‡	1.6‡

‡ There are fewer than 30 observations.

In Canada overall, there is no relationship between achievement in mathematics and whether students are taught by a male or female teacher at the Grade 8/Secondary II level (Figure 3.12, Appendix A.3.7.2). Although mathematics scores were significantly different for students in classrooms whose teacher chose not to self-identify by gender, the proportion of teachers in these categories was too small to be able to draw reliable conclusions regarding student achievement.

FIGURE 3.12 Relationship between gender of teacher and mathematics achievement



* Significant difference compared to the *female* category

Note: “Mean score in mathematics – teacher level” refers to the mean student score in a teacher’s classroom. The scores shown are the Canadian averages of those means.

-- Data suppressed to ensure confidentiality of respondents

Teacher specialization

There is widespread scholarly agreement that teachers should have a solid mastery of the content that they are teaching (Bolyard & Moyer-Packenham, 2008; Goldhaber & Brewer, 1996; Y. Li, 2008; Rice, 2010). According to an extensive review of the literature on the quality of science and mathematics teachers over the past 40 years (Bolyard & Moyer-Packenham, 2008), evidence points to a generally positive association between subject-matter preparation (as measured by subject-specific degree(s) and coursework) and student achievement. Badgett (2014) found a positive association between teachers who have completed a master’s degree and student reading achievement; however, Horn and Jang (2017) noted that other studies did not find similar trends at most levels of education for student achievement in reading and mathematics. Yet another study found that, at the elementary level, an increased level of mathematics-content specialization for teachers was associated with more positive student outcomes (Y. Li, 2008).

Some research also suggests that teacher experience plays a role in student achievement. For example, in their investigation of middle-school mathematics and language teachers, Ladd and Sorensen (2017) found that students of teachers who had more years of teaching experience had higher test scores and better behaviour (seen, most prominently, in the reduction of student absenteeism). However, others have not found evidence of an association between increased classroom, emotional, or instructional supports and increased years of teacher experience. They have suggested, instead, that the more positive associations may be a result of less effective beginner teachers leaving the classroom to pursue other career paths (Graham et al., 2020).

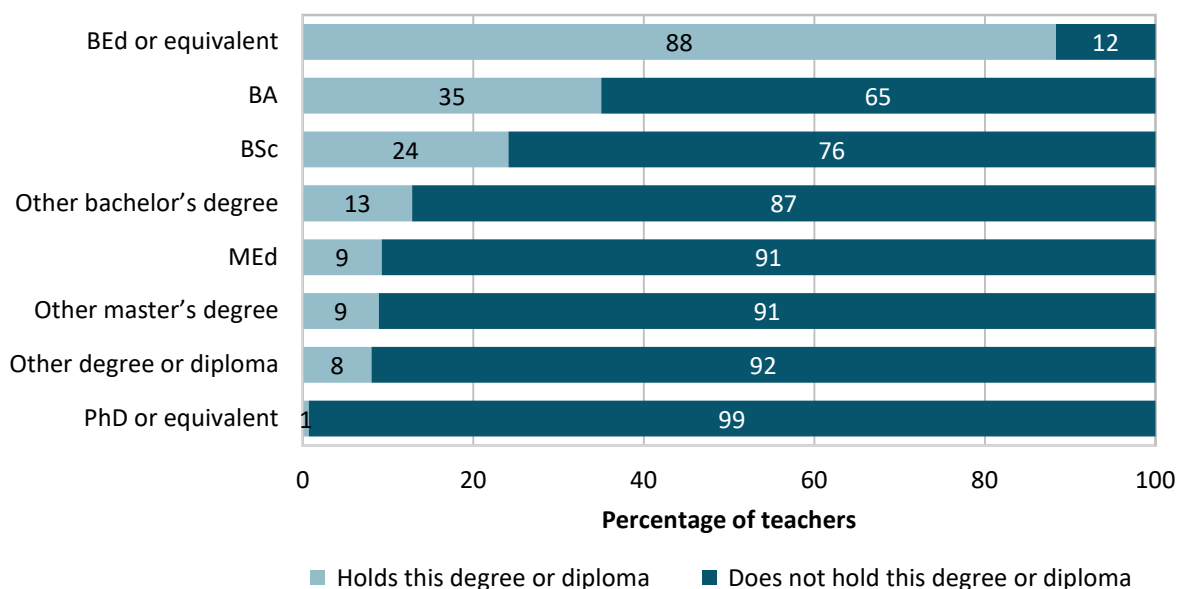
In PCAP 2019, specialization in mathematics was measured through questions related to teachers’ education, experience, and self-identification as a specialist. Teacher education includes the degrees or diplomas earned, the number of mathematics or mathematics-related courses completed during pre-service training, and areas of study in pre-service education or training. Teacher experience includes years of teaching practice and the proportion of the teacher’s assignment that is in mathematics. Teachers were also asked to indicate whether they considered themselves a specialist in teaching mathematics, and, if so, whether that was based on education, experience, or both.

Teacher education

In Canada, Grade 8/Secondary II teachers generally become qualified to teach by completing a bachelor of education (BEd) degree, either concurrently with an undergraduate degree or consecutively following the completion of an undergraduate degree from an accredited university. At least one supervised practicum in the field is required in any teacher education program. Its duration ranges from approximately two to six months, depending on the province or territory and accrediting institution. Some provinces and territories also require a qualifying examination, completion of a probationary teaching period, and/or completion of a mentoring or induction program that may provide another full year of professional support, including orientation, mentoring, and professional development in areas such as subject-specific content and processes, classroom management, and effective communication. Incentives may be offered at the provincial/territorial or school board/district level, including higher salaries and promotions, for teachers to further their qualifications by acquiring additional academic credentials or specialist courses.¹⁰

In PCAP 2019, teachers were given a list of eight education attainment categories and asked to identify all that applied to them. As shown in Figure 3.13, close to 90 percent of teachers reported holding a BEd or equivalent (i.e., a form of teacher training). About one-third of teachers had a bachelor of arts (BA) degree, while one-quarter had a bachelor of science (BSc) degree. Nine percent had a master's degree in education, while another 9 percent had a master's degree in another specialization; 1 percent had completed studies at the doctoral level (Appendix A.3.8.1). In Canada overall, no relationship was found between teacher education and student achievement in mathematics (Figure 3.14, Appendix A.3.8.1).

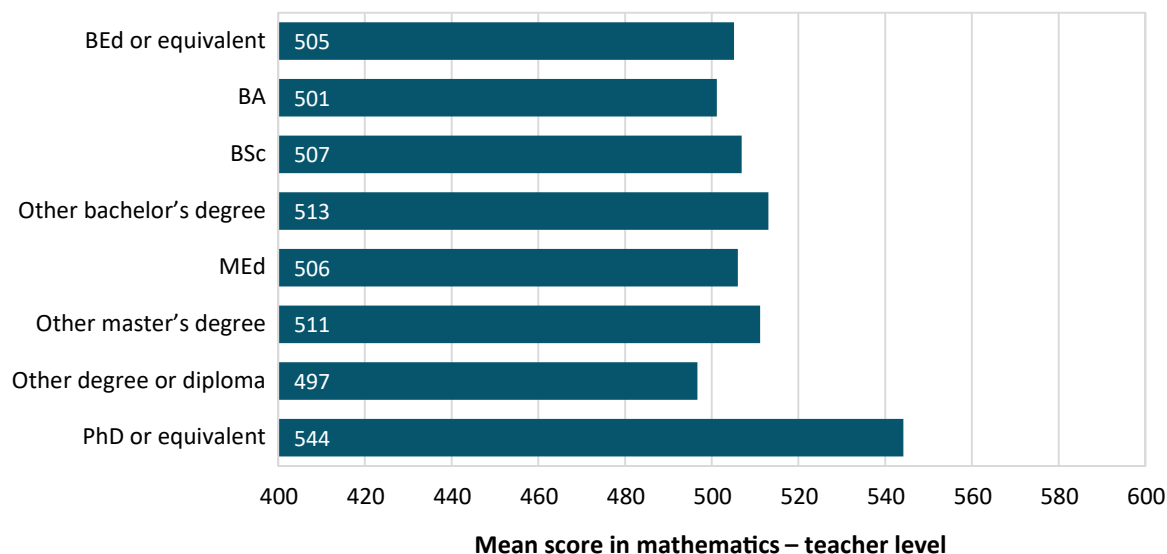
FIGURE 3.13 Academic credentials of Grade 8/Secondary II mathematics teachers



Note: Teachers identified all degrees that they held; numbers represent percentages for each category.

¹⁰ Data are available for teacher education requirements for mathematics from the *Teacher Education and Development Study in Mathematics 2008*, in which teacher education was surveyed in 17 countries and several Canadian provinces (CMEC, 2010).

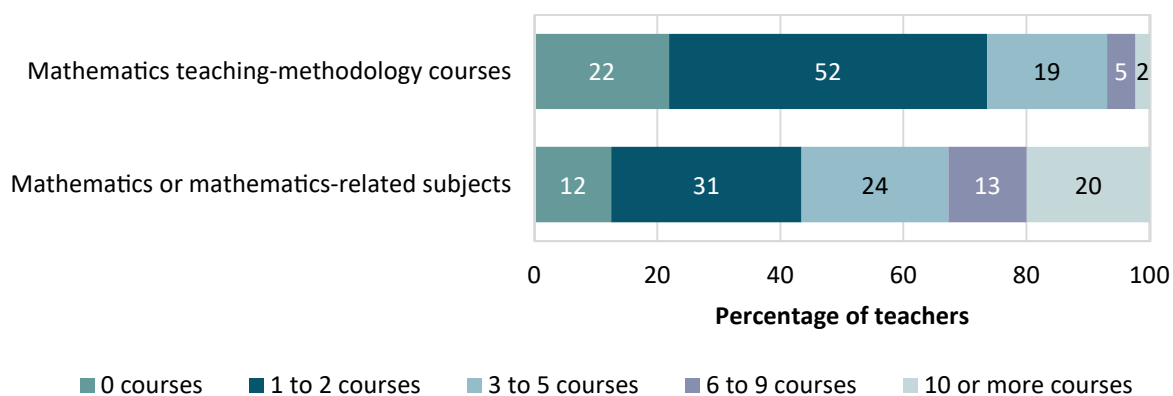
FIGURE 3.14 Relationship between teacher education and mathematics achievement



Note: “Mean score in mathematics – teacher level” refers to the mean student score in a teacher’s classroom. The scores shown are the Canadian averages of those means.

To examine the level of specialist training in mathematics, teachers were asked two questions related to their postsecondary studies: (1) the number of semester-long courses in mathematics or mathematics-related topics (content), and (2) the number of semester-long courses in mathematics teaching methodology (pedagogy). As shown in Figure 3.15, Grade 8/Secondary II teachers reported taking more courses in mathematics content than in pedagogy. One-third of teachers reported taking six or more courses related to mathematic content in their postsecondary training compared to less than 10 percent of teachers taking the same number of course related to mathematics pedagogy (Appendix A.3.8.2).

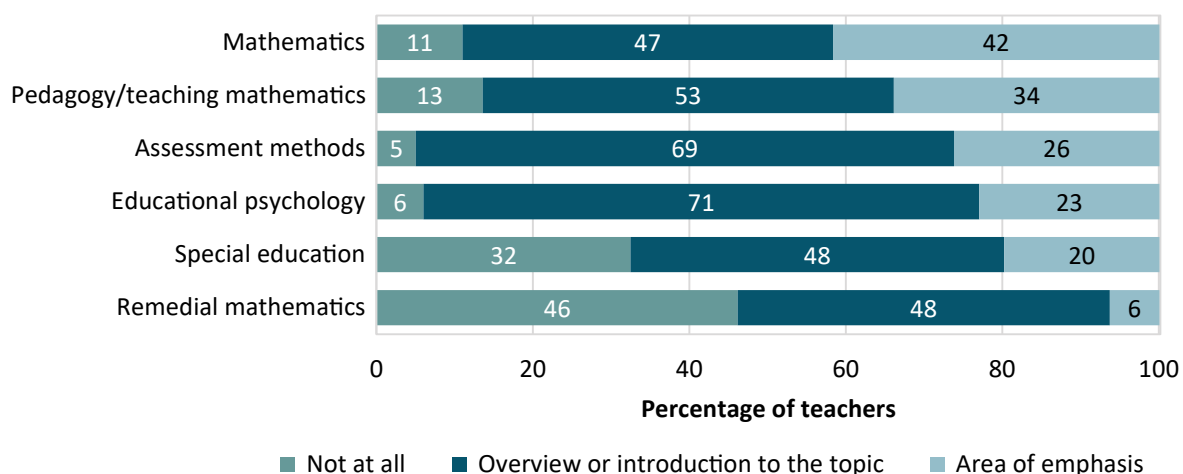
FIGURE 3.15 Number of postsecondary mathematics courses teachers completed



To further elucidate the level of specialist training among Grade 8/Secondary II teachers who participated in PCAP 2019, a six-item question asked about the extent to which the specific areas of study shown in Figure 3.16 were part of their formal education and/or training. Most teachers indicated that, during their education/training, they had received at least an introduction to or overview of mathematics (either as a discipline or in relation to pedagogy), assessment methods,

educational psychology, and special education. Over 40 percent of teachers indicated that mathematics as a discipline was an area of emphasis during their education/training; close to 50 percent of teachers indicated that teaching remedial mathematics was not covered at all.

FIGURE 3.16 Areas of study during formal education and/or training



Teacher experience

The effects of teacher experience are rather complex and are intertwined with a number of other factors. Teaching mathematics requires not only a strong understanding of mathematical content, but also specialized knowledge in the form of mathematical pedagogy, or mathematical knowledge for teaching (Ball et al., 2008), in order to support the needs of the diverse learners. Novice teachers may have had extensive exposure to mathematics content through their postsecondary studies and may be confident that they have the background knowledge to teach effectively. According to Thanheiser (2009), they may have mastered the procedural knowledge of mathematics, but they may not explicitly know or understand the mathematical constructs involved. Training for pre-service and novice teachers must include “addressing their beliefs about what it means to know mathematics, to learn mathematics, and to teach mathematics for *understanding*” (Suppa et al., 2020, p. 494). Santagata and Lee (2021) suggest that pre-service and induction programs for novice mathematics teachers should include a focus on individual teachers’ pedagogical knowledge, the development of a student-centred vision of mathematics instruction, and tailored support for teaching mathematics during a teacher’s first year.

In PCAP 2019, Grade 8/Secondary II teachers were asked how many years they had been teaching. As Figure 3.17 indicates, the length of teaching experience varies greatly. About 20 percent of teachers in Alberta, Saskatchewan, and Manitoba have fewer than five years of experience. On the other side of the scale, at least 30 percent of teachers in Quebec, Prince Edward Island, and Newfoundland and Labrador reported that they had been teaching for more than 20 years (Appendix A.3.8.4).

FIGURE 3.17 Years of teaching experience

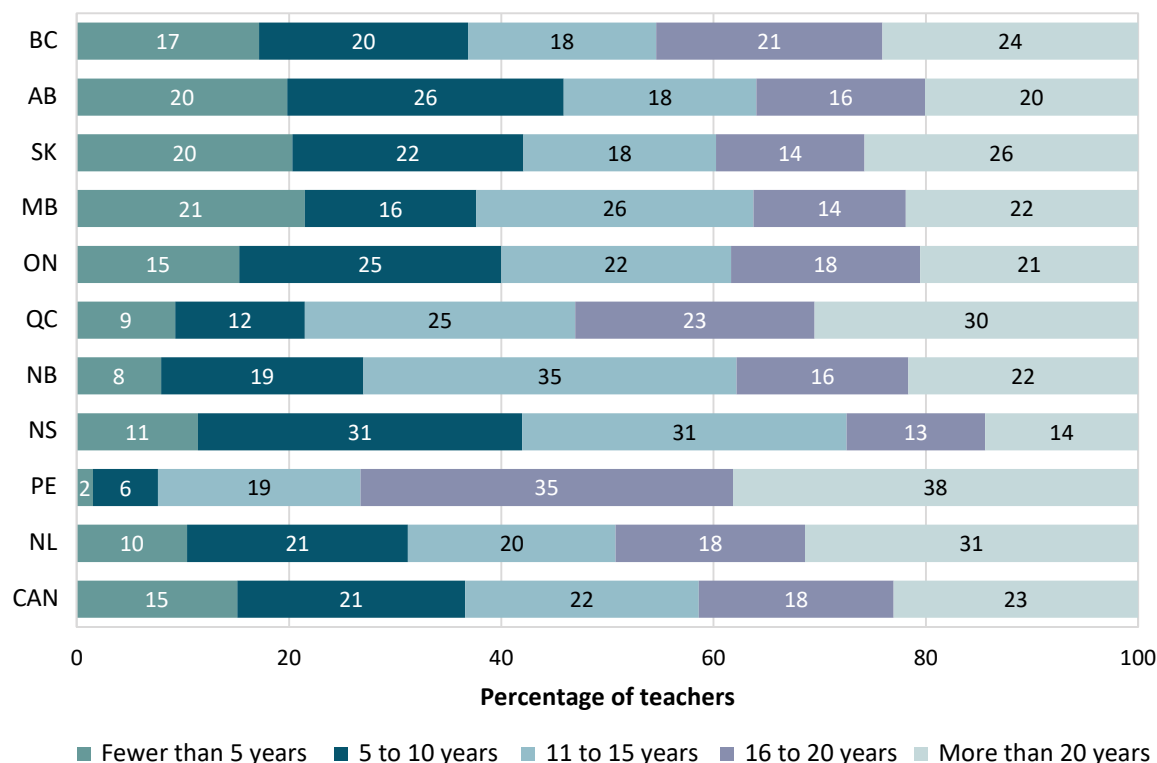
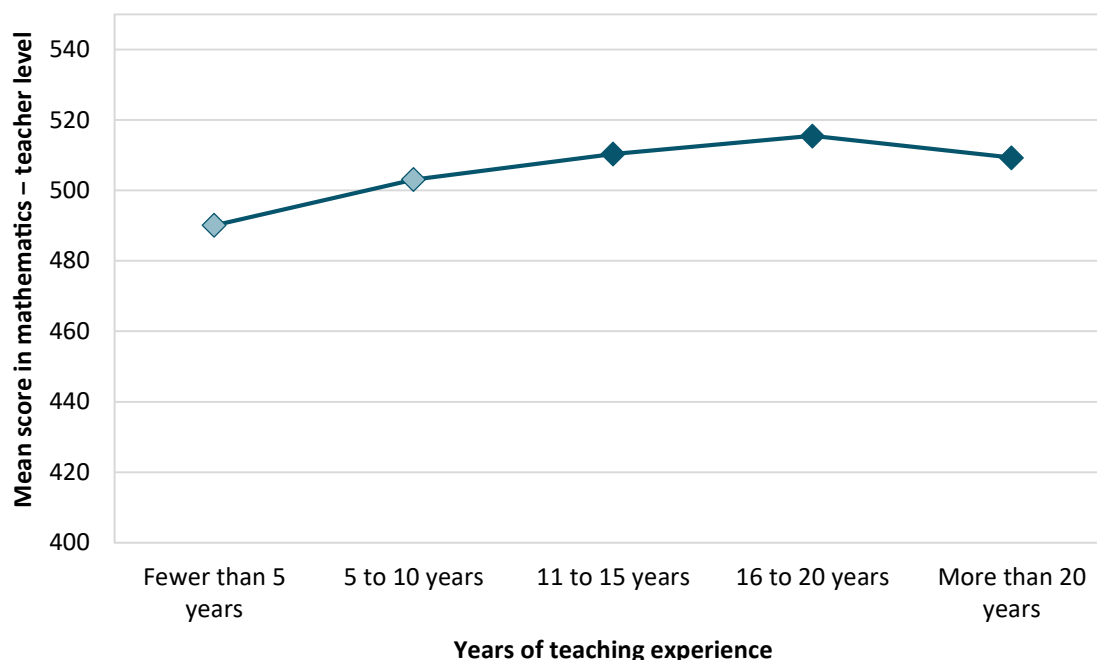


Figure 3.18 illustrates the relationship between students' mathematics achievement and the level of experience of their teachers. In Canada overall, there was no significant difference in students' achievement in relation to the number of years that their teacher had been teaching mathematics once the teacher exceeded 5 years of teaching experience. On the other hand, students in classes taught by a teacher with fewer than 5 years of teaching experience had mathematics achievement similar to that of students taught by a teacher with 5 to 10 years of teaching experience, but had lower achievement than students in classes taught by a teacher with 11 or more years of teaching experience (Appendix A.3.8.5). In PCAP 2010, when mathematics was first the focus of the study, there was a positive relationship between teacher experience and students' mathematics achievement up to the 11-to-15-year range and then a decline thereafter (CMEC, 2012b).

FIGURE 3.18 Relationship between years of teaching experience and mathematics achievement



Notes: Darker shade denotes significant difference compared to the *fewer than 5 years* category

“Mean score in mathematics – teacher level” refers to the mean student score in a teacher’s classroom. The scores shown are the Canadian averages of those means.

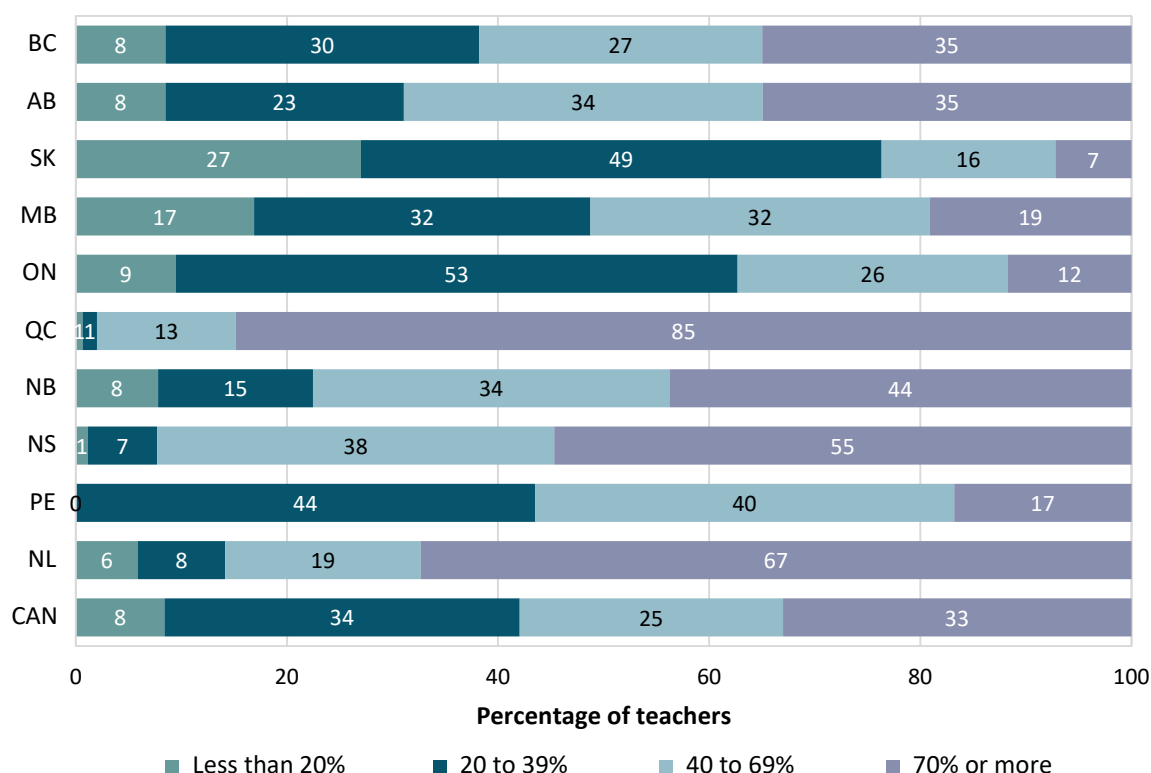
Teaching assignment

Teaching assignments may also play a role in students’ learning. In their investigation of the structural differences in elementary mathematics teaching assignments, Webel et al. (2017) found advantages and disadvantages in both teaching and learning mathematics that were associated with different teaching assignments. The authors highlight the difference between the “self-contained teacher,” who is responsible for teaching all subjects, and “departmentalization,” “in which teachers teach one or a few (but not all) subjects to multiple class groups” (Slavin, 1987, pp. 116–117). In their interviews with and observations of elementary mathematics teachers in a departmentalized structure, the authors found that teachers reported having more time to reflect on mathematics teaching and to review specific lessons between classes. This, however, came at the disadvantage of reduced flexibility in meeting the needs of particular classes, such as through extending lessons. The authors further specified models of departmentalization: the “team approach,” in which teachers of different content areas collaborate to address student needs; “class swap,” in which students switch their teacher for a single subject; and “grade-level mathematics teacher,” which is similar to the approach at the secondary level.

The mathematics teachers of students writing the PCAP 2019 assessment were asked to indicate approximately what percentage of their total teaching time for the school year was assigned to mathematics. As shown in Figure 3.19, Quebec stands out as having the highest proportion of teachers whose assignment focused on mathematics: 85 percent of its mathematics teachers spend at least 70 percent of their teaching time teaching mathematics. By contrast, Saskatchewan reported the smallest proportion (7 percent) of teachers whose mathematics assignment made up at least 70 percent of their instructional time. In Canada, on average, approximately one-third of teachers reported having 20 to 39 percent of their total teaching assignment dedicated to mathematics

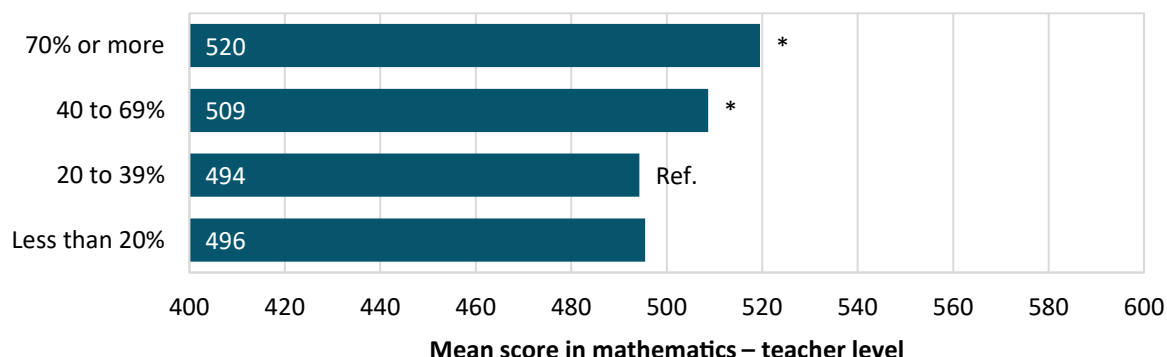
instruction, while another third reported being assigned to this subject for at least 70 percent of their time (Appendix A.3.8.6). Depending on the structure of a school and/or the organization of a school district, Grade 8/Secondary II teachers could be generalists teaching all subjects to a given class, or they could be considered specialists and assigned to teach mathematics to multiple grades and classes in a given school.

FIGURE 3.19 Percentage of teachers' schedule assigned to mathematics



The relationship between the proportion of teachers' schedules assigned to mathematics and student achievement is shown in Figure 3.20 (Appendix A.3.8.7). At the pan-Canadian level, the percentage of a teacher's schedule devoted to teaching mathematics was not significantly associated with student achievement in classes in which the teacher's mathematics assignment was less than 40 percent of their total teaching assignment. However, mean scores in mathematics were higher in classes in which teachers' mathematics assignment was between 40 and 69 percent of their total teaching assignment. Scores were even higher in classes in which the teacher's mathematics assignment was 70 percent or more of their total teaching assignment, a finding that is consistent with the results reported for mathematics in PCAP 2010 (CMEC, 2012b).

FIGURE 3.20 Relationship between percentage of teachers' schedule assigned to mathematics and mathematics achievement



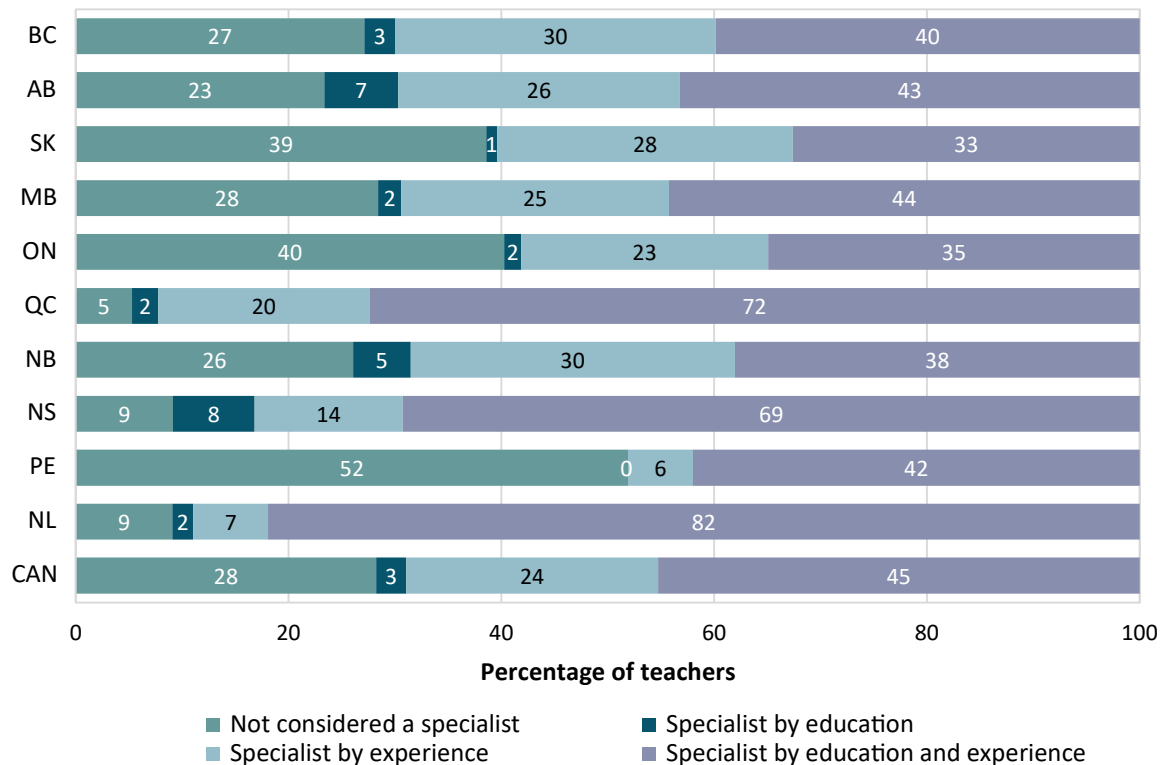
* Significant difference compared to the 20 to 39% category

Note: "Mean score in mathematics – teacher level" refers to the mean student score in a teacher's classroom. The scores shown are the Canadian averages of those means.

Teacher self-identification as a specialist

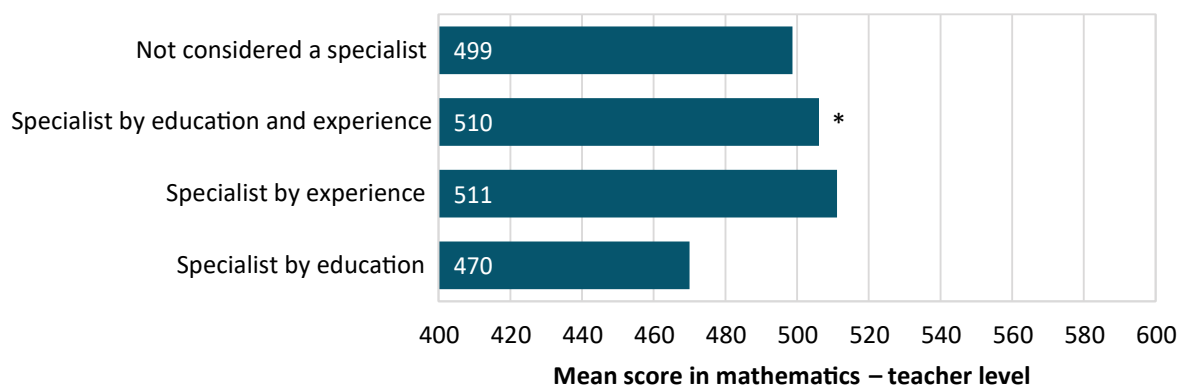
In the PCAP 2019 teacher questionnaire, teachers were asked whether they considered themselves a specialist in teaching mathematics and, if so, whether they were a specialist based on their education, experience, or both. In all provinces, the highest percentage of teachers who consider themselves specialists reported that they were specialists by both education and experience. Close to 70 percent of teachers identify themselves as specialists by education and experience in Quebec and Nova Scotia, while over 80 percent of teachers in Newfoundland and Labrador consider themselves specialists based on these two criteria. On the other hand, over half of Prince Edward Island teachers do not consider themselves specialists in mathematics (Figure 3.21, Appendix A.3.8.8).

FIGURE 3.21 Percentage of teachers identifying themselves as mathematics specialists



Students tended to achieve higher scores when they are taught by teachers who consider themselves specialists by both experience and education, compared with those who do not consider themselves to be specialists (Figure 3.22). However, no significant relationships were observed between the other categories of teacher specialization and student achievement (Appendix A.3.8.9).

FIGURE 3.22 Relationship between teacher specialization and student mathematics achievement



* Significant difference compared to the *not considered a specialist* category

Note: “Mean score in mathematics – teacher level” refers to the mean student score in a teacher’s classroom. The scores shown are the Canadian averages of those means.

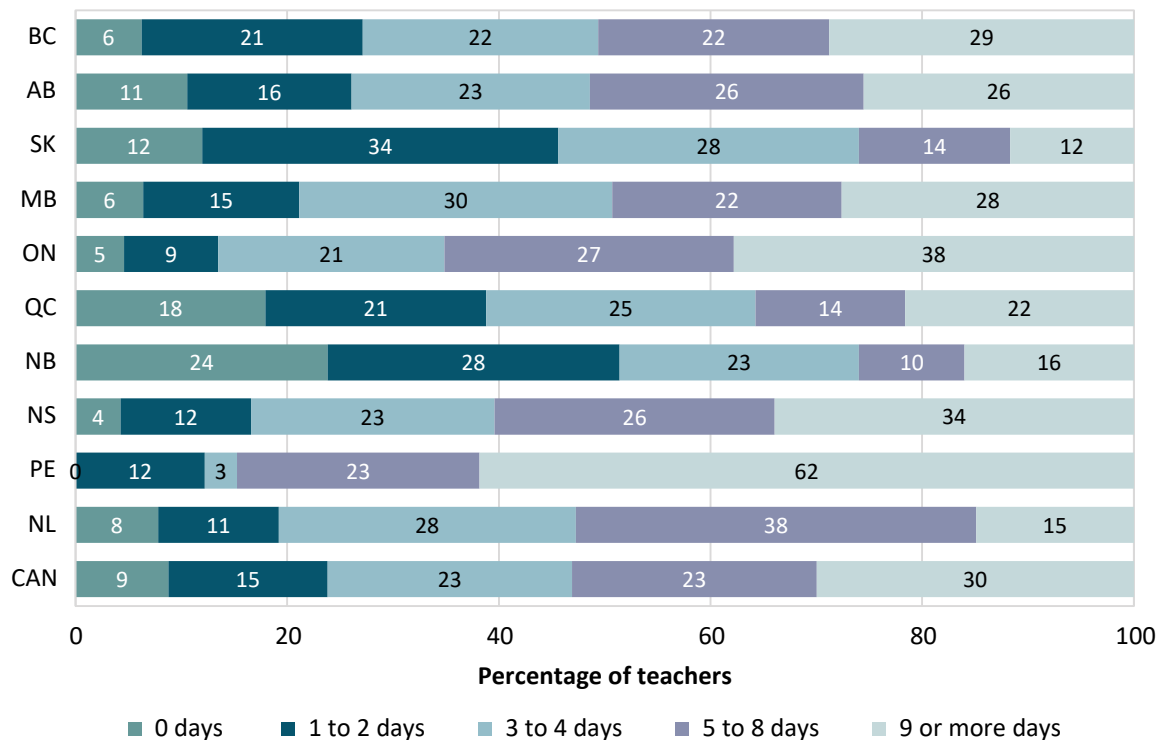
Professional development

A wide variety of professional development (PD) opportunities are accessible to teachers and can be pursued both individually and collaboratively, depending on teacher needs. Examples include enrolment in additional qualification programs or courses; attending workshops or conferences; engagement with professional learning communities (PLCs); working toward certificates and/or degrees; reading professional and/or academic literature; and participation in research, informal dialogue, mentoring, or peer observation. Most school districts/boards in Canada also schedule dedicated PD days that address specific school or district issues and initiatives.

Professional development provides opportunities for in-service teachers to upgrade their pedagogical skills and knowledge. Koellner and Jacobs (2015) identify a range of PD models, placing them on a continuum from highly adaptive (e.g., responsive to goals, resources, and context, and based on general guidelines) to highly specified models (e.g., predetermined experiences based on particular learning goals). Adaptive approaches are an increasingly common type of PD, and adaptive PD for mathematics educators provides ongoing long-term opportunities that facilitate incremental learning for teachers (Koellner & Jacobs, 2015).

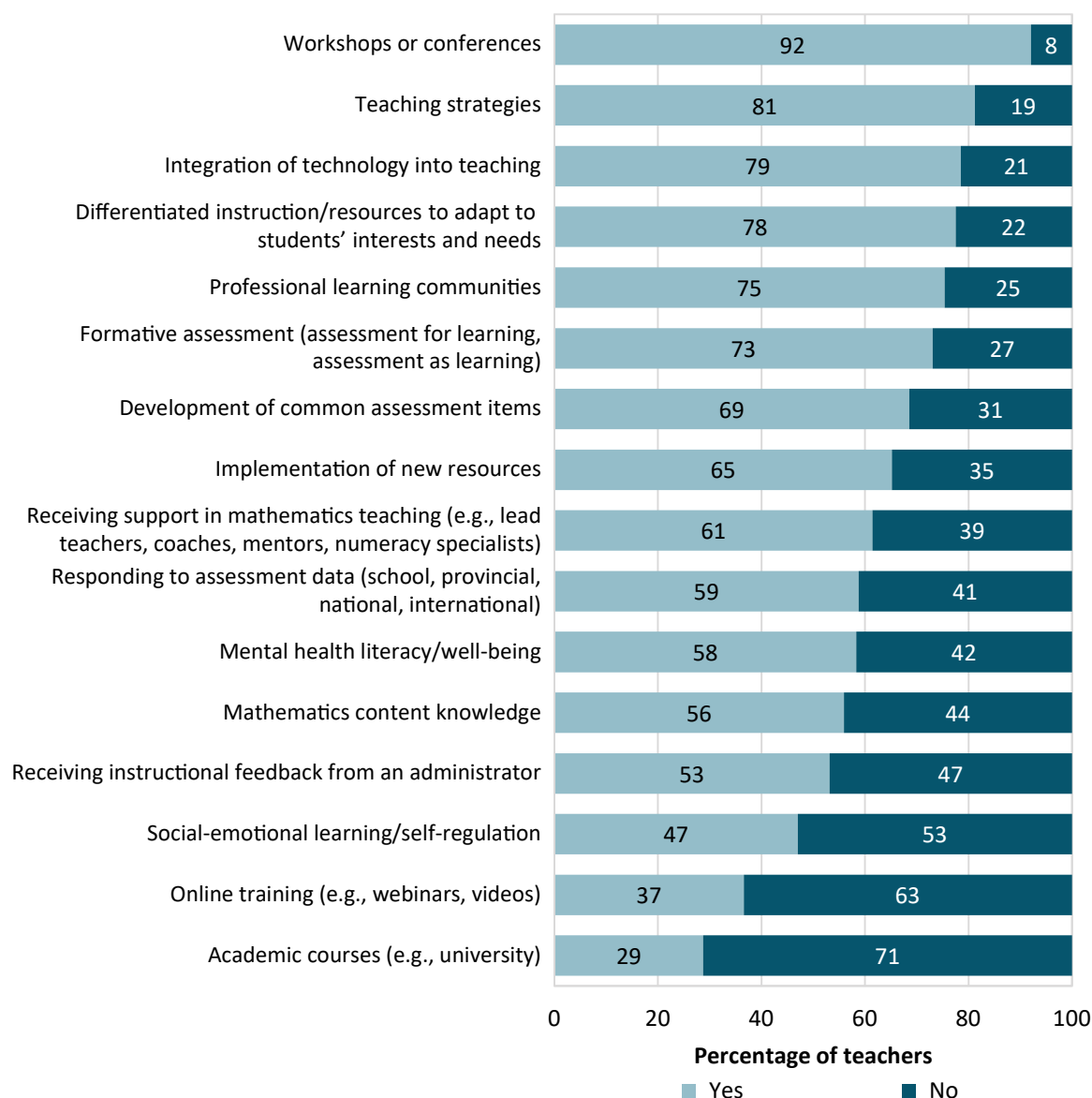
In PCAP 2019, teachers were asked about the number of days in the past five years in which they had participated in professional development related to the teaching of mathematics. The largest proportion of teachers indicating that they had had nine or more days of PD dedicated to mathematics was in Prince Edward Island, where over 60 percent of teachers reported this level of participation. On the other end of the scale, approximately 50 percent of teachers in Saskatchewan and New Brunswick reported having had two or fewer PD days related to teaching mathematics in the past five years (Figure 3.23, Appendix A.3.9.1). There could be a variety of explanations for this low PD participation. It may imply that, as generalists, Grade 8/Secondary II teachers do not pursue content-specific PD or that they have a stronger need for development in other areas. Alternatively, teachers may not have easy access to PD opportunities focusing on mathematics, or PD on broader topics may be more readily available to them.

FIGURE 3.23 Number of days of professional development activities related to teaching mathematics in the past five years



Teachers were also asked whether they had participated in the 16 different types of professional development shown in Figure 3.24. At the pan-Canadian level, the most common form of PD was attending workshops or conferences (92 percent). Around 80 percent of teachers had pursued PD to learn more about teaching strategies, integrating technology into teaching, and strategies to adapt instruction to students' interests and needs. Included in the 16 types of professional development are two types of PD specific to mathematics. Over half of the teachers who completed the teacher questionnaire have attended PD sessions focused on mathematics content knowledge, and 62 percent reported receiving support in mathematics teaching. The least popular forms of PD were online training and academic courses (Appendix A.3.9.2).

FIGURE 3.24 Types of professional development activities for teachers in the past five years



Teachers were also asked about the impact of these professional development activities on student learning in their classrooms. Table 3.4 presents teachers' perceptions of the impact of each type of PD activity. The PD activity selected by the highest proportion of teachers as having some or a lot of impact on student learning was teaching strategies (85 percent). Eighty-one percent of teachers indicated that PD related to mathematics content knowledge had some or a lot of impact on student learning; three-quarters of teachers thought that receiving support in mathematics teaching from lead teachers, coaches, mentors, or numeracy specialists had a similar impact on student outcomes (Appendix A.3.9.2).

TABLE 3.4 Percentage of teachers by their perceptions of the impact of professional development activities on student learning

Professional development activity	None	A little	Some	A lot
Teaching strategies	1‡	14	56	30
Workshops or conferences	2‡	14	57	27
Formative assessment (assessment for learning, assessment as learning)	1‡	18	46	35
Mathematics content knowledge	1‡	18	49	32
Academic courses (e.g., university)	2‡	18	48	32
Implementation of new resources	1‡	20	51	28
Development of common assessment items	2‡	19	53	26
Professional learning communities	2‡	20	47	31
Integration of technology into teaching	3‡	20	48	30
Differentiated instruction/resources to adapt to students' interests and needs	1‡	21	44	33
Receiving support in mathematics teaching (e.g., from lead teachers, coaches, mentors, numeracy specialists)	5‡	20	50	25
Mental health literacy/well-being	3	29	48	19
Social-emotional learning/self-regulation	3‡	29	49	19
Receiving instructional feedback from an administrator	7	30	46	17
Online training (e.g., webinars, videos)	6‡	33	49	12
Responding to assessment data (school, provincial, national, international)	11	35	41	12

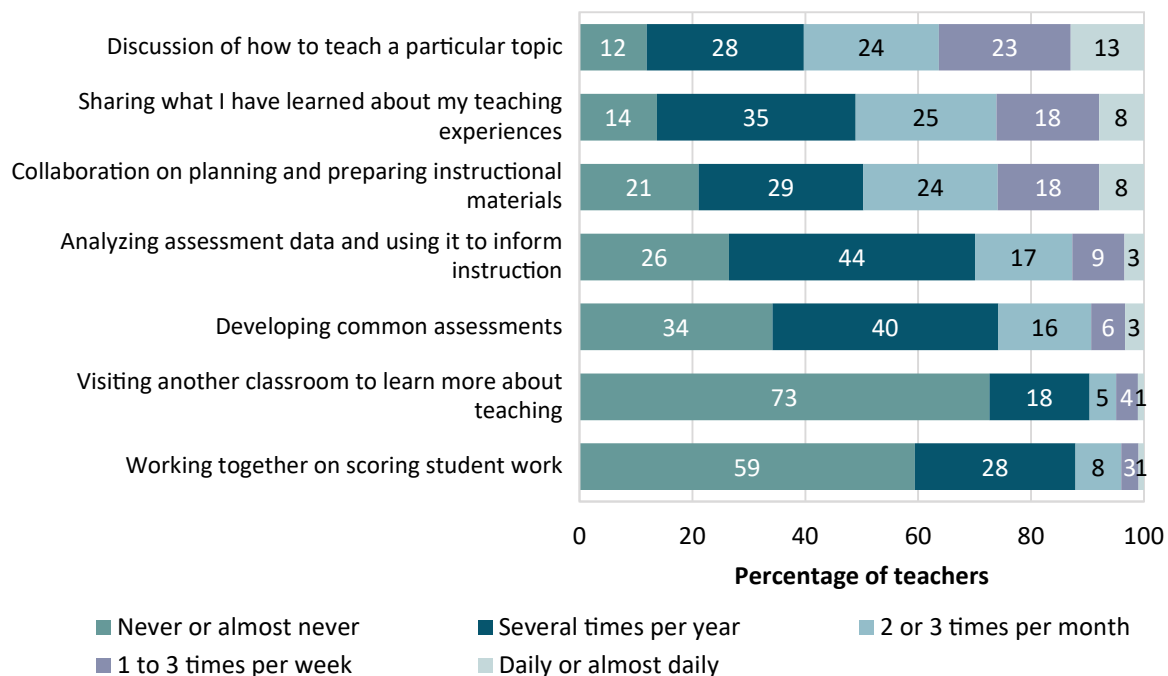
‡ There are fewer than 30 observations.

Note: Shaded rows indicate activities that at least 80 percent of teachers reported as having some or a lot of impact.

Collaboration

Mathematics teachers were asked about the type of collaboration they had experienced with their colleagues. The majority of teachers reported that they never or almost never visit another classroom to learn about teaching or work together to score student work. However, most teachers reported that they engage in discussions with their colleagues at least two or three times a month on how to teach a particular topic (Figure 3.25, Appendix A.3.9.3).

FIGURE 3.25 Types of collaboration between mathematics teachers



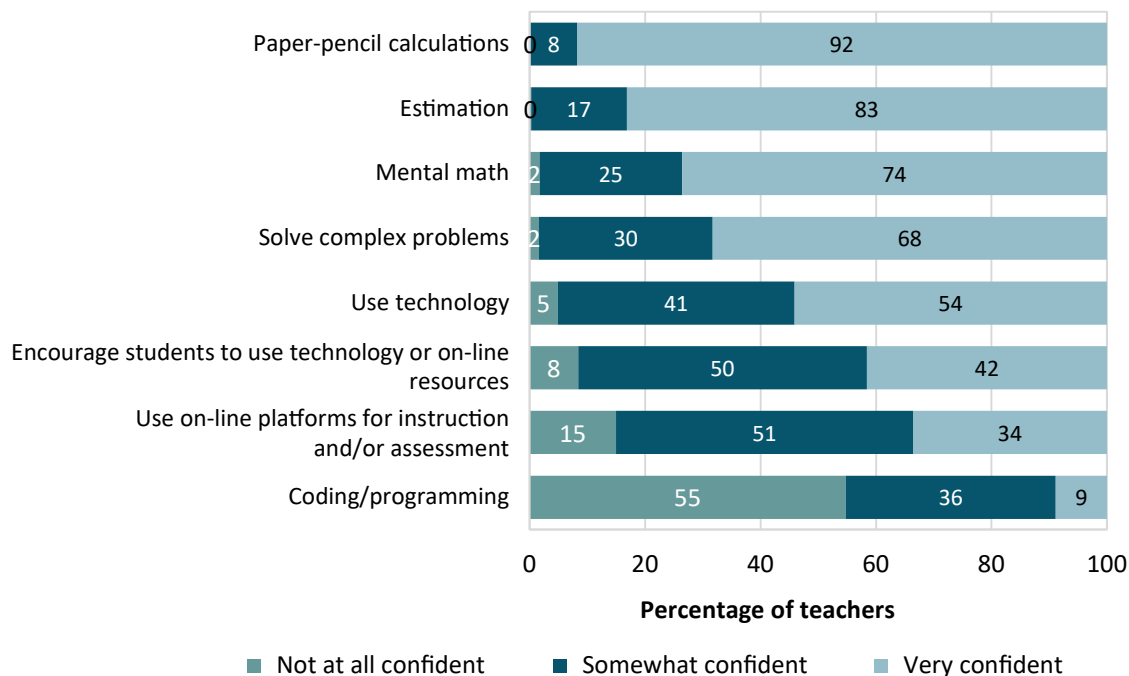
Teacher self-efficacy

Teachers' sense of efficacy — the belief that they can have a positive effect on student learning — has emerged as an important construct in teacher education. Teacher efficacy is grounded in Bandura's social cognitive theory (1977; 1997), which roots human agency in a sense of self-efficacy. According to Bandura, self-efficacy beliefs motivate people toward specific actions in all aspects of their lives, and therefore have predictive value. Bandura identified two dimensions of self-efficacy: personal self-efficacy and outcome expectancy. When applied to teaching, the personal self-efficacy factor is generally known as personal teaching efficacy (PTE). Teachers with a high level of PTE have confidence that their training and/or experience will allow them to help their students overcome obstacles to their learning (Bandura, 1977). The second factor, when applied to teaching, is commonly called general teaching efficacy (GTE) and is related to teachers' belief that they can influence a student's motivation and performance. According to Moslemi and Mousavi (2019), teachers with higher self-efficacy are likelier to accommodate different learner needs and ultimately remain in the profession.

Confidence

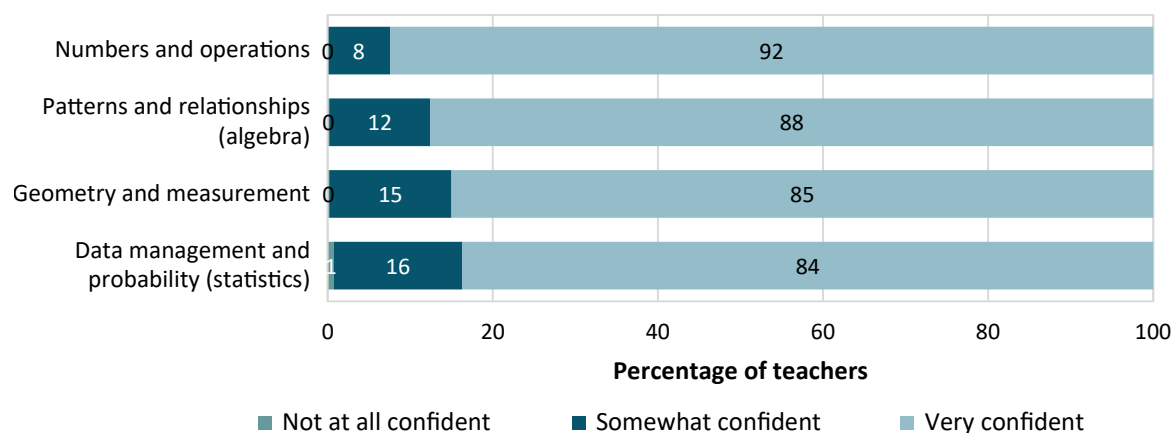
As shown in Figure 3.26, nearly all teachers said they were somewhat confident or very confident in their ability to perform a variety of mathematical tasks. Relatively small proportions of teachers were not confident in their ability to use technology or online platforms for instruction, but the majority of teachers were not confident about their ability to do coding or programming (Figure 3.26, Appendix A.3.10).

FIGURE 3.26 Teachers' confidence in their ability to perform mathematics tasks



Teachers were also asked about their confidence in helping their students develop their understanding of the subdomains of mathematics. As shown in Figure 3.27, teachers expressed the most confidence in their ability to help students understand numbers and operations and the least confidence in teaching the data management and probability subdomain (Appendix A.3.10). Nonetheless, more than 80 percent of teachers were very confident about their ability to help students develop their understanding in each of the four domains.

FIGURE 3.27 Teachers' confidence in their ability to help their students understand mathematics subdomains



Attitudes and beliefs

In PCAP 2019, teachers were asked to identify factors they believed influenced student performance in mathematics. Over 95 percent of teachers agreed or strongly agreed that work ethic, learning from the errors they made, prior knowledge, and teaching influenced students' mathematics outcomes (Table 3.5, Appendix A.3.11.1).

TABLE 3.5 Percentage of teachers by level of agreement with statements about factors influencing student performance in mathematics

Students' performance in my mathematics class is mostly influenced by:				
	Strongly disagree	Disagree	Agree	Strongly agree
Work ethic	1‡	1	46	52
Learning from the errors they make	1‡	3‡	60	36
My high expectations for all students	1‡	11	58	31
Prior knowledge	0‡	3	71	27
Teaching	0‡	3	74	23
Parents/guardians	1‡	15	65	19
Peer influence	1‡	17	66	15
Availability of help outside the classroom	3	26	62	9
Natural ability	6	39	49	6

‡ There are fewer than 30 observations.

Teachers were asked to self-report on their attitudes related to teaching and learning mathematics. A large majority of teachers strongly agreed with a statement about the importance of practice for student learning in mathematics. A majority of teachers also strongly agreed that all students can succeed in mathematics, with a majority disagreeing or strongly disagreeing that success in mathematics requires natural ability (Table 3.6, Appendix A.3.11.2).

TABLE 3.6 Percentage of teachers by level of agreement with statements about attitudes related to teaching and learning mathematics

To what extent do you agree with the following statements about mathematics?				
	Strongly disagree	Disagree	Agree	Strongly agree
Practice is important for student learning in mathematics	0‡	0‡	29	71
It is possible for all students to succeed in mathematics	1‡	7	40	52
Success in mathematics requires hard work	0‡	5	49	46
Student success in mathematics requires good teaching	0‡	2	56	42
There is not enough emphasis on basic computational skills in the early grades	3	23	41	33
Students should be given the opportunity to engage in computational thinking (e.g., programming, coding, robotics) in the mathematics classroom	2‡	17	58	23
By the time students reach Grade 8/Secondary II, the emphasis in mathematics teaching should be more on problem solving	1‡	28	56	16
Students should not be allowed to use calculators until they have mastered basic computational skills	9	44	36	12
Success in mathematics requires natural ability	14	65	19	2‡
Because calculators are easily available, there is less need to emphasize basic computational skills in teaching mathematics	38	50	10	2‡

‡ There are fewer than 30 observations.

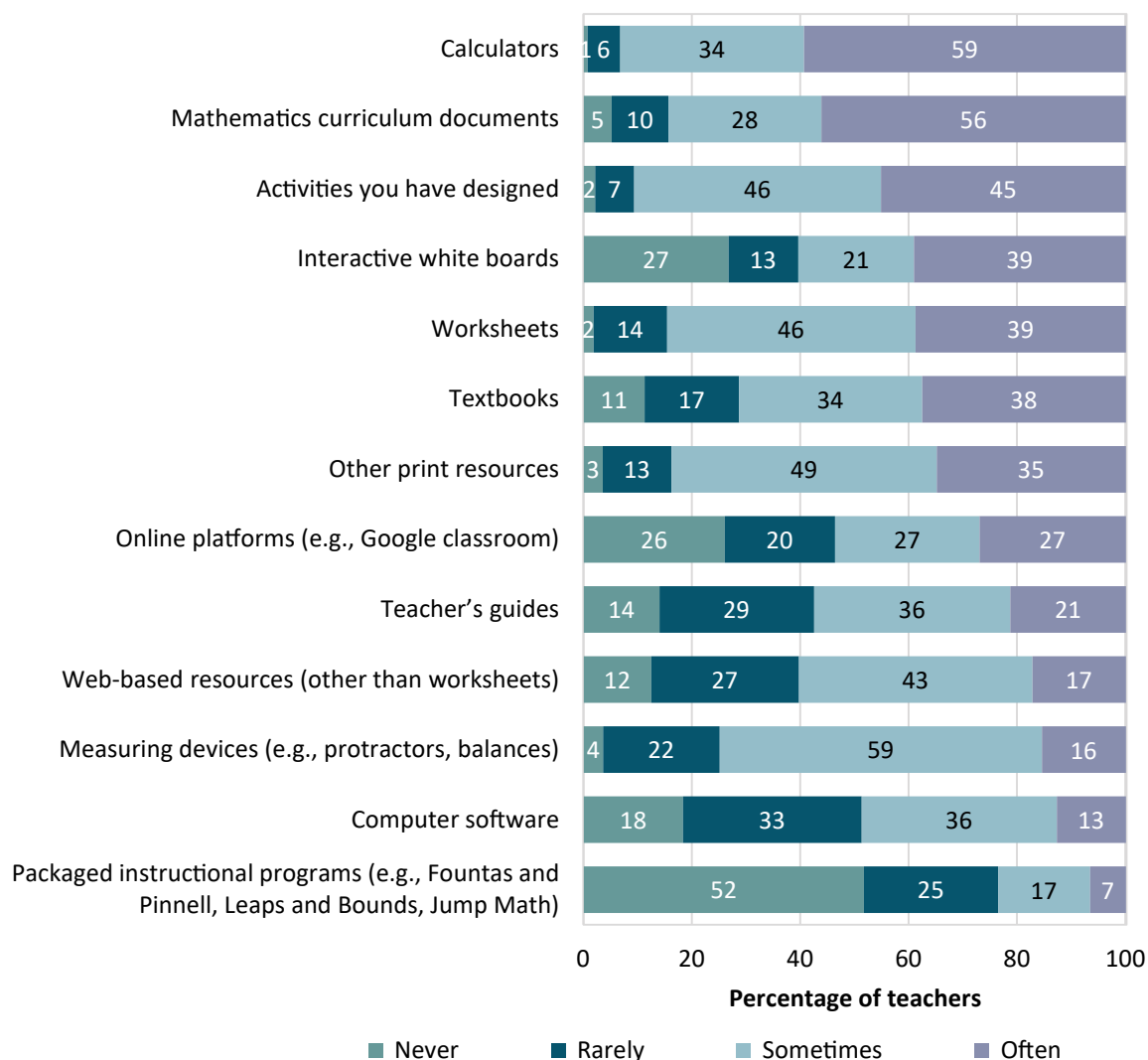
Classroom practices

This section looks at data related to classroom practices of mathematics teachers in schools that participated in PCAP 2019 and their relationship to achievement, where relevant. The topics discussed in this section include teaching resources, probing student understanding, curriculum knowledge and understanding of vertical articulation, teachers' homework expectations, and assessment practices.

Resources used for mathematics instruction

To examine the resources used in mathematics instruction, the teacher questionnaire listed 13 items along with a frequency of use scale that ranged from *never* to *often*. As Figure 3.28 shows, the majority of teachers reported often using calculators and mathematics curriculum documents in their mathematics instruction. Forty-five percent of teachers often use activities that they designed and about 40 percent often use interactive white boards, worksheets, and textbooks. The least frequently used resource was packaged instructional programs, with close to 80 percent of teachers never or rarely using them (Figure 3.28, Appendix A.3.12.1).

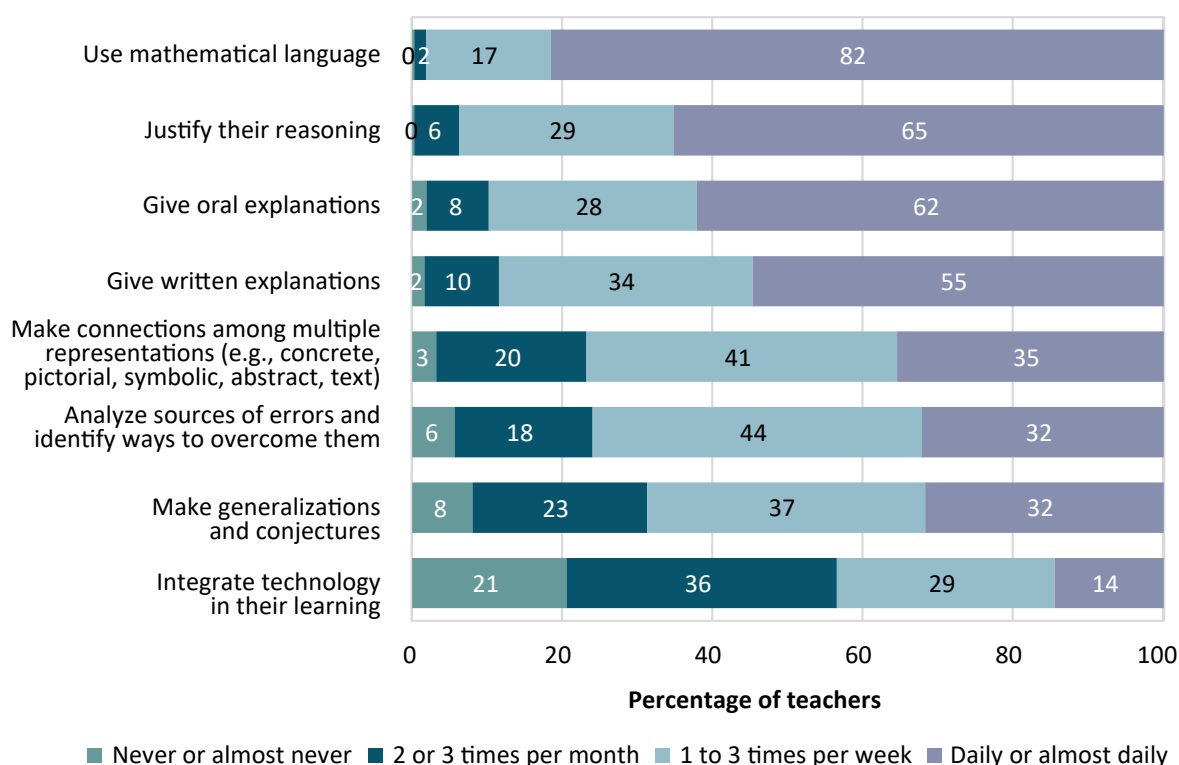
FIGURE 3.28 Resources used in mathematics instruction



Probing student understanding

PCAP 2019 asked teachers how they provide students with opportunities to show their mathematical understanding. Over 80 percent of teachers reported using mathematical language to probe student understanding daily or almost daily. The majority of teachers also asked students daily or almost daily to justify their reasoning and to give oral and written explanations. Forty-three percent of teachers reported integrating technology in students' learning at least weekly to probe their mathematical understanding (Figure 3.29, Appendix A.3.12.2).

FIGURE 3.29 Teachers' use of opportunities for students to show understanding in mathematics



Curriculum knowledge and understanding of vertical articulation

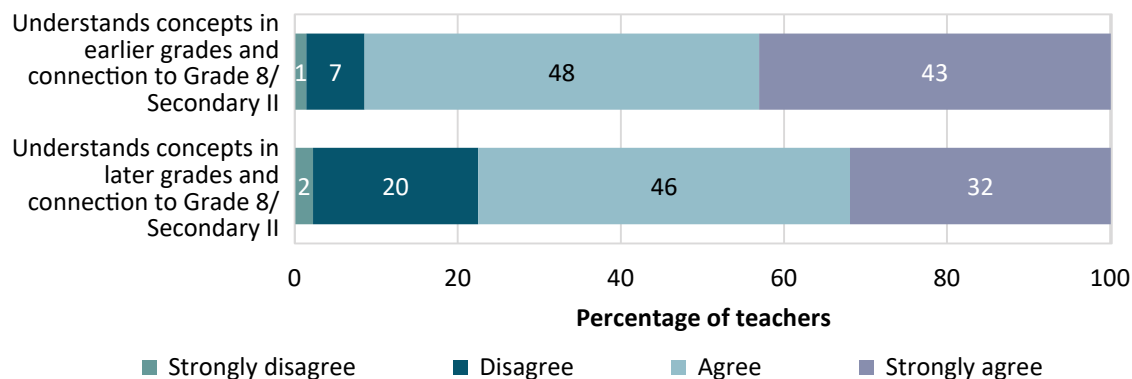
Shulman (1986) distinguishes between *lateral curriculum knowledge*, defined as the teacher's ability to link content from one subject area to another (i.e., cross-curricular instruction), and *vertical curriculum knowledge*, defined as the teacher's familiarity with subject area content that has been taught in preceding years and/or will be taught in later years. Whereas *horizon knowledge* refers to the teacher's awareness of how content is connected to the broader mathematical landscape (Hill & Ball, 2009), *vertical articulation* is connected to teachers' understanding of learning progressions, which describe student outcomes throughout different grade levels and provide standards for assessments (Suh & Seshaiyer, 2015). Teachers' knowledge and skills are essential to supporting learning progressions, ultimately enabling the mathematical agenda to move forward (Suh & Seshaiyer, 2015).

To explore their understanding of vertical articulation in mathematics curricula, teachers were asked about their level of agreement with the following two statements:

- I have a deep understanding of the mathematics concepts taught in earlier grades and how they connect to the Grade 8/Secondary II mathematics curriculum.
- I have a deep understanding of the mathematics concepts taught in later grades and how they connect to the Grade 8/Secondary II mathematics curriculum.

As shown in Figure 3.30, 92 percent of teachers agreed or strongly agreed with the first statement, while 78 percent of teachers agreed or strongly agreed with the second (Appendix A.3.12.4).

FIGURE 3.30 Teachers' understanding of vertical articulation in mathematics curricula



Teachers' homework expectations

In PCAP 2019, teachers were asked to report on the amount of time they expected students to spend on mathematics homework. In Newfoundland and Labrador, a quarter of teachers reported that they expected students to do more than two hours of mathematics homework per week. In contrast, only 1 percent of teachers in New Brunswick reported having the same expectation, while 35 percent of teachers in that province reported that they do not assign any mathematics homework. In Canada overall, approximately 60 percent of teachers assign between 30 minutes and two hours of homework in mathematics per week (Figure 3.31, Appendix A.3.13.1). From the student perspective, as reported in Chapter 2, close to 60 percent of students reported spending an hour or less on mathematics homework (this figure does not include those students who reported that their teacher did not assign homework in mathematics). Approximately one in four students spend over an hour on homework in this subject (Figure 2.13, Appendix A.2.4.6).

FIGURE 3.31 Amount of time teachers expect students to spend on mathematics homework per week

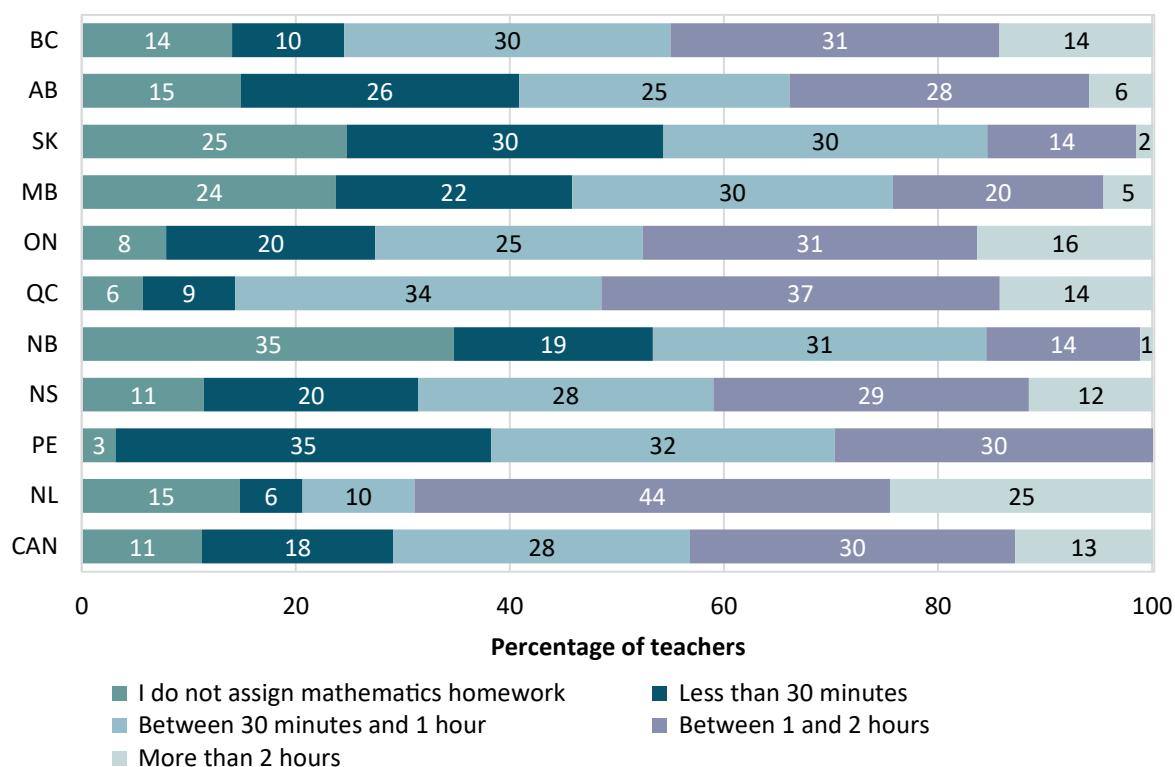
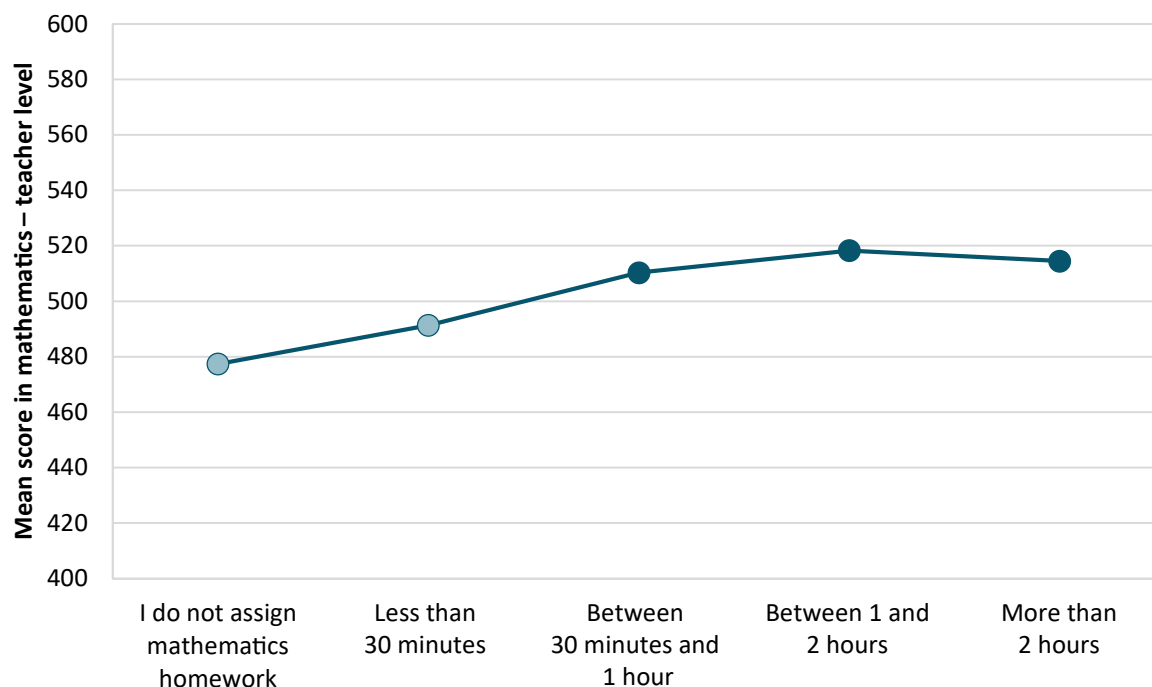


Figure 3.32 indicates that students whose teachers reported assigning more than 30 minutes of homework per week had higher mathematics achievement on average than students who were assigned less than 30 minutes of homework per week. However, there was no significant difference in mathematics achievement between students who were assigned 30 minutes to an hour of homework and those who were assigned more than an hour of homework (Appendix A.3.13.2). In order to benefit from homework assignments, students need to make an effort to complete those assignments. As shown in Chapter 2, a difference of more than 50 points in mathematics scores was found between students who reported that they often complete their mathematics homework and those who rarely do so (Figure 2.14, Appendix A.2.4.7).

FIGURE 3.32 Relationship between the amount of mathematics homework assigned per week and mathematics achievement

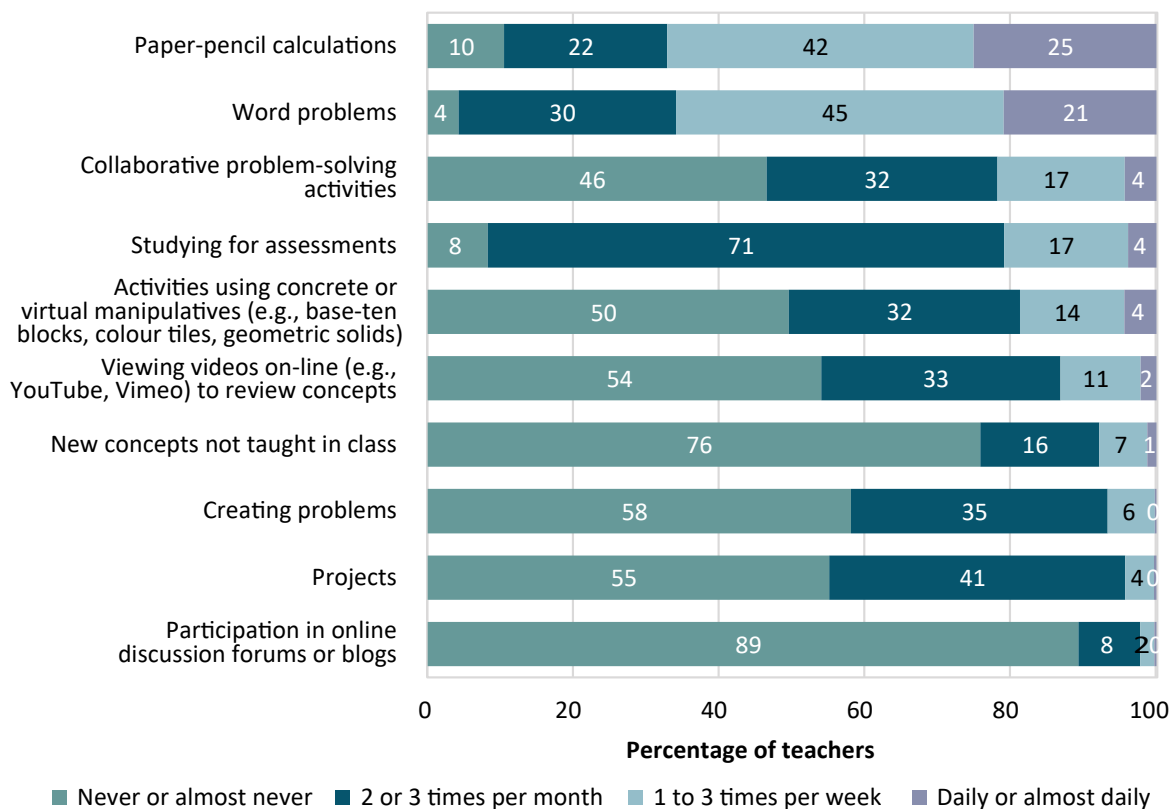


Notes: Darker shade denotes significant difference compared to the *less than 30 minutes* category

"Mean score in mathematics – teacher level" refers to the mean student score in a teacher's classroom. The scores shown are the Canadian averages of those means.

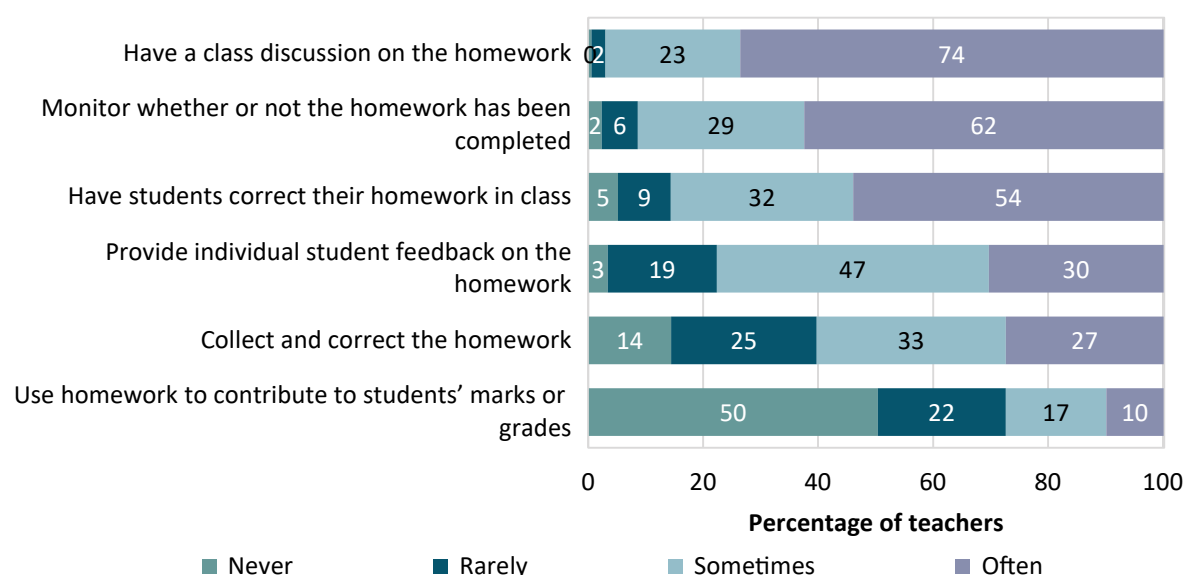
Teachers were asked about the types of homework that they assigned in their mathematics classrooms. Figure 3.33 lists the types of homework in descending order by the proportion of teachers who assign them at least once a week. The most common types of homework were paper-and-pencil calculations and word problems, which were assigned at least weekly by two-thirds of teachers. Perhaps not surprisingly, few teachers reported assigning homework that was based on concepts not taught in class or that required students to participate in online discussions (Figure 3.33, Appendix A.3.13.3).

FIGURE 3.33 Types of homework assigned by mathematics teachers



Teachers were asked to report on how they monitored their students' homework effort. Nearly three-quarters of teachers reported often having a class discussion on homework to gauge the level of effort student had put into it. A majority of teachers also reported often monitoring completion of homework and often having students correct their homework in class. Almost three-quarters of teachers reported that they never or rarely considered homework when determining students' marks (Figure 3.34, Appendix A.3.13.4).

FIGURE 3.34 Teacher monitoring of students' homework



Assessment

Teachers use assessment to gain insight into students' current ideas, gaps in understanding, and reasoning processes. This information can then be used to adapt instructional and assessment strategies to student needs. The power of assessment to reveal and support learning depends on how well students' responses authentically reflect their thinking and understanding (Shepard, 2005). Questions about assessment are included in each of the three PCAP questionnaires. Questions for teachers look at assessment practices, including strategies and types of questions.

Question types

There is much debate on the use of multiple-choice tests versus constructed-response tests in which students must communicate their knowledge and understanding using methods such as text, graphs, or tables. Much of the debate has focused on equivalency related to difficulty, reliability, validity, and psychometrics. There are numerous research articles in favour of each type of test, in addition to mixed-methods tests, which use both types. It appears that a broad range of assessment tools is needed to capture important learning goals and processes and to directly connect assessment to ongoing instruction (Shepard, 2000).

Figure 3.35 presents types of questions in descending order by the proportion of teachers who sometimes or often use them on mathematics tests. Overall in Canada, over 90 percent of mathematics teachers reported that they sometimes or often use various types of written-response questions to assess their students' understanding, while approximately 60 percent of teachers use selected-response questions with the same frequency. The most common type of written-response question on mathematics tests requires multi-step solutions, with 71 percent of teachers reporting that they often used this type of question (Figure 3.35, Appendix A.3.14.1).

FIGURE 3.35 Types of questions teachers use on mathematics tests

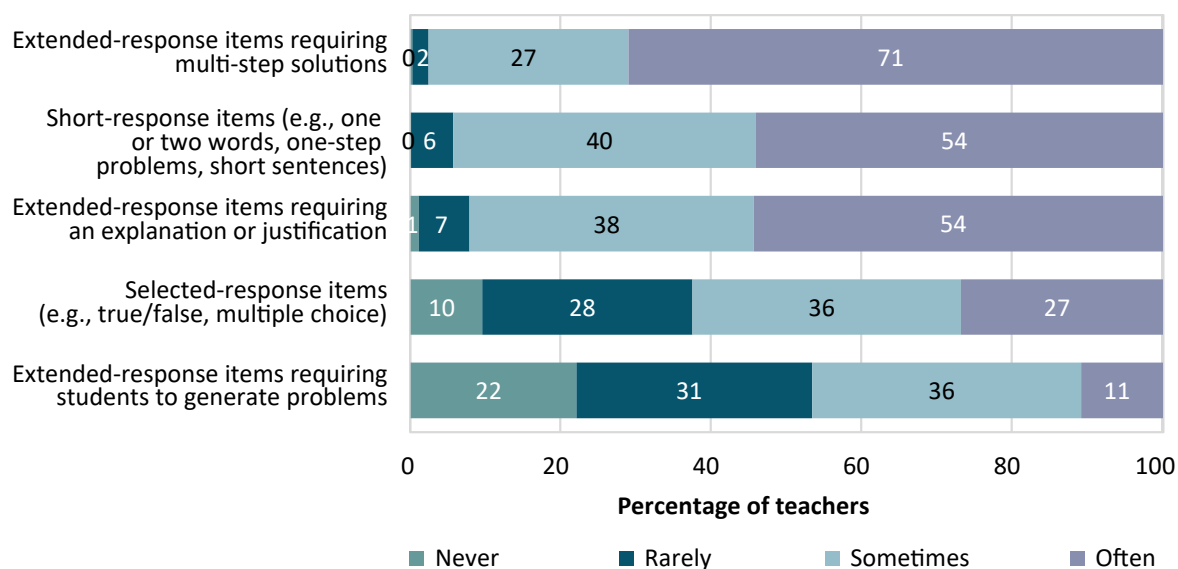
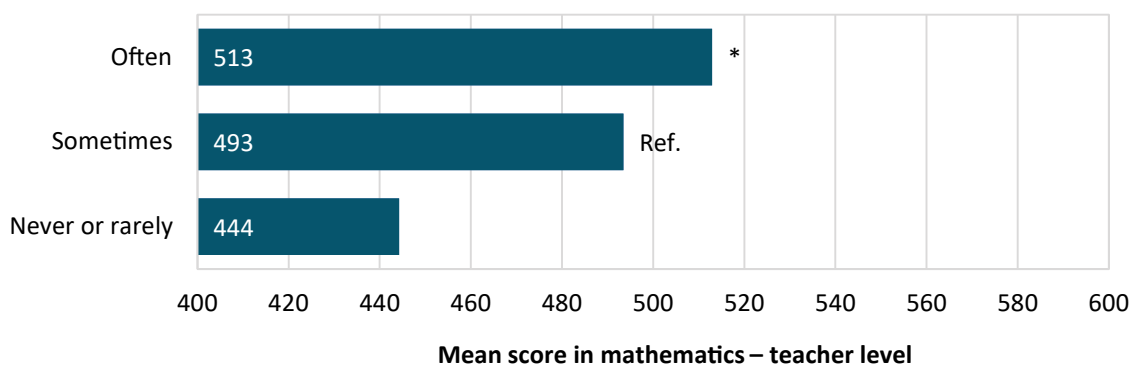


Figure 3.36 shows that there is a positive relationship between the frequency of use of extended-response items requiring multi-step solutions in mathematics assessment and average mathematics achievement. It is important to note that less than 2 percent of teachers reported that these types of questions were never or rarely used (Appendix A.3.14.2). No relationship with achievement was found for other types of questions.

FIGURE 3.36 Relationship between frequency of extended-response items requiring multi-step solutions and mathematics achievement



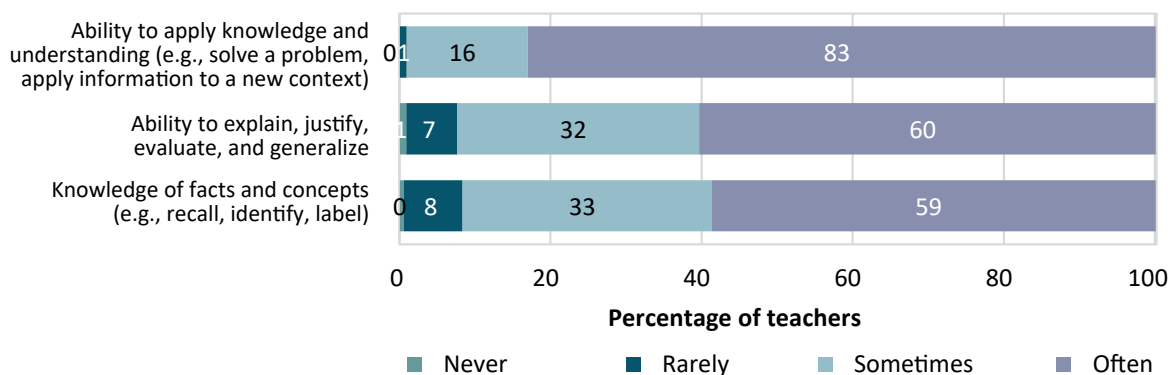
* Significant difference compared to the *sometimes* category

Note: “Mean score in mathematics – teacher level” refers to the mean student score in a teacher’s classroom. The scores shown are the Canadian averages of those means.

Levels of thinking

Teachers use different types of questions to probe students' level of thinking during their interactions with mathematics concepts. As shown in Figure 3.37, over 80 percent of teachers often use questions that measure students' ability to apply knowledge and understanding. Smaller proportions of teachers reported that they often use questions that measure students' ability to explain, justify, evaluate, and generalize their thinking (60 percent) and students' knowledge of facts and concepts (59 percent) (Appendix A.3.14.3).

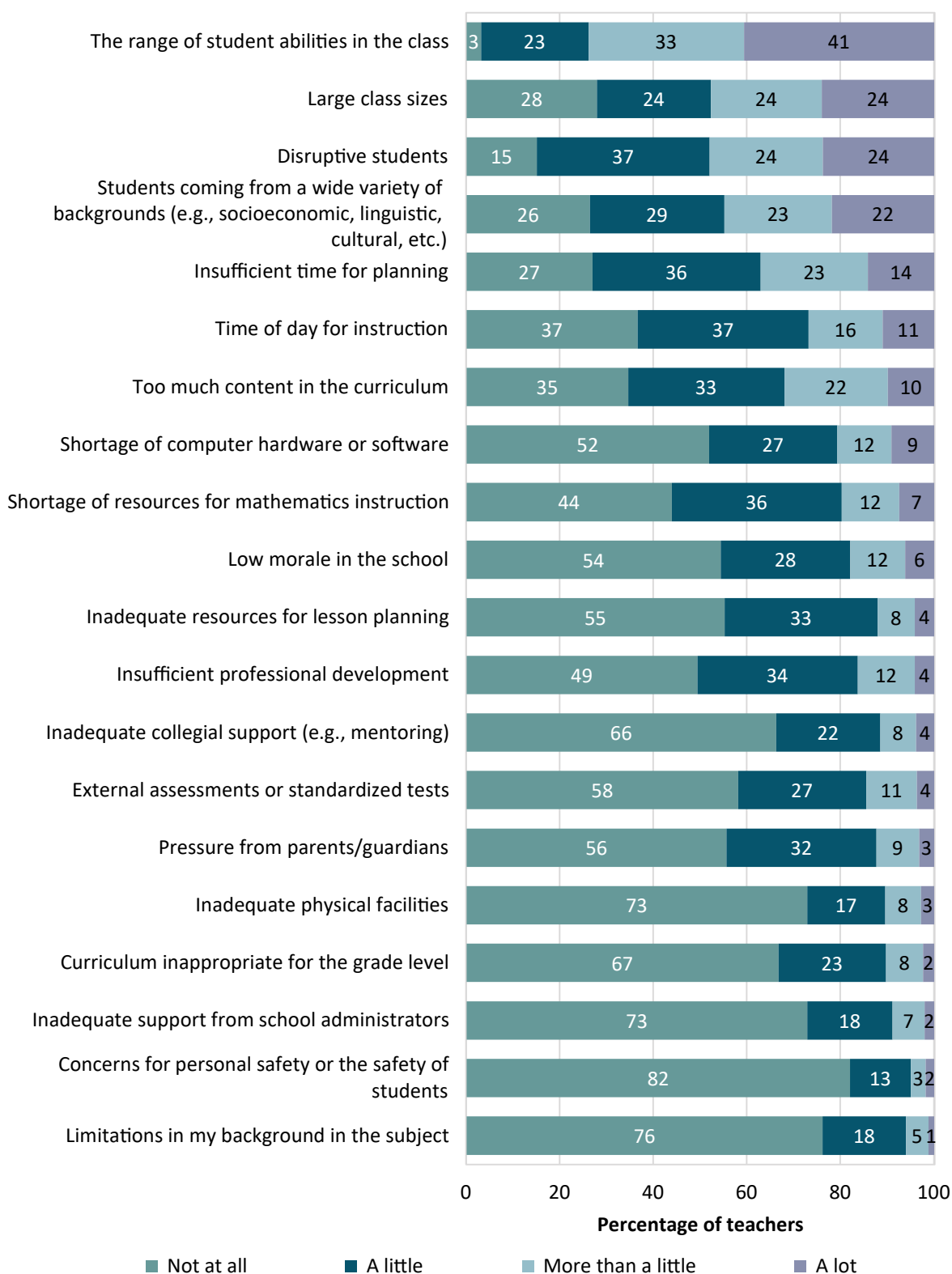
FIGURE 3.37 Types of questions teachers use in mathematics assessments to measure different levels of thinking



Challenges in teaching mathematics

In PCAP 2019, teachers were asked to report on challenges that they face in teaching mathematics. As shown in Figure 3.38, 41 percent of teachers reported that the range of student ability in their class presented a lot of challenges to their mathematics teaching. About one-quarter of teachers reported that they are often challenged by large class sizes, disruptive students, and diverse classroom composition. The challenges that were reported least frequently were concerns about safety and the teacher's limited background knowledge in mathematics (Appendix A.3.15.1).

FIGURE 3.38 Challenges in mathematics teaching, as reported by teachers



Principal component analysis was applied to these components to generate the *challenges to teaching index*, which comprises three of these items: the range of student abilities in the class, disruptive students, and students coming from a wide variety of backgrounds (e.g., socioeconomic, linguistic, cultural, etc.) (Figure 3.39). The top quarter of the index represents students whose teachers were most likely to report that these three factors presented challenges to their mathematics teaching, while the bottom quarter represents those whose teachers reported such challenges least frequently. Unsurprisingly, students have higher achievement in mathematics in classrooms in which teachers reported fewer challenges to teaching, with a 44-point difference in PCAP mathematics scores in Canada overall between the top and bottom quarter of this index. There was no difference in achievement between student in the top and third quarters of the index (Figure 3.40, Appendix A.3.15.2).

FIGURE 3.39 Teachers' responses to questionnaire items related to the challenges to teaching index

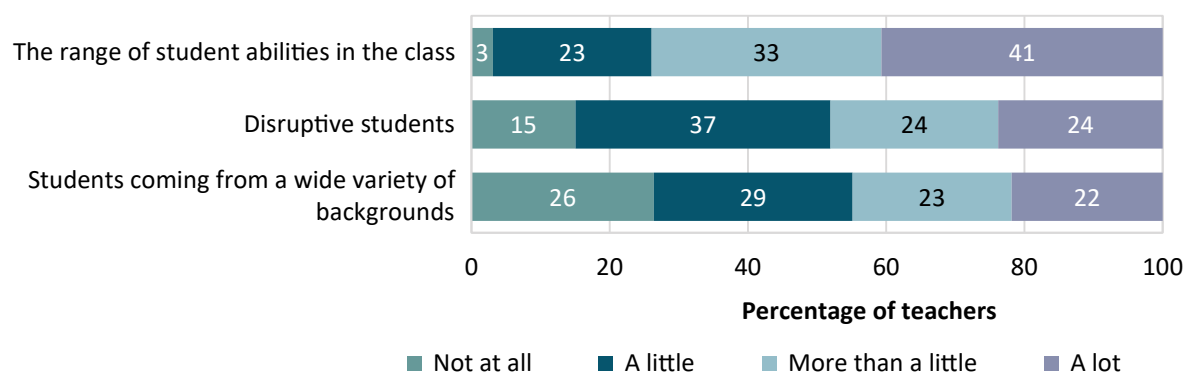
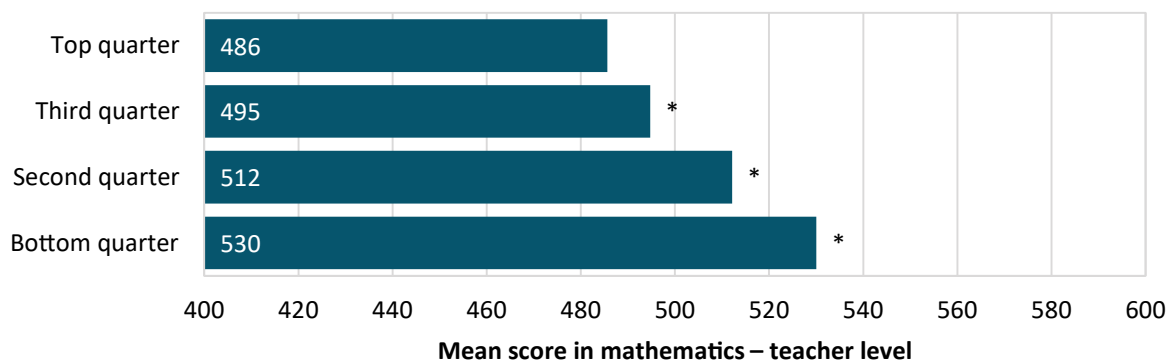


FIGURE 3.40 Relationship between the challenges to teaching index and mathematics achievement



* Significant difference compared to the adjacent lower quarter; the bottom quarter is compared to top quarter

Note: "Mean score in mathematics – teacher level" refers to the mean student score in a teacher's classroom. The scores shown are the Canadian averages of those means.

Summary

This chapter has presented information on the characteristics of Canadian Grade 8/Secondary II classrooms and on the practices of teachers, based on data gleaned from the PCAP 2019 teacher questionnaire.

Teachers' instructional practices and beliefs and their relationship with achievement in mathematics were examined. According to PCAP 2019, the majority of Canadian teachers have confidence in their ability to teach mathematics and believe that they can positively influence student outcomes. They believe that all students can succeed in mathematics and that this success is the result of quality teaching and student effort rather than natural ability. Higher mathematics achievement was associated with large classes (25 or more students) that had only one grade level and those where teachers' mathematics assignment was 40 percent or more of their total teaching assignment. Lower achievement was found in classrooms where another adult was present most of the time, where accommodations were often used to meet the needs of students, and where teachers reported greater challenges to teaching caused by class composition related to the range of student ability, diverse backgrounds, and disruptive students. Large achievement gaps were found in classrooms in which program modifications were most frequently used and where students were most often given more time to accomplish tasks.

Mathematics teachers use a variety of resources in their classrooms, with the most common resources being curriculum guides and calculators. In terms of providing opportunities for students to demonstrate their understanding, the majority of teachers ask students to use mathematical language, justify their reasoning, and give oral and written explanations daily or almost daily. More than 40 percent of teachers reported integrating technology in students' learning at least weekly to probe their mathematical understanding. Better mathematics outcomes were found in classrooms where teachers assigned 30 minutes or more of mathematics homework per week and often assessed their students using extended-response items requiring multi-step solutions. Mathematics teachers more frequently assessed their students' learning by asking them to demonstrate their understanding by constructing responses rather than by answering selected-response questions.

The majority of Canadian teachers hold a bachelor of education or equivalent (i.e., a form of teacher training). They have pursued professional development opportunities, predominantly through workshops and conferences and through activities focused on teaching strategies, integrating technology into teaching, and strategies to adapt instruction to students' interests and needs. Most teachers reported that they have a deep understanding of the mathematics concepts taught in both earlier grades and later grades and how they connect to the Grade 8/Secondary II mathematics curriculum. Higher mathematics achievement was found in classrooms where teachers considered themselves specialists by both education and experience compared to teachers who did not consider themselves specialists.

Excellence in education depends not only on the motivation of students, the quality and dedication of school personnel, and parental support, but also on the characteristics of and resources available in the school environment. Decisions made at one level of a school system that affect these characteristics and the allocation of these resources are affected by decisions made at other levels. Classroom-level decisions are influenced by school-level decisions, which, in turn, are influenced by decisions related to resources, policies, and practices made at the level of the school district, or even the province/territory.

All schools experience challenges as they strive to provide the best educational opportunities possible for their students. Nonetheless, from a pan-Canadian and provincial/territorial perspective, the quality of education in Canada is very high. According to a report relating provincial/territorial profiles to achievement equity (CMEC, 2012a), Canada has achieved both high performance levels and a relatively high degree of equity among students across provinces. And, unlike the findings in many other countries that participate in PISA, in Canada the performance of students is only weakly related to their socioeconomic status (OECD, 2019). Yet it is apparent that socioeconomically advantaged students in Canada attend the most successful schools and have access to greater resources; meanwhile, students attending schools with disciplinary problems may experience difficulty with academic performance (Mullis, Martin, Foy, et al., 2012).

This chapter examines four aspects of the schools that participated in PCAP 2019: demographic background and grade configuration; diversity of the school population; factors influencing learning; and challenges to learning and teaching.

Over 1,500 schools from all provinces participated in PCAP 2019. Schools were randomly selected, with the probability of selection proportional to the size of the school, based on the list of all schools with Grade 8/Secondary II students under the purview of the ministry/department of education in each province. Schools were selected separately in the anglophone and francophone school systems; students in French immersion programs were considered part of the anglophone population. Each of the participating schools received a school questionnaire, to be answered by the school principal. The following sections analyze the information provided in response to this questionnaire.

School demographics and grade configuration

Ongoing efforts by educational researchers have tried to discern the most effective learning environments, ones in which all students can thrive. This section describes environmental factors of the schools in which participating Grade 8/Secondary II students were enrolled. These include demographic features such as the size of the communities in which the schools are located, the type of governance (public versus private), and the number of students enrolled. This section also examines grade configurations in participating schools.

School demographics

Many factors influence the extent to which a school achieves efficiency and effectiveness. As complex, open systems, schools are always changing in response to the actions of people and institutions both within and outside of school walls. Students and teachers are at the core of schooling, but their classroom environment is situated within a complexity of institutions, resource networks, policies, and practices. Provinces determine the statutory contexts of schooling, and school districts are responsible for developing policies that apply these statutes to best meet the unique needs of the schools and families within their communities.

Community size

The size of the community in which a school is located impacts the allocation of resources and influences options for grade configurations within the school. Over the past few decades, many small rural schools have been closed, and, overall, rural communities have had greater challenges than urban ones in keeping their schools open. Rural school districts often cover large geographical areas, resulting in some unique operational challenges such as the logistics of student transportation networks, maintaining modern facility infrastructure, offering a variety of courses to students, and providing teachers with professional development opportunities. In PISA 2015, a rural disadvantage in academic performance was observed when the performance of students attending schools in communities with populations of less than 3,000 was compared to that in communities with a population greater than 100,000 (Echazarra & Radinger, 2019). Yet, rural communities believe that their schools offer advantages for students and families. With lower teacher-student ratios, these schools may offer students more personalized support, as teachers have opportunities to adapt to student needs and tailor lessons to suit learners.

All schools strive to offer high-quality instruction to students, regardless of their geographical locations. New technologies offer innovative ways to close the rural-urban gaps in education by connecting professional learning networks and expanding distance-learning opportunities for students (OECD, 2013b).

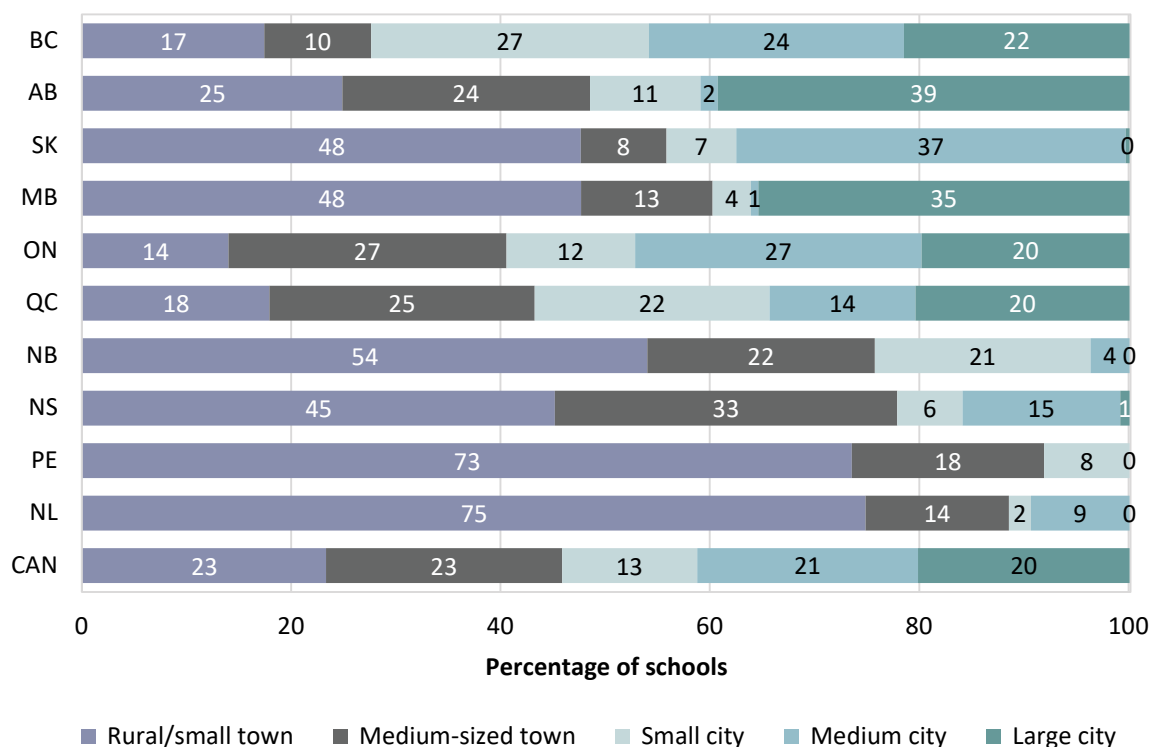
The schools that participated in PCAP 2019 were located in communities ranging from rural areas and small towns to large cities. The population ranges used in this study to categorize different communities are given in Table 4.1.

TABLE 4.1 Definitions of communities by population size

Rural/small town	Medium town	Small city	Medium city	Large city
Fewer than 5,000 people	5,000 to 24,999 people	25,000 to 99,999 people	100,000 to 499,999 people	Over 500,000 people

At the pan-Canadian level, schools are distributed fairly equally among four of the five categories of communities listed in the school questionnaire. The exception is small cities, which have a lower proportion of schools compared to both smaller and larger communities. Provincially, the proportion of schools by community size varies according to provincial populations: the largest numbers of rural schools are found in the Atlantic and Prairie provinces, which have the smallest populations, while smaller proportions of rural/small-town schools are found in Canada's most populous provinces (Figure 4.1, Appendix A.4.1.1).

FIGURE 4.1 Size of communities in which schools are located



In Canada overall, 23 percent of schools in anglophone systems and 26 percent of schools in francophone systems were located in a rural area or small town. In anglophone school systems, the proportion of rural schools varies from 13 percent in Ontario to 81 percent in Prince Edward Island. In francophone school systems, the highest percentage of rural schools was found in Manitoba (67 percent); in British Columbia, none of the francophone schools that participated in PCAP were rural. Across Canada, 21 percent of schools in anglophone systems and 17 percent of schools in francophone systems were located in large cities. At the provincial level, the highest proportions of large-city schools participating in PCAP were located in both the anglophone and francophone school systems in Alberta (39 and 40 percent, respectively) and in the anglophone system in Manitoba (36 percent) (Table 4.2, Appendix A.4.1.2).

TABLE 4.2 Percentage of schools by size of communities in which they are located and language of school system

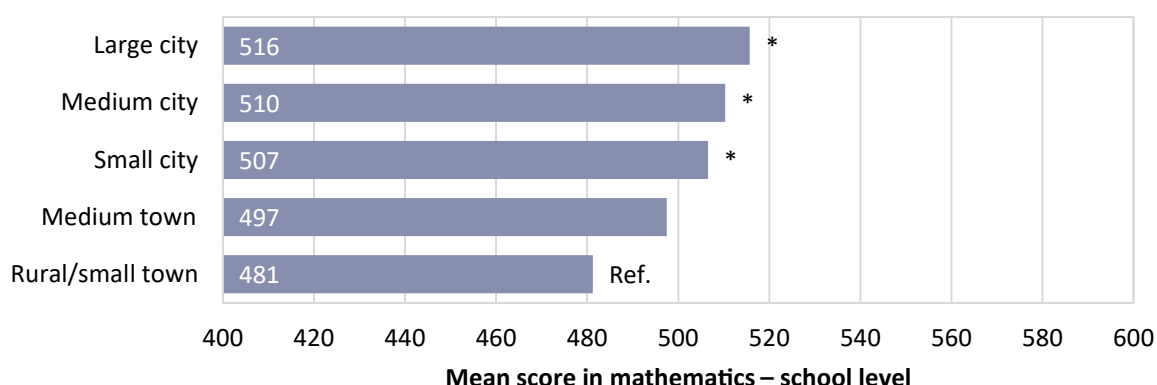
	Rural/small town	Medium town	Small city	Medium city	Large city
Anglophone school systems					
BC	18‡	10‡	25	25	22‡
AB	25‡	24‡	11‡	1‡	39
SK	48	8‡	6‡	37	0‡
MB	47	13‡	4‡	1‡	36
ON	13‡	27‡	12‡	28	20
QC	17‡	25‡	17‡	17‡	25‡
NB	51	18‡	26‡	5‡	0
NS	46	33	6‡	15‡	1‡
PE	81‡	10‡	10‡	0	0
NL	76	14‡	2‡	9‡	0
CAN	23	22	12	22	21
Francophone school systems					
BC	0	9‡	64‡	18‡	9‡
AB	20‡	10‡	10‡	20‡	40‡
SK	33‡	0	33‡	33‡	0
MB	67‡	7‡	7‡	0	20‡
ON	30	19‡	19‡	14‡	18‡
QC	18‡	25‡	24	13‡	20‡
NB	58	27‡	13‡	2‡	0
NS	40‡	30‡	10‡	20‡	0
CAN	26	23	21	13	17

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Figure 4.2 shows the relationship between the size of the community in which schools are located and mathematics achievement. Mean scores were similar in smaller communities (rural/small towns and medium towns); however, scores for schools located in cities of any size were higher than those in smaller centres (Appendix A.4.1.3). Such a finding needs to be considered in the context of regional differences, school resources, and other broader underlying factors impacting rural communities and smaller towns.

FIGURE 4.2 Relationship between the size of the community in which schools are located and mathematics achievement



* Significant difference compared to the *rural/small town* category

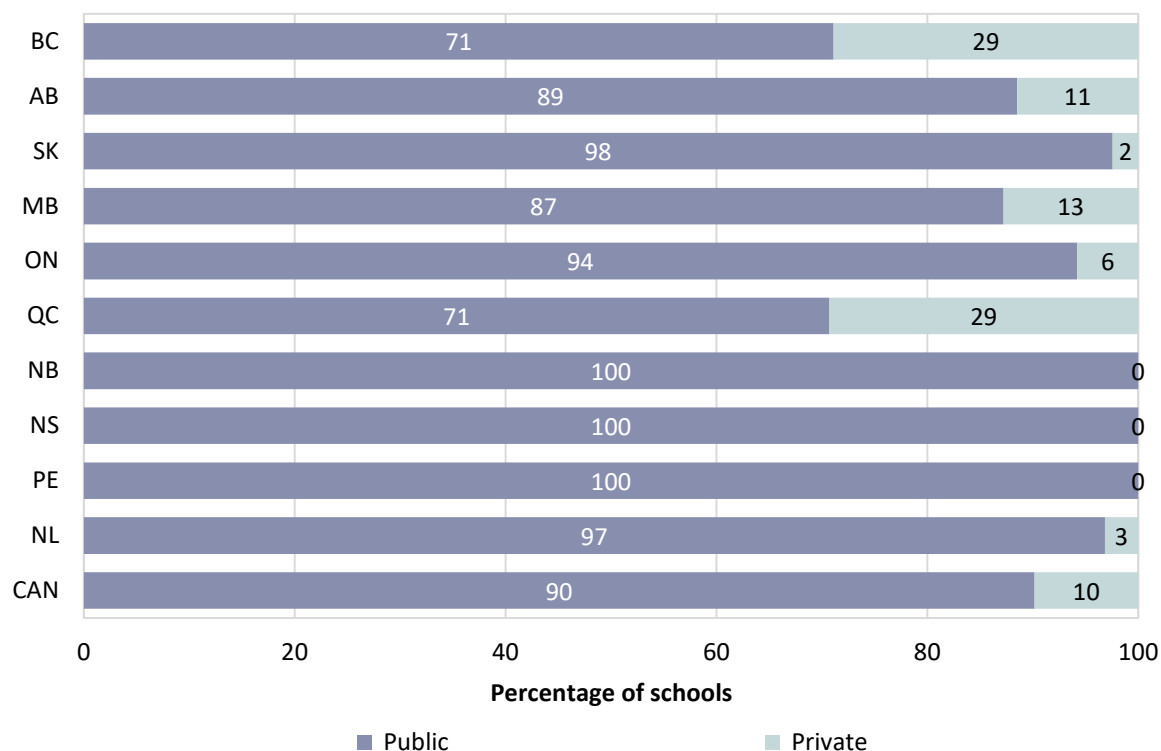
Note: “Mean score in mathematics – school level” refers to the mean student score in a school. The scores shown are the Canadian averages of those means.

School governance

The popularity of private schools has been on the rise in Canada, with enrolments steadily increasing in recent years (Statistics Canada, 2020b). The relative strengths and weaknesses of public and private education have long been debated. Parents choose private schools for a host of reasons. Private schools offer parents a choice that is believed to provide a learning environment with high-quality teachers within a caring environment where students will thrive. However, some observers have argued that private schools contribute to greater stratification of educational opportunities and outcomes (OECD, 2012). In OECD countries, including Canada, higher academic achievement in private schools has been found to be associated primarily with the higher socioeconomic status and education levels of the families they serve (OECD, 2012; Frenette & Chan, 2015).

As indicated by principals’ responses to the PCAP 2019 school questionnaire, 90 percent of participating schools across Canada were publicly funded. This is similar to the proportion reported by Statistics Canada (91.8 percent) for the year prior the PCAP study (Statistics Canada, 2020b). The highest proportions of private schools that participated in PCAP were located in British Columbia and Quebec (29 percent), while only public schools were sampled in New Brunswick, Nova Scotia, and Prince Edward Island (Figure 4.3, Appendix A.4.2.1).

FIGURE 4.3 Percentage of public and private schools



In Canada overall, 91 percent of participating schools in anglophone school systems were publicly funded, compared with 83 percent of schools in francophone school systems. The highest proportions of private anglophone schools were found in British Columbia (30 percent) and Quebec (28 percent), while private francophone schools were reported only in Quebec (29 percent) (Table 4.3, Appendix A.4.2.2).

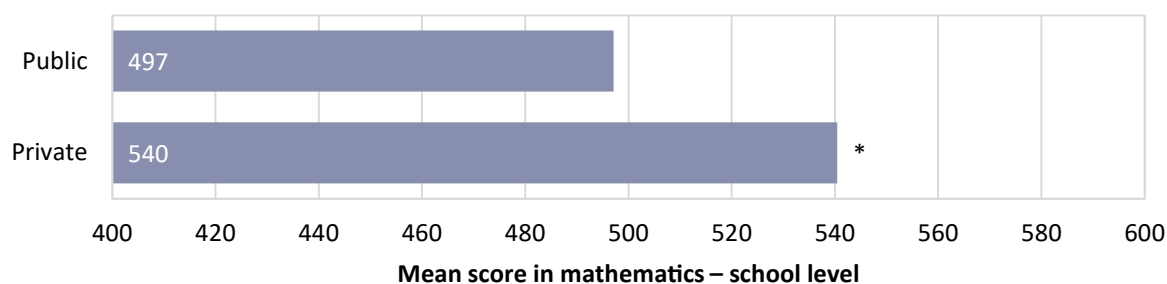
TABLE 4.3 Percentage of public and private schools, by language of the school system

	Anglophone school systems		Francophone school systems	
	Public	Private	Public	Private
BC	70	30‡	100‡	0
AB	88	12‡	100‡	0
SK	98	2‡	100‡	0
MB	86	14‡	100‡	0
ON	94	6‡	100	0
QC	72	28‡	71	29‡
NB	100	0	100	0
NS	100	0	100‡	0
PE	100‡	0	--	--
NL	97	3‡	--	--
CAN	91	9	83	17‡

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

As shown in Figure 4.4, the average mathematics score of students in private schools was higher than that of students in public schools (Appendix A.4.2.3). As noted in the literature, such difference in achievement should be considered in the context of the socioeconomic status and parental education levels of the students attending these schools; moreover, given the small proportion of private schools in the sample (10 percent), any conclusions should be drawn with caution.

FIGURE 4.4 Relationship between school governance and mathematics achievement

* Significance difference compared to *public* category

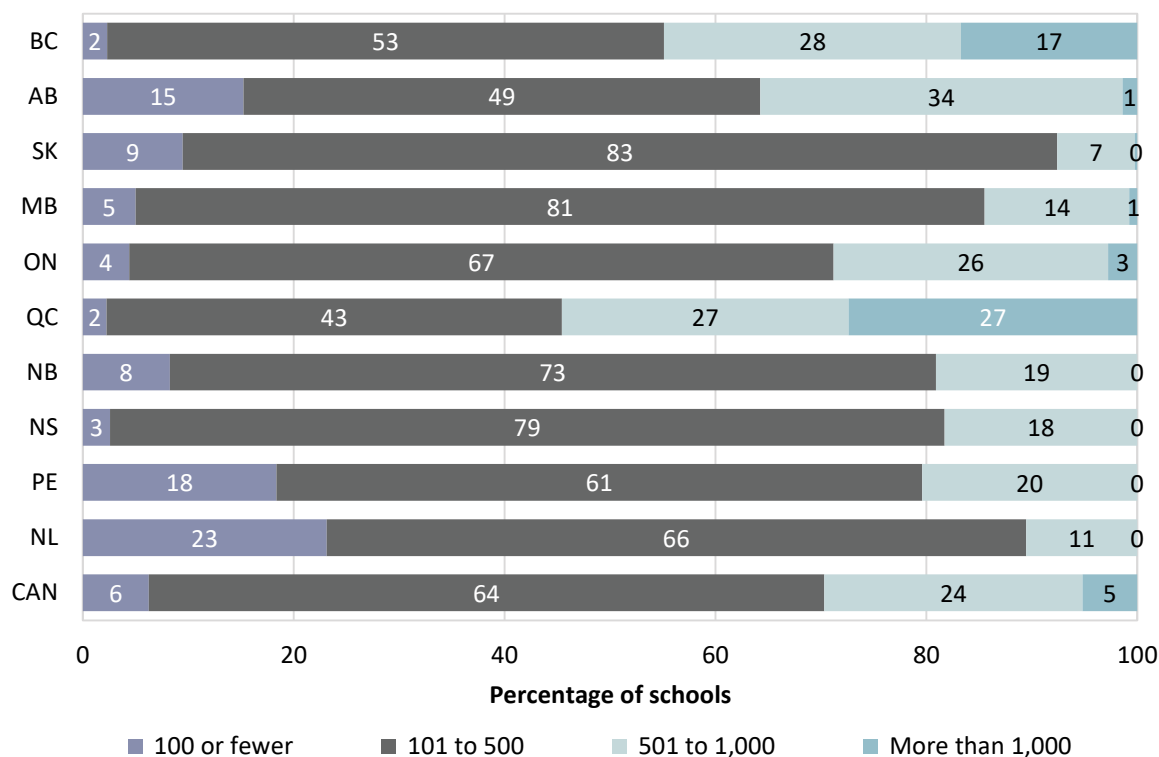
Note: "Mean score in mathematics – school level" refers to the mean student score in a school. The scores shown are the Canadian averages of those means.

School size

Although some studies have not found a connection between the number of students in a school and student achievement (Jones & Ezeife, 2011), others have found a non-linear relationship (Borland & Howsen, 2003). Regardless, the size of a school may be related to several factors that have been found to have a relationship with learning, including socioeconomic status, the number of grade levels in a school, teacher instructional practices, the school environment (Jones & Ezeife, 2011; Gershenson & Langbein, 2015), and opportunities for teacher collaboration and professional development (Abalde, 2014).

The school questionnaire asked principals about their schools' enrolment. In Canada overall, close to two-thirds of schools participating in PCAP 2019 had 101 to 500 students, while about one-quarter of schools had enrolments of 501 to 1,000 students. The highest proportion of small schools, with 100 students or fewer, was in Newfoundland and Labrador (23 percent), while the highest proportion of large schools, with more than 1,000 students, was in Quebec (27 percent) (Figure 4.5, Appendix A.4.3.1).

FIGURE 4.5 Total enrolment in schools



When the data are explored by language of the school system, the majority of participating schools in both language systems had between 101 and 500 students, with the exception of anglophone schools in Alberta and francophone schools in Quebec. The greatest proportion of large schools (more than 1,000 students) in anglophone systems was in British Columbia (17 percent) and Quebec (15 percent). The greatest proportion of small schools (under 101 students) was in francophone systems in British Columbia (27 percent) and Saskatchewan (33 percent) (Table 4.4, Appendix A.4.3.2).

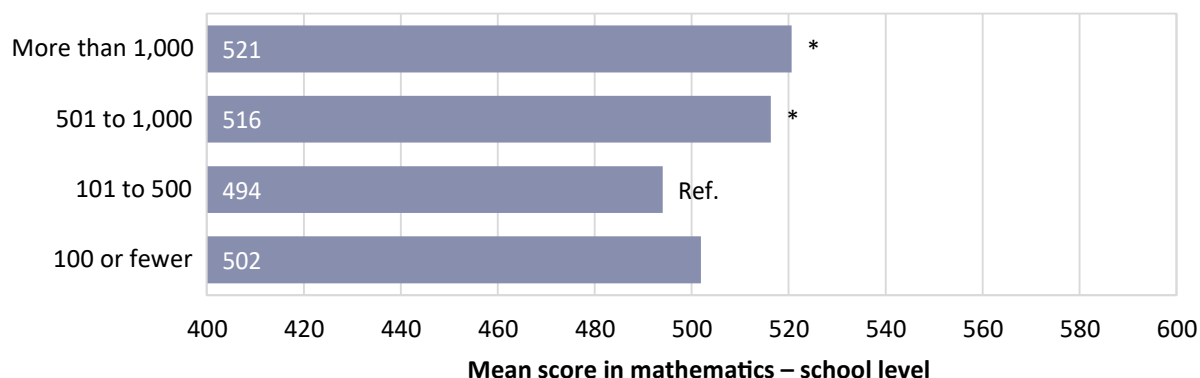
TABLE 4.4 Percentage of schools by total enrolment and language of the school system

Anglophone school systems					Francophone school systems			
	100 or fewer	101 to 500	501 to 1,000	More than 1,000	100 or fewer	101 to 500	501 to 1,000	More than 1,000
BC	2‡	53	28	17	27‡	55‡	18‡	0
AB	15‡	48	35	1‡	10‡	90‡	0	0
SK	9‡	83	7‡	0‡	33‡	67‡	0	0
MB	5‡	81	14	1‡	7‡	80‡	13‡	0
ON	4‡	67	27	3‡	18‡	65	14‡	3‡
QC	8‡	53‡	25‡	15‡	1‡	41‡	28	30
NB	6‡	70	23‡	0	11‡	76	13‡	0
NS	3‡	79	18‡	0	0	80‡	20‡	0
PE	10‡	67‡	24‡	0	--	--	--	--
NL	22‡	67	11‡	0	--	--	--	--
CAN	6	66	25	3	7	53	22	18

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Figure 4.6 shows that higher results in mathematics were obtained in larger schools (more than 500 students) compared to schools with 500 or fewer students (Appendix A.4.3.3). However, as very few schools that participated in PCAP 2019 had an enrolment of 100 or fewer students, comparisons of mathematics achievement of students in these schools with that of students in schools with larger enrolments are not conclusive.

FIGURE 4.6 Relationship between school size and mathematics achievement

* Significant difference compared to the 101 to 500 category

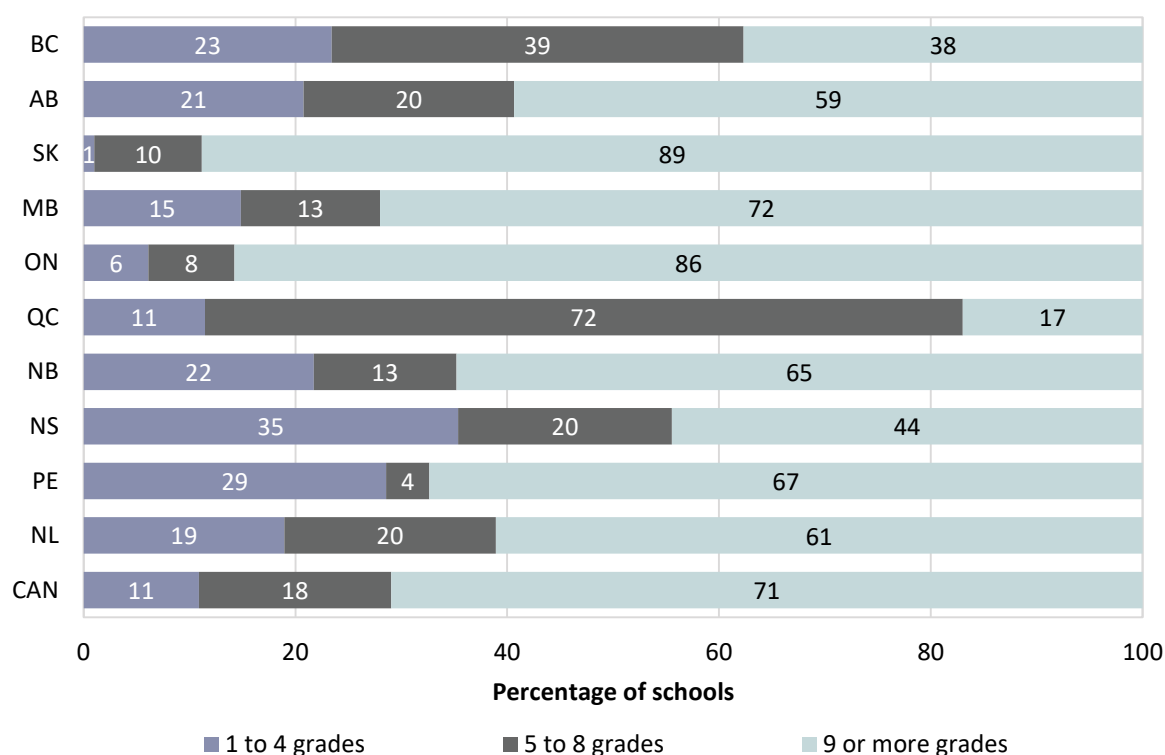
Note: "Mean score in mathematics – school level" refers to the mean student score in a school. The scores shown are the Canadian averages of those means.

Grade configuration

Grade configuration determines the number of times a student will move to a new school and the age at which such transitions occur. Numerous studies have explored grade configurations, and these have noted a trend toward merging junior high schools with their elementary counterparts to create schools that include Kindergarten through Grade 8 (Schwartz et al., 2011). It appears that the relationship between grade configuration and achievement is not uniform across countries. An Ontario school board found that various grade configurations (K–6, K–8, and 6–8) did not have a significant long-term effect on Grade 6 EQAO (Education Quality and Accountability Office) assessments within that board once other school-level predictors such as school socioeconomic status, suspension rates, and the proportion of students with special needs within schools were included in the model (Toronto District School Board Research and Information Services, 2011). Similarly, a study based in Sweden found that various grade configurations (1–6, 1–9, and 7–9) had no significant effect on grade point average, high school graduation, high school program selected (i.e., academic versus vocational), and enrolment in postsecondary programs (Holmlund & Böhlmark, 2019). These studies contrast with work completed in the United States, where Schwartz and colleagues (2011) found that students who attended K–8 schools or K–4/5–8 schools had higher achievement in Grade 8 compared to students who transitioned to middle schools later (i.e., K–5/6–8 or K–6/7–8).

In the school questionnaire, principals were asked about the number of grade levels in their schools. The most common grade configuration was nine or more grades, and close to 90 percent of participating schools in Saskatchewan and Ontario had that configuration. Quebec had the highest proportion of schools with five to eight grades (72 percent), while Nova Scotia has the highest proportion of schools with one to four grades (35 percent) (Figure 4.7, Appendix A.4.4.1).

FIGURE 4.7 Number of grade levels in schools



At least three-quarters of participating schools in anglophone systems in Canada overall, Saskatchewan, and Ontario had nine or more grades; similar proportions were found in francophone school systems in British Columbia, Manitoba, and New Brunswick. Approximately one-third of anglophone schools in the Maritime provinces had four or fewer grades, while about 1 in 10 francophone schools in Alberta and Quebec were this size (Table 4.5, Appendix A.4.4.2).

TABLE 4.5 Percentage of schools by number of grade levels and language of school system

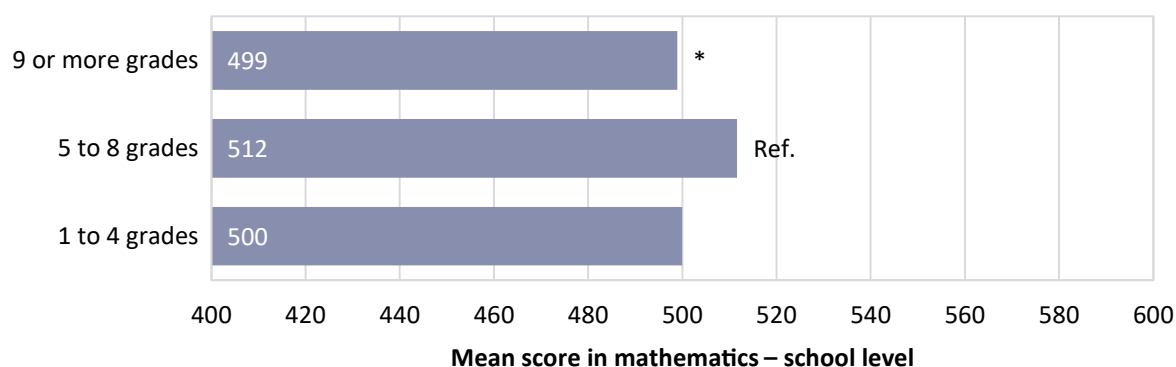
	Anglophone school systems			Francophone school systems		
	1 to 4 grades	5 to 8 grades	9 or more grades	1 to 4 grades	5 to 8 grades	9 or more grades
BC	24	40	36‡	0	18‡	82‡
AB	21	19‡	60	10‡	40‡	50‡
SK	1‡	10‡	89	0	33‡	67‡
MB	16	14‡	71	0	7‡	93‡
ON	6‡	7‡	87	4‡	35	61
QC	4‡	58	38‡	13‡	74	13‡
NB	32‡	17‡	51	7‡	9‡	84
NS	39	18‡	43	0	40‡	60‡
PE	33‡	5‡	62‡	--	--	--
NL	19‡	19‡	62	--	--	--
CAN	11	13	76	9‡	55	36

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

As shown in Figure 4.8, in Canada overall, average mathematics achievement in schools with five to eight grades was higher than that in schools with nine or more grades (Appendix A.4.4.3). However, given that, at the pan-Canadian level, less than 20 percent of schools that participated in PCAP 2019 had between five and eight grades, comparisons of mathematics achievement of students in those schools with that of students in schools with other grade configurations should be made with caution.

FIGURE 4.8 Relationship between the number of grade levels in schools and mathematics achievement



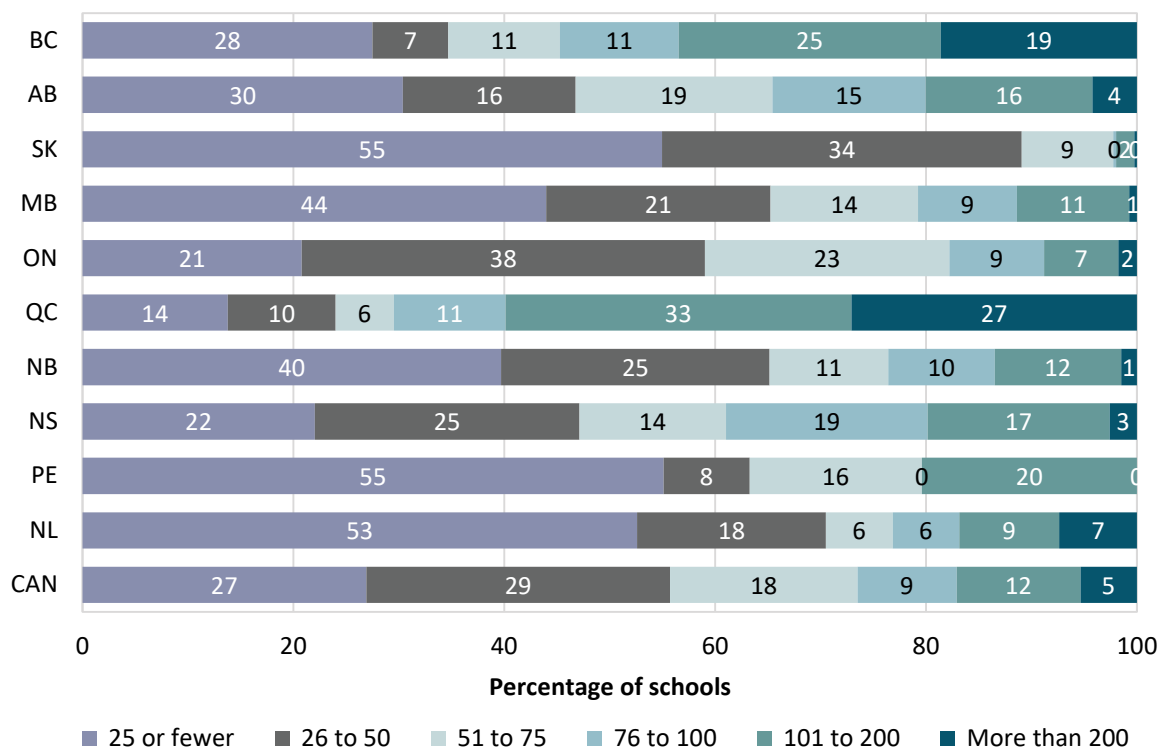
* Significant difference compared to the 5 to 8 grades category

Note: “Mean score in mathematics – school level” refers to the mean student score in a school. The scores shown are the Canadian averages of those means.

Grade 8/Secondary II enrolment

Enrolments in each grade affect how schools choose to configure classes, as they strive to optimize resources and effectively meet students’ learning needs. Principals of schools participating in PCAP 2019 reported the number of Grade 8/Secondary II students in their schools. Across Canada, Quebec had the largest proportion of schools (60 percent) with more than 100 students in the PCAP target grade. More than half of the schools in Saskatchewan, Prince Edward Island, and Newfoundland and Labrador had 25 or fewer students in Grade 8 (Figure 4.9, Appendix A.4.5.1).

FIGURE 4.9 Grade 8/Secondary II enrolment in schools



In Canada overall, close to 60 percent of English-language schools and over 40 percent of French-language schools had fewer than 50 students at the Grade 8/Secondary II level. The highest proportions of schools with the largest enrolment at this grade level (200 or more students) were found in the anglophone school systems in British Columbia (19 percent) and in the francophone school systems in Quebec (30 percent) (Table 4.6, Appendix A.4.5.2).

TABLE 4.6 Percentage of schools by enrolment of Grade 8/Secondary II students and language of the school system

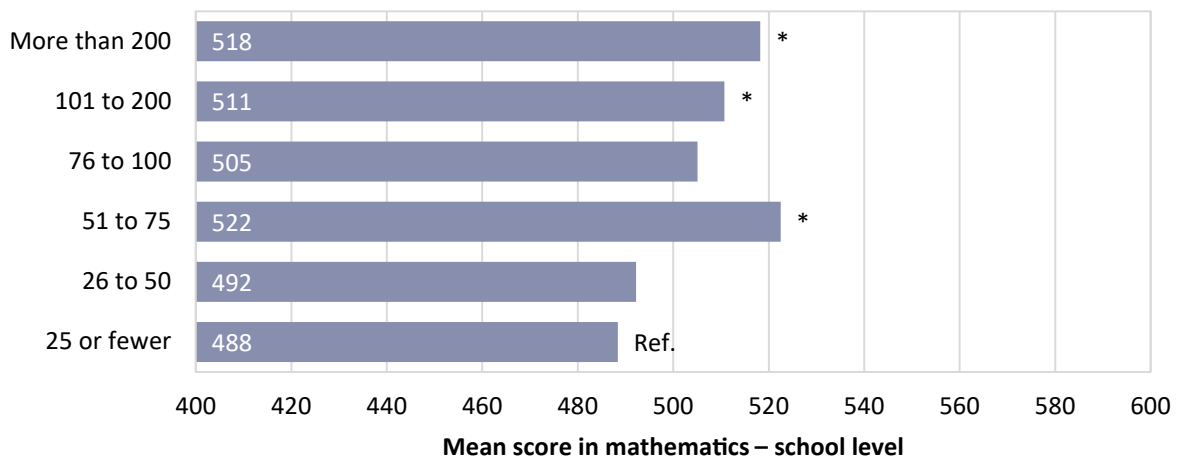
	25 or fewer	26 to 50	51 to 75	76 to 100	101 to 200	More than 200
Anglophone school systems						
BC	26‡	7‡	11‡	12‡	26	19
AB	30‡	16‡	19‡	15‡	16	4‡
SK	55	34	9‡	0‡	2‡	0‡
MB	43‡	21‡	15	10‡	11‡	0‡
ON	19‡	39	24	9‡	7‡	2‡
QC	26‡	21‡	11‡	9‡	21‡	11‡
NB	31‡	25‡	13‡	12‡	18‡	1‡
NS	18‡	27‡	14‡	19‡	19‡	3‡
PE	48‡	10‡	19‡	0	24‡	0
NL	52	18‡	6‡	6‡	10‡	7‡
CAN	27	31	19	10	10	3
Francophone school systems						
BC	73‡	18‡	9‡	0	0	0
AB	50‡	30‡	10‡	10‡	0	0
SK	50‡	50‡	0	0	0	0
MB	67‡	27‡	0	0	0	7‡
ON	51	23‡	9‡	4‡	11‡	2‡
QC	11‡	8‡	4‡	11‡	35	30
NB	51‡	27‡	9‡	8‡	4‡	2‡
NS	60‡	10‡	10‡	20‡	0	0
CAN	29	15	6‡	9‡	24	19

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

As can be seen in Figure 4.10, the relationship between mathematics achievement and enrolment figures of Grade 8/Secondary II students was not linear. Compared to small schools with 25 or fewer students at this grade level, students in schools with 51 to 75 and more than 100 students achieved higher scores in mathematics. No significant differences were found for the other enrolment categories (Appendix A.4.5.3).

FIGURE 4.10 Relationship between Grade 8/Secondary II enrolment and mathematics achievement



* Significant difference compared to the 25 or fewer category

Note: “Mean score in mathematics – school level” refers to the mean student score in a school. The scores shown are the Canadian averages of those means.

Diversity of the school population

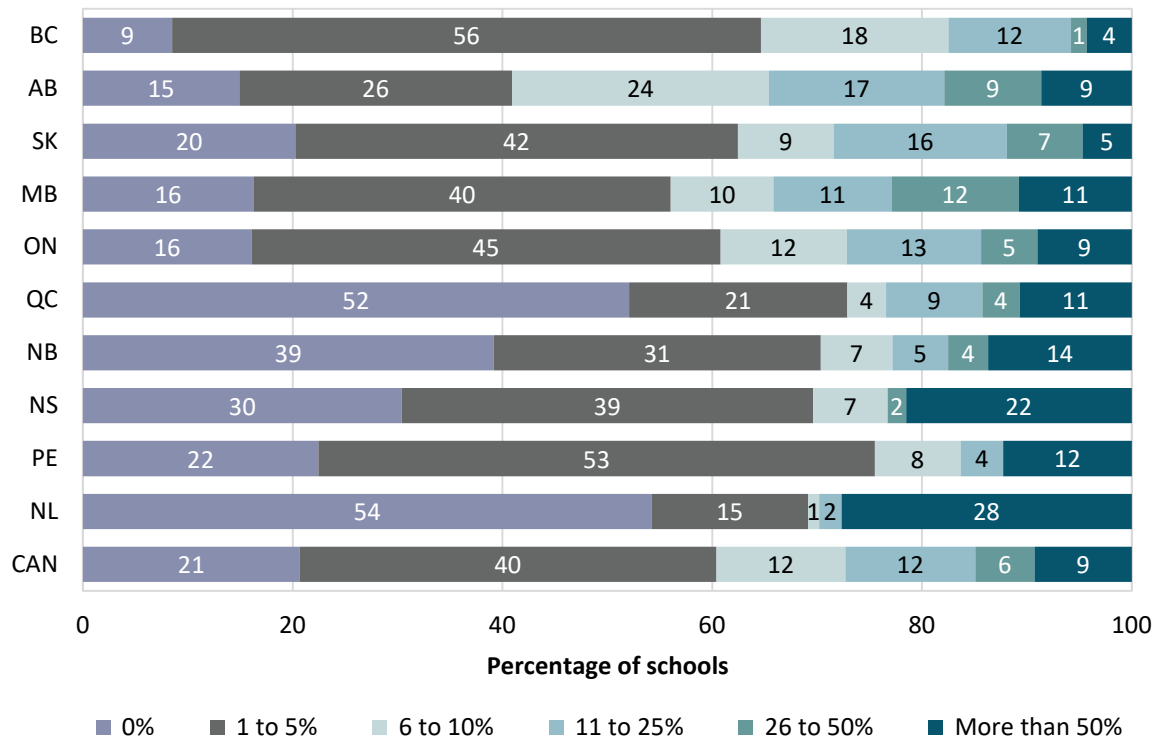
Two indicators of school populations’ diversity were included in the PCAP 2019 school questionnaire: the proportion of students in English- or French-second-language programs and the proportion of students who identify as Indigenous.

Second-language learners

Principals were asked to report the percentage of students in their schools who identified as English-language learners in anglophone schools and French-language learners in francophone schools. These students are, or have been, in special classes for those whose first language is not the language of the school system. Although these programs are available to all Canadian families who send their children to schools in an official language that is different than their home language, they are often associated with immigrant students.

Nova Scotia and Newfoundland and Labrador stand out as having the largest proportion of schools in which more than 50 percent of students are in second-language programs: more than half of the student body are second-language learners in 22 percent of Nova Scotia schools and 28 per cent of Newfoundland and Labrador schools. This compares to only 9 percent of schools in Canada overall. Generally, across provinces, principals most frequently reported that 5 percent or less of their students are in second-language programs (Figure 4.11, Appendix A.4.6.1).

FIGURE 4.11 Percentage of second-language learners in schools



In at least one in five anglophone schools in Quebec, Nova Scotia, and Newfoundland and Labrador and the same proportion of francophone schools in Alberta and Nova Scotia, more than 50 percent of students are second-language learners. In about half of the provinces, the percentage of schools where 5 percent or less of students are in second-language programs is similar between the two language systems (Table 4.7, Appendix A.4.6.2).

TABLE 4.7 Percentage of schools by proportion of second-language learners and language of the school system

	0%	1 to 5%	6 to 10%	11 to 25%	26 to 50%	More than 50%
Anglophone school systems						
BC	8‡	58	18‡	11‡	1‡	4‡
AB	14‡	26‡	25‡	17‡	10‡	8‡
SK	20‡	42	9‡	17‡	7‡	5‡
MB	16‡	40	9‡	11‡	13‡	11‡
ON	15‡	46	12‡	13‡	5‡	8‡
QC	21‡	23‡	6‡	13‡	15‡	23‡
NB	28‡	40	9‡	5‡	5‡	12‡
NS	30	40	8‡	0	2‡	20‡
PE	19‡	57‡	5‡	5‡	0	14‡
NL	54	15‡	1‡	2‡	0	28‡
CAN	16	43	13	13	6	9
Francophone school systems						
BC	27‡	9‡	9‡	27‡	9‡	18‡
AB	50‡	10‡	20‡	0	0	20‡
SK	40‡	60‡	0	0	0	0
MB	29‡	29‡	21‡	21‡	0	0
ON	30	20‡	9‡	12‡	11‡	18‡
QC	58	20	3‡	8‡	1‡	8‡
NB	54	19‡	4‡	5‡	2‡	16‡
NS	33‡	33‡	0	0	0	33‡
CAN	49	20	6‡	9‡	4‡	12

‡ There are fewer than 30 observations.

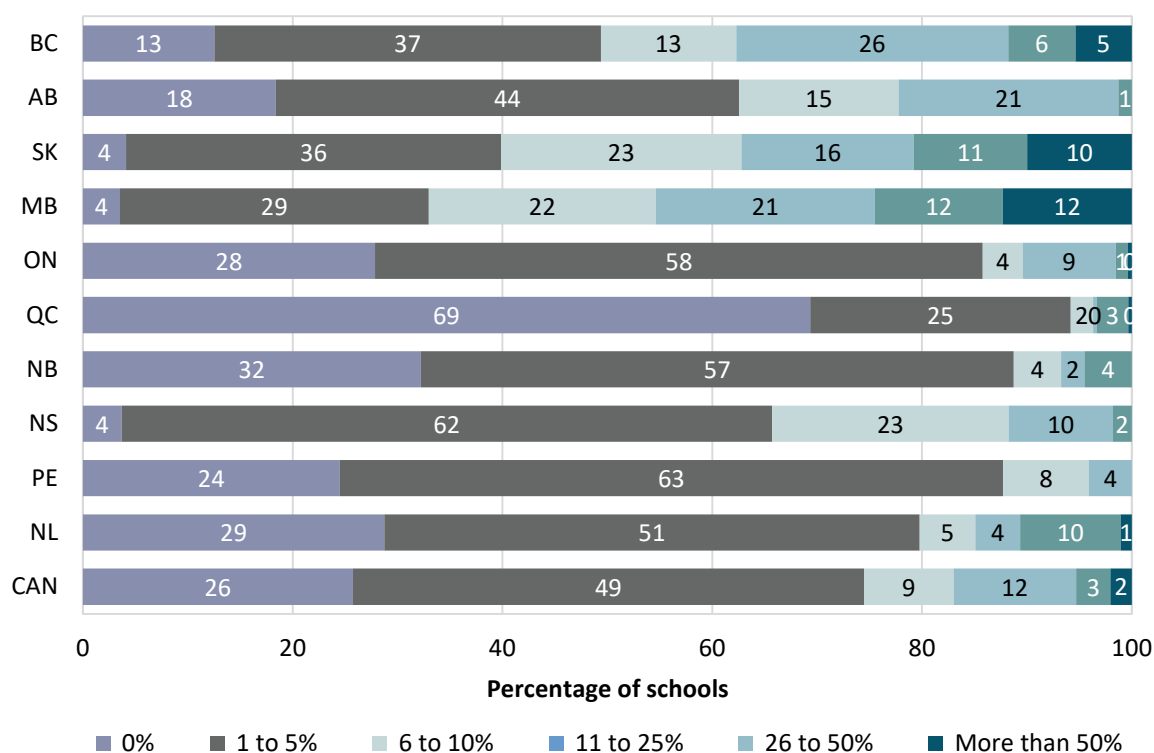
Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Indigenous students

As mentioned in Chapter 1, in Canada overall, 4.4 percent of students who participated in PCAP 2019 identified themselves as First Nations, 2.3 percent as Métis, and 0.3 percent as Inuit (Table 1.9, Appendix A.1.21). It is important to note that federally funded schools do not participate in PCAP, and only those students of Indigenous identity who were attending schools under provincial jurisdiction are reported here.

Principals were asked to report the percentage of students in their schools who identify themselves as Indigenous (i.e., First Nations, Métis, or Inuit). The proportion of students who identify as Indigenous in the PCAP sample of schools is relatively small, with principals in most provinces most likely to report that Indigenous students constitute 1 to 5 percent of their student body (Figure 4.12, Appendix A.4.7.1).

FIGURE 4.12 Percentage of students who identify as Indigenous in schools



Anglophone school systems in Saskatchewan and both school systems in Manitoba had the highest proportions of Indigenous students: in about one-fifth of these schools, principals reported that at least 25 percent of the student population identified as Indigenous (Table 4.8, Appendix A.4.7.2).

TABLE 4.8 Percentage of schools by proportion of students who identify as Indigenous and language of the school system

	0%	1 to 5%	6 to 10%	11 to 25%	26 to 50%	More than 50%
Anglophone school systems						
BC	13‡	37	13‡	25‡	7‡	6‡
AB	18‡	43	16‡	22‡	1‡	0
SK	4‡	35	23	17‡	11‡	10‡
MB	4‡	30	21‡	20	12‡	13‡
ON	28	58	3‡	9‡	1‡	0‡
QC	35‡	55‡	4‡	2‡	2‡	2‡
NB	23‡	61	6‡	1‡	8‡	0
NS	3‡	59	25‡	11‡	2‡	0
PE	24‡	62‡	10‡	5‡	0	0
NL	29‡	51	5‡	4‡	10‡	1‡
CAN	22	51	9	13	3	2‡
Francophone school systems						
BC	0	36‡	18‡	45‡	0	0
AB	20‡	80‡	0	0	0	0
SK	17‡	83‡	0	0	0	0
MB	0	20‡	27‡	33‡	20‡	0
ON	18‡	62	14‡	5‡	1‡	0
QC	76	19‡	2‡	0	3‡	0
NB	44‡	50‡	2‡	4‡	0	0
NS	11‡	89‡	0	0	0	0
CAN	53	36	5‡	3‡	3‡	0

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Factors influencing learning

Instructional time management

Within the school year, instructional time describes the time scheduled for instruction and other activities during which students and teachers interact and students are expected to be engaged in learning. Instructional time does not include days that teachers attend conferences or professional development activities.

Districts and schools organize instructional time and schedule subject-specific classes for students. Scheduling (i.e., by the semester or full year) affects classrooms by influencing the continuity of instruction and the types of pedagogy that teachers employ. Mathematics classes at the Grade 8/Secondary II level are offered on a full-year or semestered basis, depending on the policy of the school, district, or province.

Scheduling

As shown in Figure 4.13 and Table 4.9, the vast majority of schools across Canada offer Grade 8/Secondary II mathematics courses on a full-year basis with the exception of British Columbia, where roughly one-quarter of schools in both anglophone and francophone school systems schedule their mathematics courses on a semestered basis (Appendices A.4.8.1, A.4.8.2).

FIGURE 4.13 Percentage of semestered and full-year mathematics classes

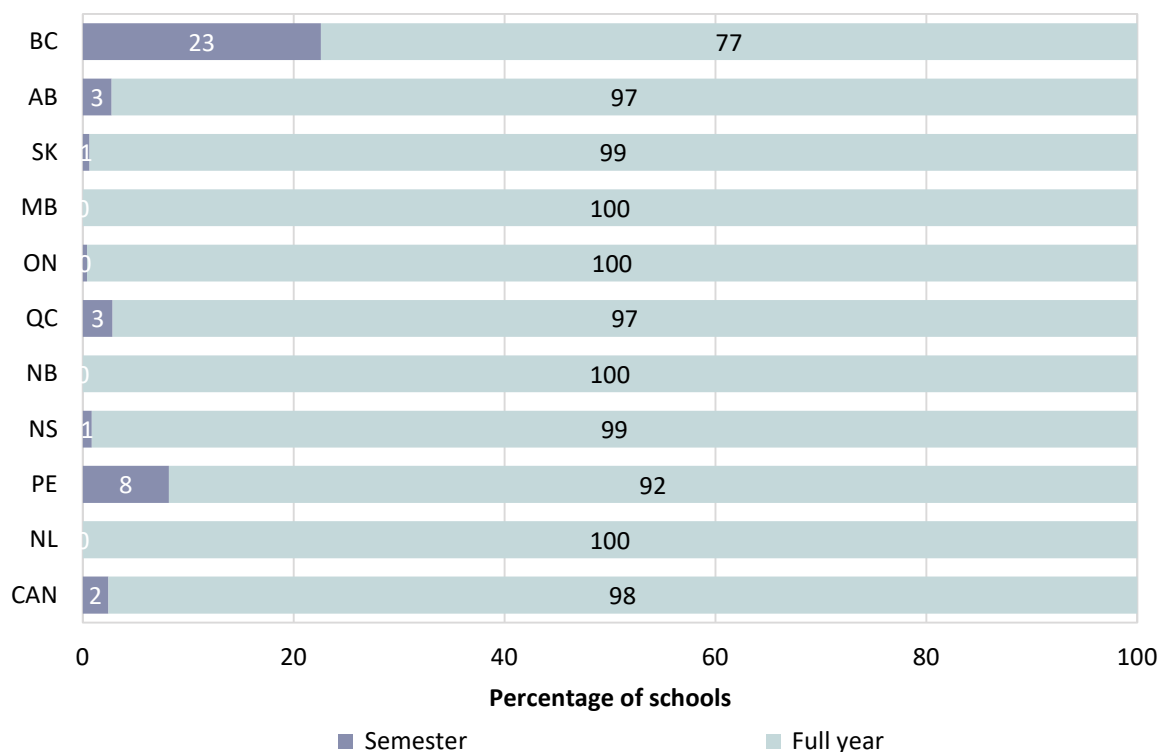


TABLE 4.9 Percentage of semestered and full-year mathematics classes, by language of the school system

	Anglophone school systems		Francophone school systems	
	Semester	Full year	Semester	Full year
BC	22‡	78	27‡	73‡
AB	3‡	97	0	100‡
SK	1‡	99	0	100‡
MB	0	100	0	100‡
ON	0‡	100	1‡	99
QC	2‡	98	3‡	97
NB	0	100	0	100
NS	1‡	99	0	100‡
PE	10‡	90‡	--	--
NL	0	100	--	--
CAN	2	98	2‡	98

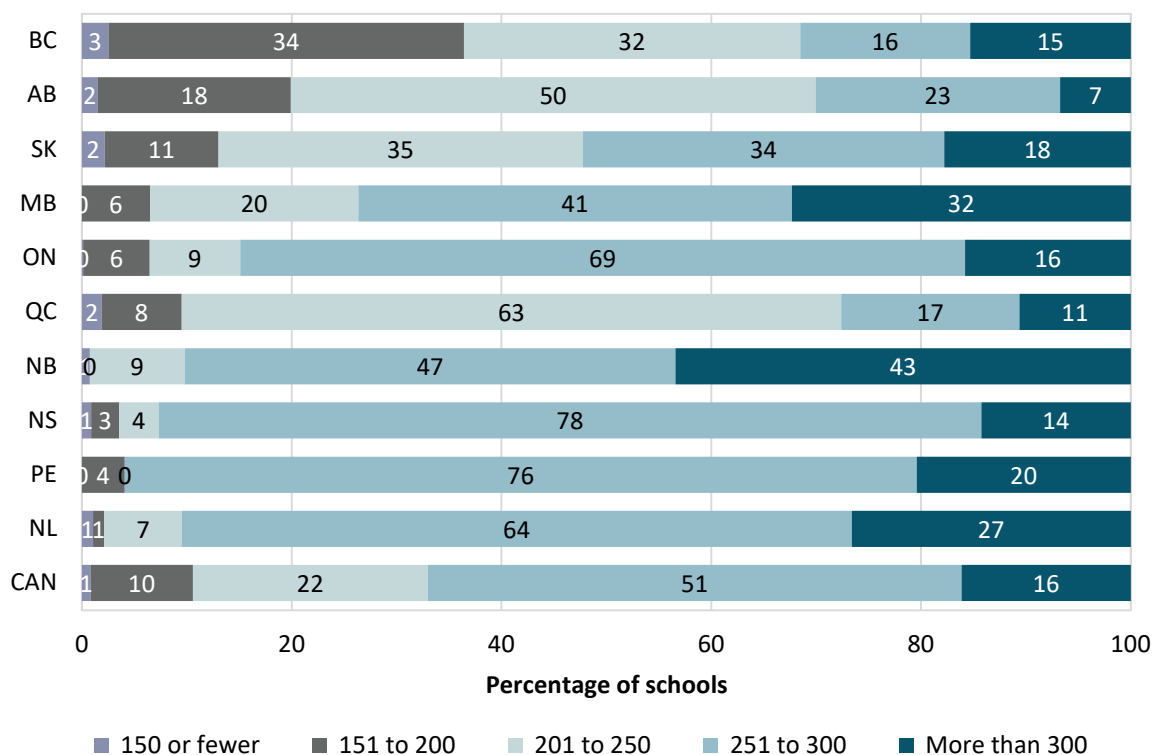
‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Weekly mathematics instruction time

School principals were asked to indicate the number of minutes of mathematics instruction offered each week to Grade 8/Secondary II students at their schools. In Canada overall, about half of schools offered 250 to 300 minutes of weekly instruction in mathematics; however, instructional time varied among the provinces (Figure 4.14, Appendix A.4.9.1).

FIGURE 4.14 Minutes of mathematics instruction offered each week



At the pan-Canadian level, 70 percent of schools in anglophone systems and 47 percent of schools in francophone systems provide over 250 minutes of weekly mathematics instruction. In anglophone school systems, the Atlantic provinces and Ontario had the highest proportion of schools offering more than 250 minutes of mathematics instruction per week, while British Columbia and Alberta had the lowest. In francophone school systems, New Brunswick had the highest proportion (91 percent) of schools offering more than 250 minutes of weekly instruction, while British Columbia had the lowest (9 percent). In the latter province, almost three-quarters of francophone schools offered 200 or fewer minutes of mathematics instruction each week (Table 4.10, Appendix A.4.9.2).

TABLE 4.10 Percentage of schools by minutes of mathematics instruction offered each week and language of the school system

	150 or fewer	151 to 200	201 to 250	251 to 300	More than 300
Anglophone school systems					
BC	3‡	33	33	17‡	15‡
AB	2‡	18‡	50	23‡	7‡
SK	2‡	11‡	34	35	18‡
MB	0	6‡	20‡	40	34
ON	0	6‡	9‡	70	15‡
QC	0	8‡	56‡	31‡	6‡
NB	0	0	10‡	74	16‡
NS	1‡	3‡	1‡	80	15‡
PE	0	5‡	0	71‡	24‡
NL	1‡	1‡	6‡	65	27‡
CAN	1‡	10	19	55	15
Francophone school systems					
BC	0	73‡	18‡	0	9‡
AB	0	33‡	44‡	22‡	0
SK	0	17‡	67‡	17‡	0
MB	0	20‡	13‡	60‡	7‡
ON	2‡	6‡	7‡	53	32
QC	2‡	8‡	64	14‡	12‡
NB	2‡	0	7‡	9‡	82
NS	0	0	30‡	60‡	10‡
CAN	2‡	8	43	25	22

‡ There are fewer than 30 observations.

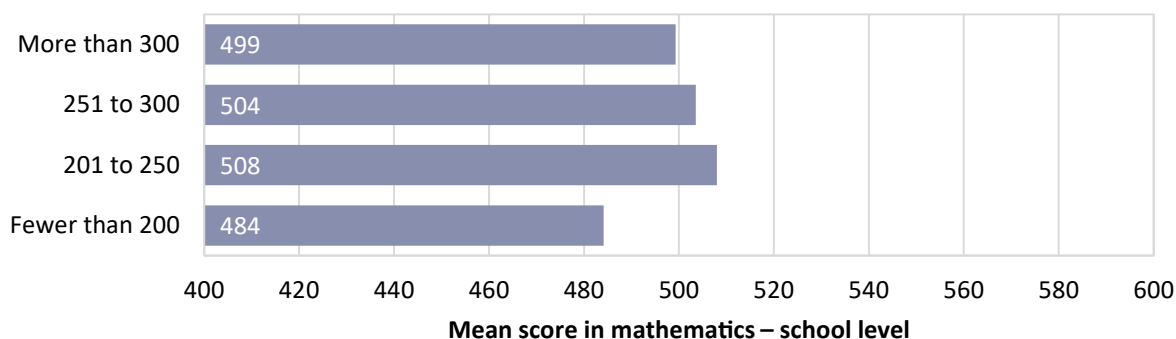
Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Comparisons with PCAP 2016, in which reading was the major domain (O’Grady, Fung, Brochu, et al., 2019), reveal that schools offered more instructional minutes per week in language arts than in mathematics. In Canada overall, 16 percent of schools that participated in PCAP 2019 offered more than 300 minutes of mathematics instruction per week, while over 40 percent of schools participating in PCAP 2016 offered more than 300 minutes of language arts instruction per week. In PCAP 2010, in which mathematics was first the major domain, around two-thirds of schools in Canada overall offered between 201 and 300 minutes of mathematics instruction per week (CMEC, 2012b, p. 114). This proportion is lower than in PCAP 2019, in which approximately three-quarter of schools allotted this much time to mathematics instruction per week.

As shown in Figure 4.15, the amount of time scheduled for weekly mathematics instruction is not significantly associated with achievement at the school level (Appendix A.4.9.3). This is consistent

with what was observed for science in PCAP 2013 (O’Grady & Houme, 2015, p. 106). For mathematics in PCAP 2010, schools that offered 201 to 250 minutes of mathematics instruction per week had higher scores than those schools that spent more time on mathematics instruction (CMEC, 2012b, p. 113). A similar trend was evident for reading in 2016, where students in schools offering less instructional time in language arts per week tended to perform better than those receiving more time (O’Grady, Fung, Brochu, et al., 2019, p. 127). As noted in past PCAP reports, caution is needed when interpreting findings on the association between instructional time and achievement, as it is possible that other factors may be confounded with instructional time, such as schools providing more instructional time to lower-achieving students.

FIGURE 4.15 Relationship between minutes of mathematics instruction each week and mathematics achievement



Note: “Mean score in mathematics – school level” refers to the mean student score in a school. The scores shown are the Canadian averages of those means.

Daily mathematics instruction time

Across the provinces, over three-quarters of schools provide daily mathematics instruction, with the exception of schools in British Columbia (41 percent) and Quebec (10 percent) (Figure 4.16, Appendix A.4.10.1). Almost all schools offer daily mathematics instruction in anglophone systems in Ontario, New Brunswick, and Nova Scotia, and in francophone systems in Manitoba and Nova Scotia. The lowest proportion of schools offering mathematics instruction on a daily basis was in francophone systems in Saskatchewan (0 percent) and Quebec (4 percent) (Table 4.11, Appendix A.4.10.2).

FIGURE 4.16 Percentage of schools offering daily mathematics instruction

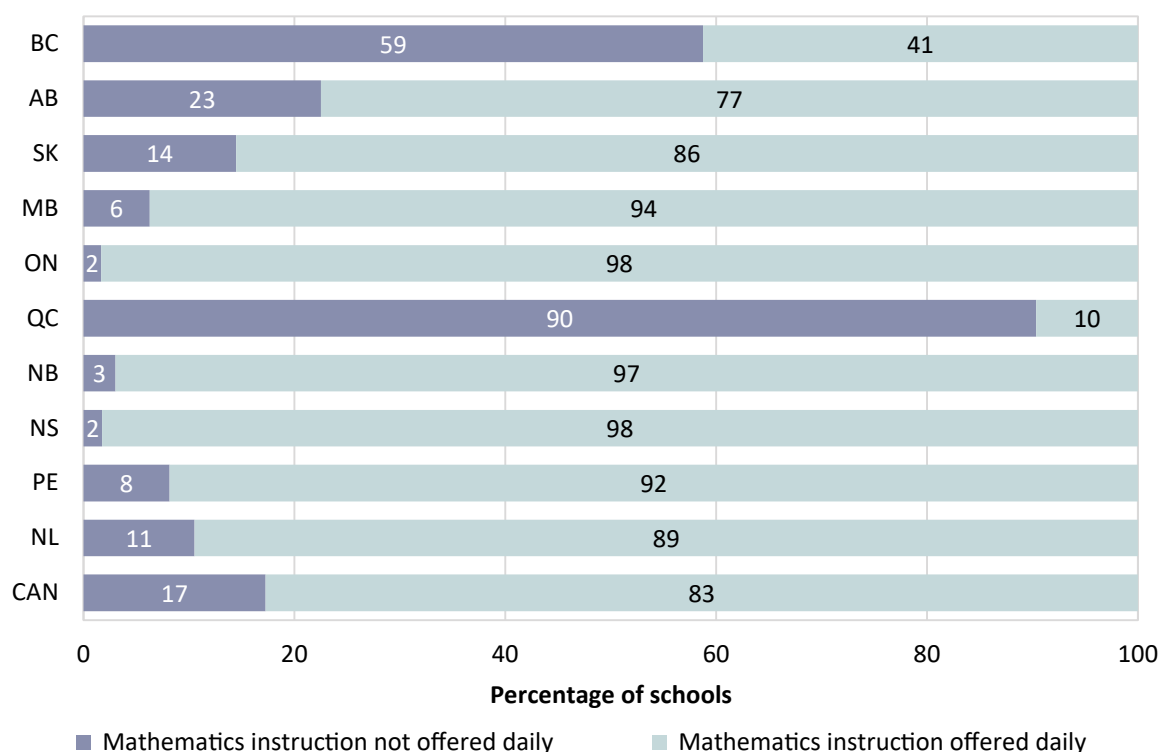


TABLE 4.11 Percentage of schools offering daily mathematics instruction, by language of the school system

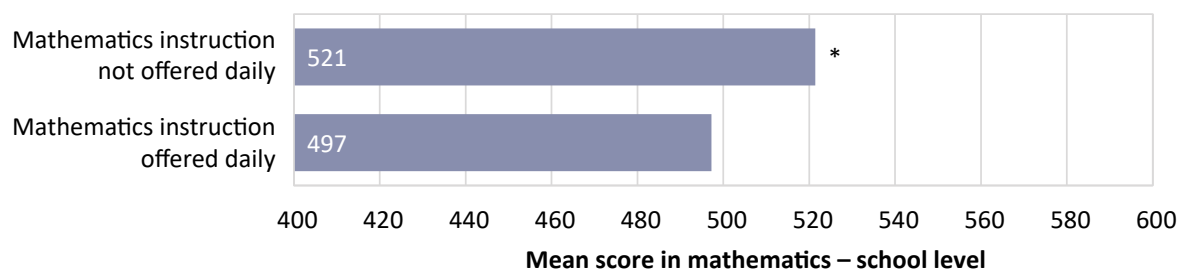
	Anglophone school system	Francophone school system
BC	42	27‡
AB	79	30‡
SK	87	0
MB	93	100‡
ON	99	95
QC	40‡	4‡
NB	99	95
NS	98	100‡
PE	90‡	--
NL	89	--
CAN	89	38

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

As shown in Figure 4.17, mathematics achievement of students in schools that offer daily mathematics instruction was lower than that of students in schools that do not offer daily mathematics instruction (Appendix A.4.10.3). As with instructional time, caution is needed in interpreting findings on the association between frequency of mathematics instruction and achievement, as it is possible that other factors may be confounded with the frequency of mathematics instruction, such as schools providing instruction more frequently to lower-achieving students.

FIGURE 4.17 Relationship between daily mathematics instruction and mathematics achievement



* Significance difference compared to the *mathematics instruction offered daily* category

Note: “Mean score in mathematics – school level” refers to the mean student score in a school. The scores shown are the Canadian averages of those means.

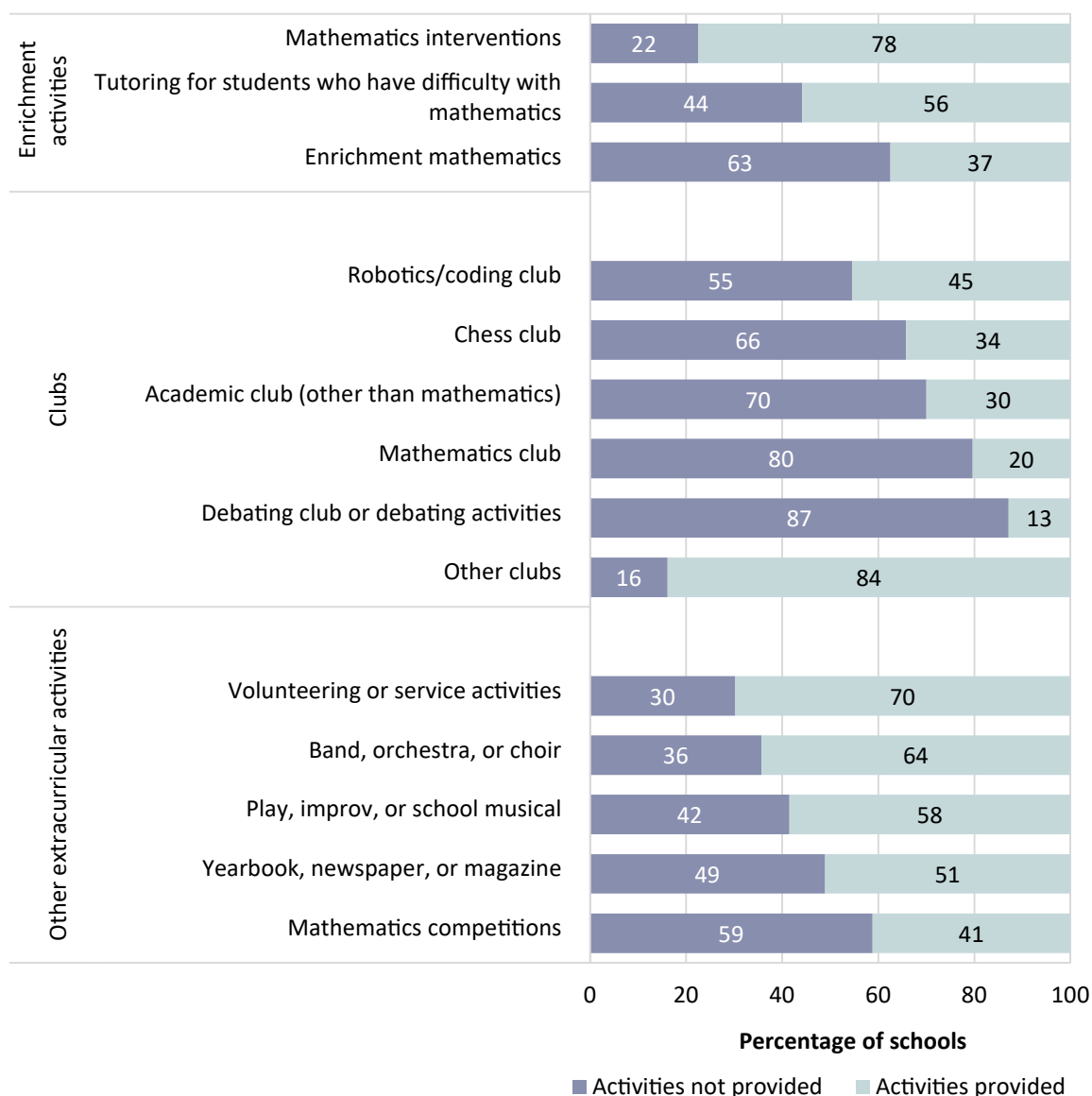
Enrichment and extracurricular activities

In addition to resources directed toward classroom instruction, school resources are also allocated to enrich students’ learning through extracurricular experiences. Schools strive to engage students by offering a wide assortment of options that pique their interest and expand their skills. Abalde (2014) found that larger schools were able to provide a wider complement of these offerings, whereas smaller schools were likely to leverage equitable student participation, drawing on and reinforcing a deeper sense of community.

Figure 4.18 lists various activities offered by schools participating in PCAP 2019, categorizing them into enrichment activities, clubs, and other extracurricular activities. For enrichment activities, mathematics interventions were offered most often (78 percent), while enrichment mathematics activities were offered the least frequently (37 percent). With respect to the second category, clubs, participating schools offered a variety of choices, including robotics/coding clubs, chess clubs, mathematics and other academic clubs, and debating clubs or activities, of which debating clubs/activities were offered the least frequently (13 percent). In addition, a high proportion of principals (84 percent) reported that their school offered a type of club other than those specified in the questionnaire. The third category, other extracurricular activities, included an array of activities, with volunteering or service activities most often offered by schools (70 percent) (Appendix A.4.11.1).

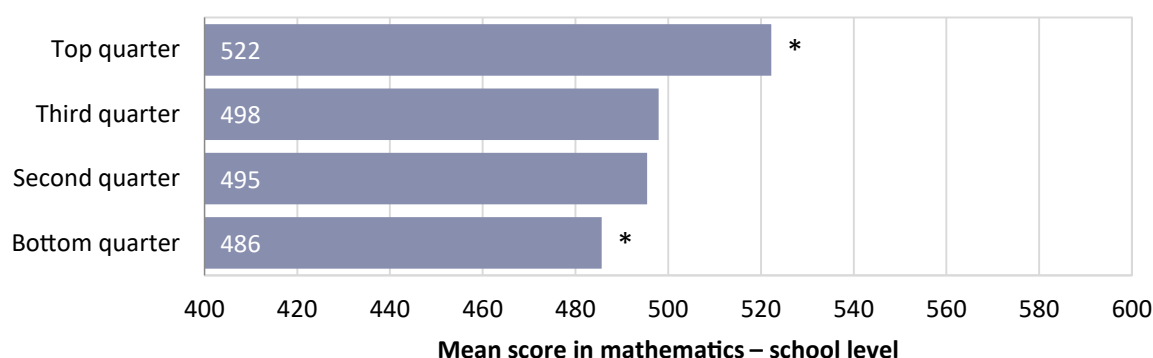
These activities were subjected to principal component analysis. Through this process, three items resolved into a component that had a correlation above .20 with mathematics achievement. The *enrichment and extracurricular activities index* comprises three items related to the availability of clubs: mathematics clubs, academic clubs (other than mathematics), and robotics or coding clubs. As shown in Figure 4.18, 45 percent of schools that participated in PCAP 2019 offered a robotics or coding club for Grade 8/Secondary II students outside of school hours. Twenty percent of schools offered a mathematics club, and 30 percent offered an academic club that focused on a subject other than mathematics.

FIGURE 4.18 Enrichment and extracurricular activities offered by schools



Schools were grouped into quartiles according to whether or not they offered the three types of activities that constitute the enrichment and extracurricular activities index. The top quarter of the index represents schools that were most likely to offer these three types of activities, while the bottom quarter represents schools that were least likely to offer them. The relationship between this index and mathematics achievement at the pan-Canadian level is shown in Figure 4.19. Mathematics scores are higher for students in schools that are most likely to provide access to these clubs, with a significant difference in achievement found between schools in the top quarter and third quarter of this index, as well as between the top quarter and the bottom quarter (Appendix A.4.11.2).

FIGURE 4.19 Relationship between the enrichment and extracurricular activities index and mathematics achievement



* Significant difference compared to the adjacent lower quarter; the bottom quarter is compared to top quarter

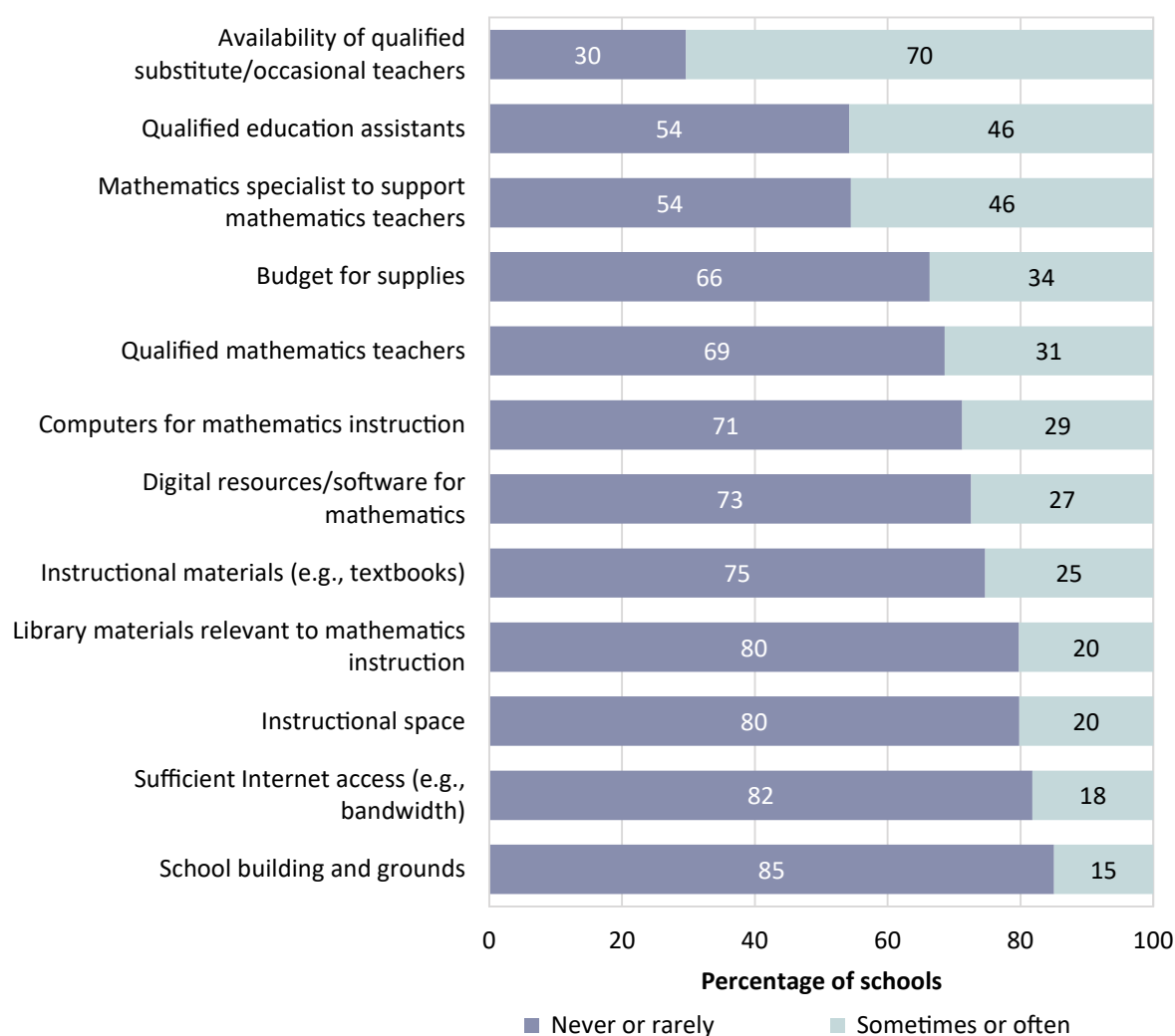
Note: “Mean score in mathematics – school level” refers to the mean student score in a school. The scores shown are the Canadian averages of those means.

Challenges to teaching and learning

Challenges to providing instruction

As with previous PCAP administrations, principals were asked to share their views on how shortages or an inadequate number of resources affected the capacity of their schools to provide instruction. Administrators’ perspectives on the adequacy of school facilities, human resources, and instructional resources are shown Figure 4.20. The majority (69 percent) of school principals reported that the availability of qualified mathematics teachers was never or rarely a concern. By contrast, other types of shortages were reported as sometimes or often affecting the capacity of the school to provide instruction; these include shortages of qualified substitute teachers (70 percent), of qualified education assistants for mathematics classrooms (46 percent), and of mathematics specialists to support mathematics teachers (46 percent). Shortages of instructional resources for mathematics were not often cited as an issue; less than 30 percent of principals reported that shortages of resources such as computers, digital resources or software, instructional materials, and library materials sometimes or often affect mathematics instruction in their school. In general, principals who responded to the school questionnaire reported being less concerned about the adequacy of school facilities and instructional resources than about the availability of qualified educational personnel able to provide additional support to mathematics teachers in various capacities (Appendix A.4.12).

FIGURE 4.20 Challenges to providing instruction, as reported by school principals



Compared with principals' responses in PCAP 2016, in which reading was the major domain, a higher percentage of principals in 2019 indicated that shortages of qualified teachers and of various additional educational personnel were affecting their school's capacity to provide instruction. However, it is not possible to conclude based on the PCAP data alone if this change is due to a decrease in qualified educational personnel or to mathematics being more affected than reading by resource issues.

Challenges to learning

School principals were asked to give their opinion on the extent to which a number of challenges hindered student learning in their schools. The 14 items included in the school questionnaire are shown in Table 4.12. Through the use of principal components analysis, five of the items were organized into one component, which was correlated with student achievement in mathematics. These five items form the *challenges to learning index*.

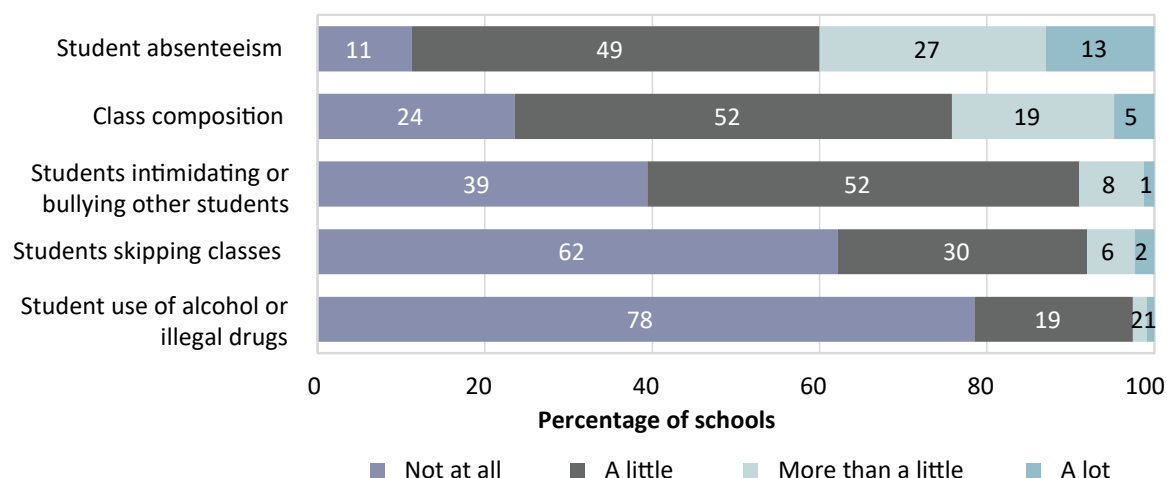
TABLE 4.12 Questionnaire items related to school-level challenges to learning

In your school, to what extent is student learning hindered by the following?
• Student absenteeism (all excused absences) • Class composition • Students intimidating or bullying other students • Students skipping classes • Student use of alcohol or illegal drugs
• Teachers' low expectations of students • Poor student-teacher relations • Disruption of classes by students • Teachers not meeting individual students' needs • Teacher absenteeism • Students lacking respect for teachers • Staff resisting change • Teachers being too strict with students • Lack of time to provide instructional leadership for staff

Note: The shaded items constitute the challenges to learning index.

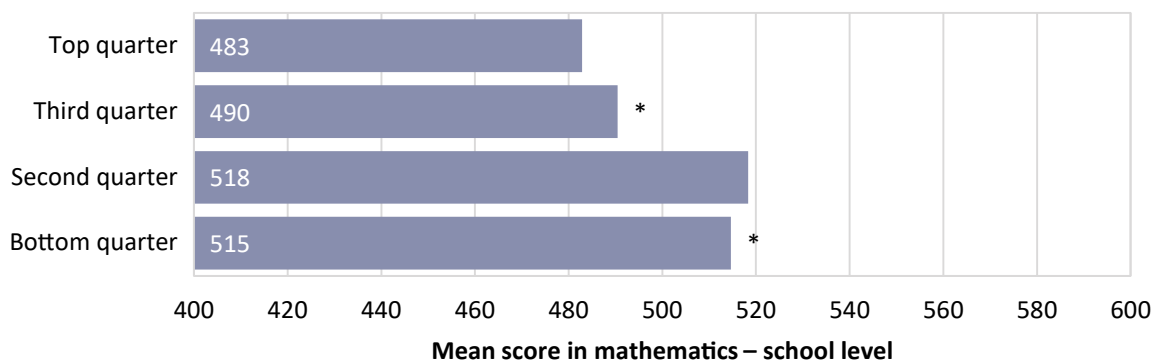
Generally, schools reported that the challenges in this index did not greatly hinder student learning. As shown in Figure 4.21, absenteeism (all excused absences) and class composition were most frequently reported as hindering learning. Principals reported that skipped classes and the use of alcohol or drugs by students were less frequently challenges in their schools (Appendix A.4.13.1).

FIGURE 4.21 Percentage of schools by principals' responses to questionnaire items constituting the challenges to learning index



Schools were grouped into quartiles according to the extent to which they reported that student learning was hindered by the five items that constitute the challenges to learning index. Schools in the top quarter of the index most frequently reported that student learning was hindered a lot, while those in the bottom quarter were least likely to indicate that the challenges hindered learning. As shown in Figure 4.22, significant differences in mathematics scores were found between the bottom half and the top half of this index, with mathematics achievement higher in schools that reported fewer challenges to learning (Appendix A.4.13.2).

FIGURE 4.22 Relationship between the challenges to learning index and mathematics achievement



* Significant difference compared to the adjacent lower quarter; the bottom quarter is compared to the top quarter
 Note: “Mean score in mathematics – school level” refers to the mean student score in a school. The scores shown are the Canadian averages of those means.

In the majority of schools participating in PCAP 2019, principals reported that student absences presented at least some challenges to learning (Appendix A.4.13.1). Figure 4.23 shows the responses to the question posed to principals about the percentage of students who were absent on a typical day from their school for reasons other than a school-sponsored activity. Overall in Canada, close to half of schools reported that 5 to 10 percent of students are absent on a typical day. The highest rates of absenteeism, with at least 1 in 10 schools reporting more than 10 percent of the students absent on a typical day, were found in British Columbia, Alberta, Saskatchewan, and Newfoundland and Labrador. Quebec schools reported the lowest rate of absenteeism, with 68 percent of schools reporting that less than 5 percent of students are absent on a typical day (Figure 4.23, Appendix A.4.14.1). Francophone schools reported lower absentee rates than anglophone schools in Canada overall; with only a couple of exceptions, absentee rates are also lower in francophone schools in the provinces (Table 4.13, Appendix A.4.14.2).

FIGURE 4.23 Percentage of students absent on a typical day for reasons other than school-sponsored activities

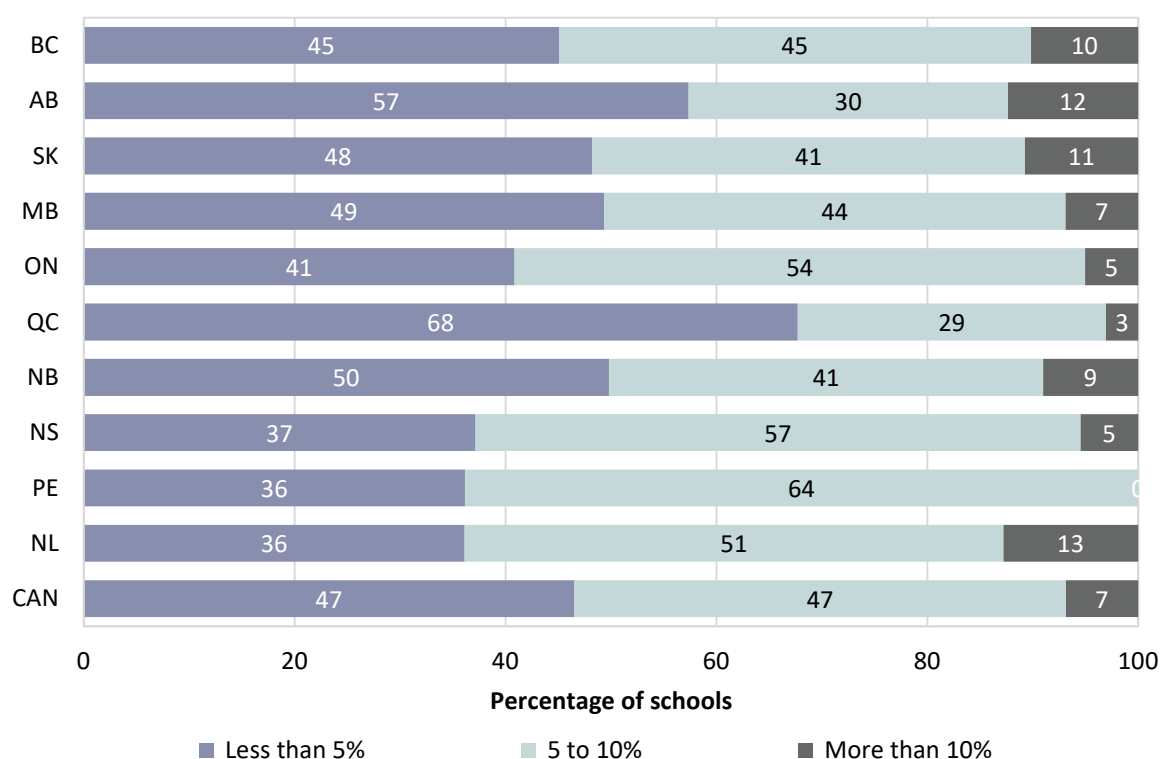


TABLE 4.13 Percentage of schools by proportion of students absent on a typical day for reasons other than school-sponsored activities and language of school system

	Anglophone school systems			Francophone school systems		
	Less than 5%	5 to 10%	More than 10%	Less than 5%	5 to 10%	More than 10%
BC	44	45	10‡	73‡	27‡	0
AB	57	30	13‡	67‡	33‡	0
SK	48	41	11‡	83‡	17‡	0
MB	47	45	7‡	87‡	13‡	0
ON	39	56	5‡	68	29‡	3‡
QC	51‡	39‡	10‡	71	27‡	2‡
NB	32‡	55	13‡	73	23‡	4‡
NS	34	61	5‡	67‡	22‡	11‡
PE	35‡	65‡	0	--	--	--
NL	35	52	13‡	--	--	--
CAN	43	49	8	71	27	2‡

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however, these results are included in the calculations for the overall Canadian and provincial totals and means.

Summary

This chapter has presented information on the schools that participated in PCAP 2019, based on responses by principals to the school questionnaire. Four aspects of the schools were examined: demographic background and grade configuration; diversity of the school population; factors influencing learning; and challenges to learning and teaching.

Schools that participated in PCAP 2019 were located in a range of locales, from large cities to small rural settings. The schools, which were both public and private, ranged in size from more than 1,000 to fewer than 100 students, and were configured with fewer than four to nine or more grades. The number of Grade 8/Secondary II students, the target population for this study, ranged from more than 200 to fewer than 25 students per school. Mathematics achievement was found to be higher in schools in larger communities, in larger schools, and in schools with a higher enrolment of Grade 8/Secondary II students. Private schools outperformed public schools in PCAP 2019.

Canadian schools are diverse and welcome newcomers from around the world. Schools across Canada offer English- and French-second-language programs. This chapter has presented demographic information on these language programs and on Indigenous self-identification at the pan-Canadian and provincial levels, as well as by language of the school system.

Mathematics instruction was scheduled mostly in full-year courses at the Grade 8/Secondary II level. In Canada overall, schools were most likely to offer between 200 and 300 minutes per week of instruction in mathematics, and most schools scheduled daily mathematics classes. Although the amount of time spent on mathematics instruction was not related to achievement, schools that did not offer daily instruction had better results than those that did.

In schools, resources are directed both to the classroom and to extracurricular activities that enrich students' learning. Schools that offered mathematics clubs, academic clubs (other than mathematics), and robotics or coding clubs as extracurricular activities were found to have better outcomes in mathematics.

With respect to providing mathematics instruction, the challenge that school principals reported most frequently was the availability of qualified substitute and occasional teachers, and, to a lesser extent, qualified education assistants and mathematics specialists to support their teachers. The challenges to student learning reported most frequently by principals were student absenteeism and class composition.

CONCLUSION

This report is the second of two reports providing results from PCAP 2019. The initial report focused on achievement results in the three domains assessed by PCAP (mathematics, reading, and science). The current report, which is complementary to the first, looks at contextual variables associated with mathematics achievement. The variables analyzed in this report are drawn from information provided in the three questionnaires administered to students, teachers, and schools as part of PCAP 2019. The information presented here is provided to inform policy, research, and practice. This report includes variables that are correlated with achievement and others that provide a descriptive lens on practices in Grade 8/Secondary II mathematics classrooms in Canada. Over the upcoming months, analysis will continue, and results will be published by CMEC on specific topics of interest.

A profile of students

No gender gap was found in mathematics in PCAP 2019. This finding is consistent with the results in PCAP 2010, when mathematics was first the major domain. However, these results differ from those in the most recent international large-scale assessments in which Canada participated: boys outperformed girls in mathematics at the Grade 4 level in TIMSS 2019 and at age 15 in PISA 2018.

Canada-wide, both English- and French-first-language students in francophone schools achieved higher scores in mathematics than their peers in anglophone schools; however, scores were similar among students who reported first languages other than French or English in both language systems.

In anglophone school systems, students who were enrolled in a second-language program, either currently or in the past, achieved significantly lower mean scores in mathematics compared to students who had never been enrolled in such a program. In francophone school systems, the difference in mathematics achievement between students who are currently enrolled and those who had never been enrolled in a second-language program was not statistically significant.

Two proxies for socioeconomic status are used in PCAP contextual reports: parents' educational levels and the number of books in students' homes. Student achievement in mathematics was highest for students whose parents had a university-level education and in homes with the greatest number of books.

In PCAP 2019, students who were not born in Canada had statistically lower scores in mathematics compared to those of their Canadian-born counterparts. Among Indigenous students, those who identified themselves as Inuit or Métis achieved higher scores in mathematics compared to those who self-identified as First Nations.

Better mathematics outcomes were associated with students who had more positive attitudes toward mathematics as well as higher mathematics self-efficacy. Higher achievement scores in mathematics were attained by students who scored in the top quarter of the student effort index and who often completed their homework and had regular attendance at school. Unsurprisingly, students who had a good grasp of mathematical terms had better assessment outcomes than their peers who were less familiar with these terms.

Motivating students to learn and to value mathematics is an important aspect of teaching this subject. Integrating mathematics into other subject areas is one way to help students see the relevance of mathematics. A majority of students reported that they have used what they learned in mathematics in science and technology classes, and almost 40 percent of students reported applying what they had learned in mathematics in their art classes.

Students reported that teachers most frequently used homework or teacher-developed classroom assessments to assess learning. The most common homework activities, according to students, were paper-and-pencil calculations, word problems, and studying for assessments. Achievement scores in mathematics were highest for students whose teachers often provided rubrics as well as feedback that included hints or strategies to help them solve problems. The majority of students participating in PCAP agreed with statements that indicated a sense of belonging or connectedness at school, and achievement was related to the degree to which they liked school.

A profile of teaching

The majority of Canadian mathematics teachers in Grade 8/Secondary II classrooms hold a bachelor of education (BEd) or equivalent, have at least five years of teaching experience, consider themselves to be a specialist by either experience or both education and experience, and reported having a good understanding of the mathematics concepts taught in earlier and later grades. Most teachers reported that they engage in discussions with their colleagues at least two or three times a month on how to teach a particular topic in mathematics. More men than women teach mathematics at the Grade 8/Secondary II level. Nearly all teachers reported that they are somewhat or very confident in their ability to perform a number of mathematical tasks, although a majority of teachers were not confident about their ability to do coding or programming. At the pan-Canadian level, over 90 percent of teachers agreed or strongly agreed with the following statements: that practice is important for student learning in mathematics; that it is possible for all students to succeed in mathematics; that success in mathematics requires hard work; and that student success in mathematics requires good teaching.

About three-quarters of teachers reported that they had participated in three or more days of professional development (PD) related to the teaching of mathematics in the past five years. The most common form of PD was attending workshops or conferences, but around 80 percent of teachers had also pursued PD opportunities to learn more about teaching strategies, integrating technology into teaching, and strategies to adapt instruction/resources to students' interests and needs. Over half of the teachers who completed the teacher questionnaire had attended PD sessions focused on mathematics content knowledge, and 61 percent reported receiving support in mathematics teaching.

Higher achievement was found in classrooms where teachers had at least five years' teaching experience, where at least 40 percent of their teaching assignment was in mathematics, and where teachers considered themselves specialists by both education and experience.

Similar to earlier PCAP cycles, class size varies considerably across provinces; in PCAP 2019, the most common class sizes reported ranged from 20 to 29 students. Thirty percent of Grade 8/Secondary II classes participating in PCAP are in multi-grade classrooms. Achievement was highest in classes with 25 or more students and with only one grade level.

Canadian teachers adapt their teaching to serve the needs of their students. These adaptations may include a vast array of instructional strategies and resources; in addition, various accommodations are provided for students who need them. Modifications that teachers were most likely to use often in classrooms to support student learning were allowing more time to accomplish a task and adapting teaching methods. At the pan-Canadian level, more than 40 percent of Grade 8/Secondary II mathematics teachers had additional adults besides themselves in the classroom at least some of the time to support students' learning. Instructional modifications or additional adults were more often required to support student learning in classrooms with lower mathematics scores.

Over half of teachers reported that instructional time was sometimes or often lost due to student misbehaviour or to disruptions outside the control of teachers. A higher frequency for both of these factors was associated with lower mathematics achievement.

In terms of classroom practices, a majority of teachers reported often using calculators and mathematics curriculum documents in their mathematics instruction. Around 40 percent of teachers often used activities that they designed, interactive white boards, worksheets, and textbooks. Most teachers reported using mathematical language to probe student understanding daily or almost daily, and the majority of teachers asked students daily or almost daily to justify their reasoning and to give oral and written explanations.

Over two-thirds of Grade 8/Secondary II teachers participating in PCAP 2019 reported assigning homework involving paper-and-pencil calculations and word problems at least once a week. More than half the teachers indicated never using homework assignments as part of students' grades. Students in classes taught by a teacher who assigned more than 30 minutes of homework per week had higher mathematics achievement than those with teachers who assigned less than 30 minutes of homework per week. Nearly three-quarters of teachers reported often having a class discussion on homework to gauge the level of effort student had put into it. A majority of teachers also reported that they often monitored completion of homework and had students correct their homework in class.

To assess their students' understanding, mathematics teachers at this level used written-response questions more frequently than selected-response questions. The most common type of written-response question required multi-step solutions, and more frequent use of this type of question was associated with higher achievement in mathematics. Teachers reported using different types of questions in mathematics assessments to measure levels of thinking; questions to measure students' ability to apply knowledge and understanding were used most frequently.

In PCAP 2019, teachers were asked to report on challenges that they face in teaching mathematics. Over 40 percent of teachers reported that the range of student ability in their classes presents a lot of challenges to their mathematics teaching. About one-quarter of teachers reported that they are challenged to a large extent by large class sizes, disruptive students, and diverse classroom composition. The challenges that teachers reported least frequently were concerns about safety and their own limited background knowledge in mathematics.

A profile of schools

School characteristics vary across the country. The PCAP 2019 school questionnaire, which was completed by the principals of the schools participating in the PCAP assessment, provided data that were used to examine characteristics of schools at the provincial and pan-Canadian levels.

The demographic information provided by principals shows the variability across schools in Canada. Schools that participated in PCAP 2019 were located in a range of locales, from large cities to small towns and rural areas. The schools, which were both public and private, ranged in size from more than 1,000 to fewer than 100 students; they had as few as one to four grades and as many as nine or more grades. The number of Grade 8/Secondary II students ranged from 25 or fewer to more than 200 per school. At the pan-Canadian level, the majority of schools offered Grade 8/Secondary II mathematics as a full-year class and provided daily mathematics instruction. Most schools offered between 200 and 300 minutes of mathematics instruction per week, with about half of schools offering 250 to 300 minutes of instruction.

Generally, higher achievement scores in mathematics were found in large schools that were located in larger centres, and in schools with more than 50 Grade 8/Secondary II students. Higher mathematics achievement was found in private, compared to public, schools and in schools that did not offer daily mathematics instruction.

In addition to the resources required for classroom learning, many schools provide resources for extracurricular experiences to enrich students' learning. Schools that offered mathematics clubs, academic clubs (other than mathematics), and robotics or coding clubs had better outcomes in mathematics.

School principals reported that the most frequent challenge to providing instruction was the lack of availability of qualified educational personnel to serve as substitute or occasional teachers and to assist mathematics teachers in various capacities. The challenges hindering student learning that were reported most frequently by principals were student absenteeism and class composition.

Final statement

The results from the PCAP 2019 assessment provide a comprehensive picture of Grade 8/Secondary II students' mathematics skills at the provincial and pan-Canadian levels. Data from the PCAP contextual questionnaires also highlight different factors in the students' homes, classrooms, and school environments that contribute to their performance in mathematics. This report helps to contextualize the learning and teaching of mathematics in Canadian schools. Over the coming months, CMEC, in collaboration with ministries and departments of education, will continue to analyze the results from PCAP in conjunction with other education indicators to better inform the teaching of mathematics and related educational policies.

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Rounding numbers

Because of rounding, some numbers in tables may not add up to exactly the totals shown. Percentages, mean scores, and differences are always calculated on the basis of the exact numbers and are rounded only after calculation.

Data accuracy

Data quality indicators presented in this report are adapted from data accuracy standards set forth by Statistics Canada (Statistics Canada, 2009); estimates based on fewer than 30 observations are flagged with the symbol ‡, and estimates with a coefficient of variation greater than 33.3 percent are considered to be too unreliable to be published and are therefore suppressed and represented by a “U.”

TABLE A.1.1 Percentage of students by gender self-identification

	Female		Male		I identify myself in another way		I prefer not to say	
	%	SE	%	SE	%	SE	%	SE
Canada and provinces								
British Columbia	47.7	(0.7)	48.4	(0.7)	1.7	(0.2)	2.2	(0.3)
Alberta	50.2	(0.9)	45.9	(0.9)	2.5	(0.4)	1.4	(0.2)
Saskatchewan	49.8	(0.9)	47.0	(0.9)	1.7	(0.2)	1.4	(0.2)
Manitoba	49.3	(0.9)	47.1	(0.9)	1.5	(0.2)	2.1	(0.3)
Ontario	48.6	(1.0)	48.6	(1.0)	1.2	(0.3)	1.6	(0.3)
Quebec	46.5	(1.3)	49.5	(1.4)	1.8	(0.3)	2.2	(0.3)
New Brunswick	48.7	(0.0)	49.0	(0.0)	1.1‡	(0.0)	1.1‡	(0.0)
Nova Scotia	46.4	(0.1)	50.3	(0.1)	1.8	(0.0)	1.5‡	(0.0)
Prince Edward Island	44.2	(0.0)	51.5	(0.0)	1.5‡	(0.0)	2.9‡	(0.0)
Newfoundland and Labrador	48.4	(0.5)	47.3	(0.4)	2.3‡	(0.1)	2.0‡	(0.2)
Canada	48.3	(0.5)	48.3	(0.5)	1.6	(0.1)	1.8	(0.1)

‡ There are fewer than 30 observations.

TABLE A.1.2 Percentage of students by gender self-identification and language of school system

	Anglophone school systems								Francophone school systems							
	Female		Male		I identify myself in another way		I prefer not to say		Female		Male		I identify myself in another way		I prefer not to say	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces																
British Columbia	47.6	(0.7)	48.5	(0.7)	1.7	(0.2)	2.2	(0.3)	51.7	(0.0)	43.4	(0.0)	2.8‡	(0.0)	2.1‡	(0.0)
Alberta	50.2	(0.9)	45.9	(0.9)	2.5	(0.4)	1.4	(0.2)	47.3	(2.9)	45.9	(2.3)	4.8‡	(1.0)	2.0‡	(0.5)
Saskatchewan	49.9	(0.9)	46.9	(0.9)	1.8	(0.2)	1.4	(0.2)	40.7	(0.0)	59.3	(0.0)	0.0	(0.0)	0.0	(0.0)
Manitoba	49.4	(0.9)	47.0	(0.9)	1.6	(0.2)	2.1	(0.3)	45.3	(0.0)	51.1	(0.0)	0.7‡	(0.0)	2.8‡	(0.0)
Ontario	48.9	(1.1)	48.3	(1.0)	1.2	(0.3)	1.6	(0.3)	43.4	(1.0)	53.6	(0.9)	0.7‡	(0.1)	2.3	(0.3)
Quebec	48.1	(1.9)	47.8	(1.9)	2.5‡	(0.3)	1.6‡	(0.3)	46.3	(1.5)	49.7	(1.5)	1.7	(0.3)	2.2	(0.3)
New Brunswick	49.2	(0.0)	48.1	(0.0)	1.4‡	(0.0)	1.4‡	(0.0)	47.4	(0.0)	51.5	(0.0)	0.5‡	(0.0)	0.6‡	(0.0)
Nova Scotia	46.4	(0.1)	50.1	(0.1)	1.9	(0.0)	1.6‡	(0.0)	45.2	(1.0)	54.1	(0.9)	0.7‡	(0.2)	0.0	(0.0)
Prince Edward Island	44.0	(0.0)	51.5	(0.0)	1.5‡	(0.0)	3.0‡	(0.0)	--	--	--	--	--	--	--	--
Newfoundland and Labrador	48.4	(0.5)	47.3	(0.4)	2.3‡	(0.1)	2.0‡	(0.2)	--	--	--	--	--	--	--	--
Canada	48.9	(0.6)	47.8	(0.5)	1.6	(0.2)	1.7	(0.1)	46.1	(1.2)	50.1	(1.3)	1.6	(0.3)	2.2	(0.3)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.1.3 Achievement in mathematics by gender, Canada

	Mean score	SE
Female	512	(2.1)
Male	509	(2.1)
I identify myself in another way	495*	(6.7)
I prefer not to say	493*	(7.4)

* Significant difference compared to the *female* category

TABLE A.1.4 Percentage of students by first language spoken

	English		French		An Indigenous language		Other language	
	%	SE	%	SE	%	SE	%	SE
Canada and provinces								
British Columbia	76.8	(1.4)	1.0	(0.1)	0.7‡	(0.1)	21.5	(1.4)
Alberta	78.9	(1.5)	1.7	(0.3)	0.8‡	(0.2)	18.6	(1.5)
Saskatchewan	84.6	(1.2)	0.6	(0.1)	1.3‡	(0.3)	13.5	(1.1)
Manitoba	78.5	(1.1)	2.1	(0.2)	1.4	(0.2)	18.0	(1.1)
Ontario	77.6	(1.6)	2.4	(0.2)	0.4‡	(0.1)	19.6	(1.6)
Quebec	13.2	(0.9)	77.6	(1.5)	1.4	(0.3)	7.8	(0.8)
New Brunswick	70.0	(0.0)	24.9	(0.0)	0.4‡	(0.0)	4.6	(0.0)
Nova Scotia	92.3	(0.2)	2.7	(0.2)	0.3‡	(0.0)	4.7	(0.1)
Prince Edward Island	93.8	(0.0)	2.1	(0.0)	0.4‡	(0.0)	3.6‡	(0.0)
Newfoundland and Labrador	95.4	(0.2)	0.7	(0.1)	0.8‡	(0.1)	3.1	(0.2)
Canada	65.6	(0.8)	17.5	(0.5)	0.7	(0.1)	16.2	(0.7)

‡ There are fewer than 30 observations.

TABLE A.1.5 Percentage of students by first language spoken and language of school system

	Anglophone school systems								Francophone school systems							
	English		French		Indigenous language		Other language		English		French		Indigenous language		Other language	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces																
British Columbia	76.9	(1.4)	0.8‡	(0.1)	0.7‡	(0.1)	21.6	(1.4)	59.6	(0.0)	29.3	(0.0)	0.0	(0.0)	11.1‡	(0.0)
Alberta	79.4	(1.6)	1.3‡	(0.3)	0.8‡	(0.2)	18.6	(1.5)	45.6	(2.6)	33.4	(1.0)	0.0	(0.0)	21.0	(2.7)
Saskatchewan	84.9	(1.2)	U‡	(0.1)	1.3‡	(0.3)	13.5	(1.1)	54.9	(0.0)	35.4	(0.0)	1.4‡	0.0	8.3‡	0.0
Manitoba	79.5	(1.1)	0.8‡	(0.2)	1.4	(0.2)	18.3	(1.1)	40.8	(0.0)	53.2	(0.0)	0.4‡	(0.0)	5.7‡	(0.0)
Ontario	79.0	(1.7)	0.6‡	(0.2)	0.4‡	(0.1)	20.0	(1.7)	49.9	(1.7)	37.6	(1.6)	0.3‡	(0.1)	12.2	(1.0)
Quebec	70.8	(1.9)	17.8	(1.7)	1.4‡	(0.4)	10.0	(1.0)	6.6	(0.8)	84.5	(1.5)	1.4	(0.4)	7.6	(0.9)
New Brunswick	92.3	(0.0)	1.6‡	(0.0)	0.6‡	(0.0)	5.5	(0.0)	15.0	(0.0)	82.6	(0.0)	0.1‡	(0.0)	2.3‡	(0.0)
Nova Scotia	93.5	(0.1)	1.4‡	(0.0)	0.3‡	(0.0)	4.8	(0.1)	66.3	(1.7)	31.0	(1.9)	U‡	(0.1)	2.3‡	0.4
Prince Edward Island	95.3	(0.0)	0.6‡	(0.0)	0.4‡	(0.0)	3.7‡	(0.0)	--	--	--	--	--	--	--	--
Newfoundland and Labrador	95.5	(0.2)	0.6‡	(0.1)	0.8‡	(0.1)	3.1	(0.2)	--	--	--	--	--	--	--	--
Canada	79.8	(0.9)	1.2	(0.1)	0.6	(0.1)	18.3	(0.9)	12.2	(0.8)	78.7	(1.4)	1.2	(0.3)	8.0	(0.8)

‡ There are fewer than 30 observations.

U Too unreliable to be published

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.1.6 Mathematics achievement by students' first language and language of the school system, Canada

	First language	Mean score	SE
Anglophone school systems	English	503	(2.1)
	French	486	(8.4)
	Other	505	(4.0)
Francophone school systems	English	522*	(3.9)
	French	540*	(3.5)
	Other	519	(8.3)

* Significant difference compared to the *anglophone school systems* category

TABLE A.1.7 Percentage of students by language used in everyday life

	English only or mostly English		French only or mostly French		English and French equally		English and a language other than French		French and a language other than English		Mostly an Indigenous language		Mostly other languages	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces														
British Columbia	65.3	(1.5)	0.6	(0.1)	2.1	(0.3)	19.7	(1.0)	0.3‡	(0.1)	0.5‡	(0.1)	11.6	(0.7)
Alberta	69.1	(1.8)	0.5‡	(0.1)	2.4	(0.3)	17.9	(1.2)	U‡	(0.2)	0.3‡	(0.1)	9.4	(0.8)
Saskatchewan	77.1	(1.3)	0.8‡	(0.2)	2.4	(0.3)	13.2	(1.0)	0.5‡	(0.1)	1.2‡	(0.3)	4.8	(0.5)
Manitoba	68.5	(1.1)	0.9	(0.1)	4.6	(0.4)	15.0	(0.8)	0.2‡	(0.0)	1.2‡	(0.2)	9.4	(0.6)
Ontario	61.5	(1.6)	1.3	(0.2)	4.1	(0.4)	23.0	(1.3)	0.6	(0.1)	0.5‡	(0.1)	9.0	(0.7)
Quebec	7.5	(0.6)	60.1	(1.7)	18.0	(0.7)	3.7	(0.4)	6.5	(0.8)	0.6‡	(0.2)	3.5	(0.4)
New Brunswick	62.1	(0.0)	12.9	(0.0)	18.0	(0.0)	4.0	(0.0)	0.4‡	(0.0)	0.4‡	(0.0)	2.3	(0.0)
Nova Scotia	83.4	(0.2)	1.7	(0.0)	6.4	(0.1)	4.7	(0.1)	0.5‡	(0.0)	0.3‡	(0.0)	2.9	(0.1)
Prince Edward Island	85.9	(0.0)	1.2‡	(0.0)	6.3	(0.0)	3.9‡	(0.0)	0.3‡	(0.0)	0.4‡	(0.0)	2.1‡	(0.0)
Newfoundland and Labrador	90.2	(0.4)	0.2‡	(0.0)	2.5‡	(0.2)	4.2	(0.2)	0.1‡	(0.0)	0.5‡	(0.1)	2.4‡	(0.2)
Canada	54.0	(0.8)	13.0	(0.4)	6.7	(0.2)	16.3	(0.6)	1.7	(0.2)	0.5	(0.1)	7.8	(0.3)

‡ There are fewer than 30 observations.

U Too unreliable to be published

TABLE A.1.8 Percentage of students by language used in everyday life and language of school system

Anglophone school systems														
	English only or mostly English		French only or mostly French		English and French equally		English and a language other than French		French and a language other than English		Mostly an Indigenous language		Mostly other languages	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	65.4	(1.5)	0.5‡	(0.1)	1.9	(0.3)	19.7	(1.0)	0.3‡	(0.1)	0.5‡	(0.1)	11.6	(0.7)
Alberta	69.7	(1.8)	0.4‡	(0.1)	1.9	(0.3)	17.9	(1.2)	U‡	(0.2)	0.3‡	(0.1)	9.4	(0.8)
Saskatchewan	77.3	(1.3)	0.7‡	(0.2)	2.2	(0.3)	13.2	(1.0)	0.5‡	(0.1)	1.2‡	(0.3)	4.9	(0.5)
Manitoba	69.5	(1.1)	0.7‡	(0.1)	3.6	(0.4)	15.3	(0.9)	U‡	(0.0)	1.2‡	(0.2)	9.7	(0.6)
Ontario	62.7	(1.7)	0.8‡	(0.2)	2.6	(0.4)	23.6	(1.4)	0.5‡	(0.1)	0.5‡	(0.1)	9.3	(0.8)
Quebec	45.1	(1.9)	6.3	(0.8)	29.2	(1.8)	14.3	(0.7)	1.2‡	(0.3)	0.8‡	(0.2)	3.3	(0.3)
New Brunswick	83.9	(0.0)	1.1‡	(0.0)	6.3	(0.0)	5.3	(0.0)	0.2‡	(0.0)	0.5‡	(0.0)	2.7	(0.0)
Nova Scotia	85.0	(0.1)	1.3‡	(0.0)	5.2	(0.1)	4.6	(0.1)	0.5‡	(0.0)	0.3‡	(0.0)	3.0	(0.1)
Prince Edward Island	88.4	(0.0)	0.9‡	(0.0)	3.9‡	(0.0)	4.0‡	(0.0)	0.2‡	(0.0)	0.4‡	(0.0)	2.1‡	(0.0)
Newfoundland and Labrador	90.2	(0.4)	0.1‡	(0.0)	2.4‡	(0.2)	4.2	(0.2)	0.1‡	(0.0)	0.6‡	(0.1)	2.4‡	(0.2)
Canada	66.3	(0.9)	0.9	(0.1)	3.2	(0.2)	19.7	(0.7)	0.4	(0.1)	0.5	(0.1)	8.9	(0.4)
Francophone school systems														
	English only or mostly English		French only or mostly French		English and French equally		English and a language other than French		French and a language other than English		Mostly an Indigenous language		Mostly other languages	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	41.3	(0.0)	7.9‡	(0.0)	33.3	(0.0)	9.7‡	(0.0)	4.2‡	(0.0)	0.0	(0.0)	3.7‡	(0.0)
Alberta	28.9	(3.4)	6.0‡	(1.1)	38.1	(2.8)	14.4‡	(2.3)	5.8‡	(1.9)	0.0	(0.0)	6.9‡	(1.5)
Saskatchewan	48.9	(0.0)	10.3‡	(0.0)	28.8‡	(0.0)	4.5‡	(0.0)	3.6‡	(0.0)	1.2‡	(0.0)	2.8‡	(0.0)
Manitoba	30.6	(0.0)	10.3‡	(0.0)	47.8	(0.0)	5.5‡	(0.0)	4.3‡	(0.0)	0.4‡	(0.0)	1.1‡	(0.0)
Ontario	39.2	(1.4)	9.2	(1.0)	33.3	(0.9)	11.3	(1.1)	3.5	(0.4)	U‡	(0.1)	3.4	(0.3)
Quebec	3.2	(0.6)	66.3	(1.8)	16.7	(0.7)	2.5	(0.4)	7.2	(0.9)	0.6‡	(0.2)	3.5	(0.4)
New Brunswick	7.8	(0.0)	42.3	(0.0)	47.0	(0.0)	0.7‡	(0.0)	0.8‡	(0.0)	0.1‡	(0.0)	1.4‡	(0.0)
Nova Scotia	49.4	(1.6)	8.7‡	(0.5)	31.3	(1.3)	6.5‡	(0.6)	2.2‡	(0.4)	0.0	(0.0)	2.0‡	(0.5)
Canada	7.7	(0.6)	58.6	(1.7)	19.7	(0.6)	3.5	(0.4)	6.6	(0.8)	0.5‡	(0.1)	3.4	(0.4)

‡ There are fewer than 30 observations.

U Too unreliable to be published

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.1.9 Percentage of students enrolled in language-immersion programs

	English immersion		French immersion		Indigenous-language immersion		Other-language immersion	
	%	SE	%	SE	%	SE	%	SE
Canada and provinces								
British Columbia	25.0	(1.1)	24.4	(1.8)	2.6	(0.3)	7.2	(0.5)
Alberta	25.0	(1.3)	22.4	(2.1)	0.6‡	(0.2)	8.0	(0.9)
Saskatchewan	23.5	(1.2)	19.4	(1.9)	4.4	(0.7)	4.1	(0.5)
Manitoba	33.4	(1.2)	27.9	(2.0)	3.8	(0.6)	6.7	(0.4)
Ontario	20.6	(1.2)	25.5	(2.6)	1.2	(0.3)	6.5	(0.5)
Quebec	32.6	(1.3)	18.5	(0.9)	1.3	(0.2)	9.7	(0.8)
New Brunswick	28.0	(0.0)	47.9	(0.0)	2.0	(0.0)	3.6	(0.0)
Nova Scotia	29.1	(0.3)	44.3	(0.5)	1.2‡	(0.0)	3.1	(0.1)
Prince Edward Island	24.4	(0.0)	51.4	(0.0)	1.0‡	(0.0)	2.6‡	(0.0)
Newfoundland and Labrador	28.3	(0.6)	33.2	(1.2)	1.2‡	(0.1)	3.0	(0.2)
Canada	25.2	(0.6)	24.6	(1.1)	1.5	(0.1)	7.2	(0.3)

‡ There are fewer than 30 observations.

TABLE A.1.10 Percentage of students by enrolment in second-language programs and language of school system, Canada

	Anglophone school systems				Francophone school systems			
	Currently enrolled		Previously enrolled		Currently enrolled		Previously enrolled	
	%	SE	%	SE	%	SE	%	SE
English-second-language program*	17.8	(0.5)	11.1	(0.5)	22.9	(1.5)	18.0	(0.9)
French-second-language program**	25.3	(1.0)	12.2	(0.4)	12.7	(0.7)	5.9	(0.4)

* These include English-language-learners (ELL), English-as-an-additional-language (EAL), and English-as-a-second-language (ESL) programs.

** These include extended and intensive French.

Note: Although students were also asked about second-language programs in Indigenous and other languages, the response rate was too low for the results to be valid.

TABLE A.1.11 Mathematics achievement by second-language learning status and language of school system, Canada

	Enrolment in a second-language program	Mean score	SE
Anglophone school systems	Currently enrolled	471*	(3.3)
	Previously enrolled	492*	(3.8)
	Never enrolled	514	(2.2)
Francophone school systems	Currently enrolled	536	(5.6)
	Previously enrolled	515*	(6.0)
	Never enrolled	537	(3.4)

* Significant difference compared to the *never enrolled* category

TABLE A.1.12 Percentage of students by their parents' education as reported by students

	University degree(s)		Completed college or cégep		Some postsecondary		Completed high school		Did not complete high school		I don't know	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	47.7	(1.4)	13.0	(0.7)	3.7	(0.3)	8.5	(0.6)	3.1	(0.2)	24.1	(0.9)
Alberta	45.3	(1.7)	13.4	(0.8)	3.2	(0.3)	8.5	(0.8)	3.9	(0.6)	25.7	(1.0)
Saskatchewan	40.0	(1.5)	13.7	(0.7)	5.2	(0.4)	11.4	(0.7)	5.3	(0.5)	24.4	(1.0)
Manitoba	38.5	(1.3)	12.7	(0.6)	3.5	(0.3)	13.6	(0.7)	5.1	(0.4)	26.6	(0.8)
Ontario	47.3	(1.7)	17.7	(0.9)	3.7	(0.4)	6.3	(0.6)	2.5	(0.3)	22.4	(1.0)
Quebec	44.5	(1.4)	12.6	(0.6)	3.3	(0.3)	8.6	(0.6)	3.5	(0.4)	27.5	(0.8)
New Brunswick	42.9	(0.0)	16.0	(0.0)	4.0	(0.0)	10.9	(0.0)	3.4	(0.0)	22.7	(0.0)
Nova Scotia	45.7	(0.2)	17.4	(0.1)	3.1	(0.1)	9.4	(0.1)	4.2	(0.1)	20.2	(0.1)
Prince Edward Island	45.4	(0.0)	16.5	(0.0)	2.1‡	(0.0)	14.9	(0.0)	6.5‡	(0.0)	14.6	(0.0)
Newfoundland and Labrador	42.1	(0.6)	16.9	(0.3)	2.7	(0.2)	9.3	(0.2)	3.4	(0.2)	25.6	(0.4)
Canada	45.7	(0.8)	15.2	(0.4)	3.6	(0.2)	8.0	(0.3)	3.2	(0.2)	24.2	(0.5)

‡ There are fewer than 30 observations.

Note: "Some postsecondary" refers to any kind of education after high school.

TABLE A.1.13 Percentage of students by their parents' education as reported by students, and language of school system

Anglophone school systems												
	University degree(s)		Completed college or cégep		Some postsecondary		Completed high school		Did not complete high school		I don't know	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	47.7	(1.4)	13.1	(0.7)	3.7	(0.3)	8.5	(0.6)	3.1	(0.2)	24.0	(0.9)
Alberta	45.3	(1.7)	13.4	(0.8)	3.2	(0.3)	8.6	(0.8)	3.9	(0.6)	25.5	(1.0)
Saskatchewan	39.9	(1.5)	13.8	(0.7)	5.2	(0.4)	11.5	(0.7)	5.4	(0.5)	24.4	(1.0)
Manitoba	38.2	(1.3)	12.9	(0.6)	3.5	(0.3)	13.7	(0.7)	5.2	(0.4)	26.5	(0.8)
Ontario	47.1	(1.8)	18.0	(1.0)	3.9	(0.4)	6.5	(0.6)	2.6	(0.4)	21.9	(1.0)
Quebec	49.6	(1.7)	12.9	(0.6)	7.0	(0.7)	7.7	(0.8)	3.1	(0.4)	19.8	(1.1)
New Brunswick	44.5	(0.0)	16.7	(0.0)	4.8	(0.0)	12.8	(0.0)	3.5	(0.0)	17.7	(0.0)
Nova Scotia	45.5	(0.2)	17.7	(0.1)	3.2	(0.1)	9.5	(0.1)	4.3	(0.1)	19.7	(0.1)
Prince Edward Island	45.5	(0.0)	16.2	(0.0)	2.2‡	(0.0)	15.2	(0.0)	6.7‡	(0.0)	14.2	(0.0)
Newfoundland and Labrador	42.1	(0.6)	17.0	(0.3)	2.7	(0.2)	9.3	(0.2)	3.4	(0.2)	25.6	(0.4)
Canada	46.1	(1.0)	15.9	(0.5)	3.8	(0.2)	8.0	(0.4)	3.2	(0.2)	23.0	(0.6)
Francophone school systems												
	University degree(s)		Completed college or cégep		Some postsecondary		Completed high school		Did not complete high school		I don't know	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	49.5	(0.0)	4.3‡	(0.0)	2.0‡	(0.0)	5.5‡	(0.0)	1.2‡	(0.0)	37.5	(0.0)
Alberta	46.5	(1.8)	11.7‡	(0.9)	U‡	(0.6)	U‡	(1.2)	2.5‡	(0.5)	34.6	(1.7)
Saskatchewan	52.9	(0.0)	9.0‡	(0.0)	1.1‡	(0.0)	5.9‡	(0.0)	2.3‡	(0.0)	28.7‡	(0.0)
Manitoba	48.9	(0.0)	7.8‡	(0.0)	1.7‡	(0.0)	6.6‡	(0.0)	2.1‡	(0.0)	33.0	(0.0)
Ontario	49.4	(1.4)	12.7	(0.7)	1.7	(0.2)	3.6	(0.5)	1.4	(0.2)	31.2	(0.9)
Quebec	44.0	(1.6)	12.5	(0.6)	2.9	(0.3)	8.7	(0.6)	3.5	(0.4)	28.4	(0.8)
New Brunswick	39.0	(0.0)	14.3	(0.0)	2.1‡	(0.0)	6.4	(0.0)	3.2‡	(0.0)	35.0	(0.0)
Nova Scotia	50.3	(1.2)	9.1‡	(0.5)	U‡	(0.1)	8.5‡	(1.1)	2.2‡	(0.4)	29.6	(1.6)
Canada	44.5	(1.4)	12.5	(0.6)	2.7	(0.3)	8.1	(0.5)	3.3	(0.4)	28.9	(0.7)

‡ There are fewer than 30 observations.

U Too unreliable to be published

Note: "Some postsecondary" refers to any kind of education after high school.

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.1.14 Mathematics achievement by parents' education as reported by students, Canada

	Mean score	SE
Did not complete high school	462	(6.2)
Completed high school	465	(2.8)
Had some postsecondary education after high school	496*	(4.6)
Completed education at a college or cégep	508*	(4.0)
Completed one or more university degrees	536*	(1.9)
I don't know	486*	(2.3)

* Significant difference compared to the *completed high school* category

TABLE A.1.15 Percentage of students by the number of books in their home

	0–10 books		11–25 books		26–100 books		101–200 books		More than 200 books	
	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces										
British Columbia	8.8	(0.7)	12.9	(0.6)	33.9	(0.9)	20.8	(0.7)	23.6	(1.0)
Alberta	8.5	(0.8)	13.4	(0.9)	32.4	(1.0)	23.5	(0.9)	22.2	(1.1)
Saskatchewan	10.9	(0.8)	16.1	(0.9)	30.2	(0.9)	22.0	(0.9)	20.8	(0.9)
Manitoba	12.2	(0.7)	15.2	(0.8)	30.7	(0.6)	19.0	(0.7)	22.9	(0.9)
Ontario	8.9	(0.7)	15.9	(0.9)	34.5	(1.0)	20.5	(0.8)	20.2	(1.1)
Quebec	13.8	(0.8)	18.6	(0.7)	35.1	(0.9)	17.5	(0.6)	14.9	(0.7)
New Brunswick	10.7	(0.0)	14.6	(0.0)	30.9	(0.0)	20.4	(0.0)	23.3	(0.0)
Nova Scotia	9.2	(0.1)	13.7	(0.1)	30.5	(0.1)	22.5	(0.1)	24.1	(0.2)
Prince Edward Island	7.8	(0.0)	12.5	(0.0)	34.5	(0.0)	18.3	(0.0)	26.9	(0.0)
Newfoundland and Labrador	8.9	(0.3)	13.8	(0.2)	37.2	(0.5)	19.8	(0.3)	20.3	(0.4)
Canada	10.1	(0.4)	15.6	(0.4)	33.9	(0.5)	20.3	(0.4)	20.1	(0.5)

TABLE A.1.16 Percentage of students by the number of books in their home and language of school system

	0–10 books		11–25 books		26 –100 books		101–200 books		More than 200 books	
	Anglophone									
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	8.8	(0.7)	12.9	(0.6)	33.9	(0.9)	20.8	(0.7)	23.6	(1.0)
Alberta	8.4	(0.8)	13.4	(0.9)	32.5	(1.0)	23.4	(0.9)	22.2	(1.1)
Saskatchewan	10.9	(0.8)	16.1	(0.9)	30.2	(0.9)	22.0	(0.9)	20.8	(0.9)
Manitoba	12.5	(0.7)	15.3	(0.8)	30.7	(0.7)	18.7	(0.7)	22.8	(0.9)
Ontario	8.9	(0.7)	15.8	(1.0)	34.6	(1.0)	20.5	(0.9)	20.3	(1.1)
Quebec	8.4	(0.8)	13.0	(1.0)	30.4	(1.0)	25.7	(1.1)	22.4	(0.8)
New Brunswick	7.8	(0.0)	12.3	(0.0)	30.2	(0.0)	22.5	(0.0)	27.3	(0.0)
Nova Scotia	9.1	(0.1)	13.5	(0.1)	30.6	(0.1)	22.4	(0.1)	24.3	(0.1)
Prince Edward Island	7.7‡	(0.0)	12.7	(0.0)	34.7	(0.0)	17.7	(0.0)	27.1	(0.0)
Newfoundland and Labrador	8.9	(0.3)	13.8	(0.2)	37.2	(0.5)	19.8	(0.3)	20.4	(0.4)
Canada	9.0	(0.4)	14.7	(0.5)	33.5	(0.6)	21.2	(0.5)	21.6	(0.6)
	Francophone									
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	10.8‡	(0.0)	12.5	(0.0)	28.3	(0.0)	22.9	(0.0)	25.5	(0.0)
Alberta	11.8‡	(1.8)	12.1‡	(1.8)	25.4	(2.8)	29.1	(2.7)	21.7	(2.3)
Saskatchewan	5.7‡	(0.0)	16.4‡	(0.0)	28.0‡	(0.0)	23.3‡	(0.0)	26.5‡	(0.0)
Manitoba	4.1‡	(0.0)	10.7	(0.0)	31.0	(0.0)	27.5	(0.0)	26.7	(0.0)
Ontario	10.4	(0.6)	17.5	(1.0)	33.1	(0.9)	20.1	(0.7)	18.9	(1.1)
Quebec	14.4	(0.9)	19.3	(0.8)	35.6	(1.0)	16.6	(0.7)	14.1	(0.8)
New Brunswick	18.1	(0.0)	20.3	(0.0)	32.9	(0.0)	15.2	(0.0)	13.6	(0.0)
Nova Scotia	10.5‡	(1.0)	18.1‡	(0.8)	28.9	(1.3)	22.9	(1.4)	19.6‡	(1.1)
Prince Edward Island	--	--	--	--	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--
Canada	14.0	(0.7)	19.0	(0.7)	35.1	(0.8)	17.1	(0.6)	14.7	(0.7)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.1.17 Mathematics achievement by the number of books in the home, Canada

	Mean score	SE
0–10 books	463	(2.9)
11–25 books	485*	(3.2)
26–100 books	510*	(2.1)
101–200 books	527*	(2.5)
More than 200 books	535*	(2.5)

* Significant difference compared to the 0–10 books category

TABLE A.1.18 Percentage of students by immigrant status

Canada and provinces	Born in Canada		Not born in Canada	
	%	SE	%	SE
British Columbia	82.2	(1.0)	17.8	(1.0)
Alberta	82.0	(1.4)	18.0	(1.4)
Saskatchewan	84.3	(1.3)	15.7	(1.3)
Manitoba	79.8	(1.3)	20.2	(1.3)
Ontario	84.7	(1.3)	15.3	(1.3)
Quebec	90.8	(0.8)	9.2	(0.8)
New Brunswick	91.9	(0.0)	8.1	(0.0)
Nova Scotia	91.8	(0.1)	8.2	(0.1)
Prince Edward Island	93.4	(0.0)	6.6‡	(0.0)
Newfoundland and Labrador	94.8	(0.3)	5.2	(0.3)
Canada	85.5	(0.6)	14.5	(0.6)

‡ There are fewer than 30 observations.

TABLE A.1.19 Percentage of students by immigrant status and language of school system

Canada and provinces	Anglophone school systems				Francophone school systems			
	Born in Canada		Not born in Canada		Born in Canada		Not born in Canada	
	%	SE	%	SE	%	SE	%	SE
British Columbia	82.2	(1.0)	17.8	(1.0)	82.5	(0.0)	17.5	(0.0)
Alberta	82.0	(1.4)	18.0	(1.4)	76.4	(3.1)	23.6	(3.1)
Saskatchewan	84.3	(1.3)	15.7	(1.3)	82.3	(0.0)	17.7‡	(0.0)
Manitoba	79.6	(1.3)	20.4	(1.3)	87.5	(0.0)	12.5	(0.0)
Ontario	84.6	(1.3)	15.4	(1.3)	86.0	(1.2)	14.0	(1.2)
Quebec	91.9	(0.9)	8.1	(0.9)	90.7	(0.9)	9.3	(0.9)
New Brunswick	90.8	(0.0)	9.2	(0.0)	94.7	(0.0)	5.3	(0.0)
Nova Scotia	91.7	(0.1)	8.3	(0.1)	93.9	(0.5)	6.1‡	(0.5)
Prince Edward Island	93.4	(0.0)	6.6‡	(0.0)	--	--	--	--
Newfoundland and Labrador	94.8	(0.3)	5.2	(0.3)	--	--	--	--
Canada	84.3	(0.7)	15.7	(0.7)	90.2	(0.8)	9.8	(0.8)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.1.20 Mathematics achievement by immigrant status, Canada

	Mean score	SE
Born in Canada	511	(1.9)
Not born in Canada	503*	(3.3)

* Significant difference

TABLE A.1.21 Percentage of students by their Indigenous identity as reported by students

	Not Indigenous		First Nations		Inuit		Métis		Indigenous, multiple identities		Both Indigenous and non-Indigenous	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	90.6	(0.8)	5.7	(0.6)	U‡	(0.1)	2.4	(0.3)	0.3‡	(0.1)	0.8‡	(0.1)
Alberta	90.1	(1.1)	4.2	(0.9)	U‡	(0.1)	3.8	(0.4)	1.0‡	(0.2)	0.7‡	(0.2)
Saskatchewan	79.4	(1.6)	10.9	(1.3)	U‡	(0.1)	7.5	(0.6)	1.2‡	(0.2)	0.9‡	(0.2)
Manitoba	79.7	(1.4)	9.4	(0.9)	U‡	(0.1)	9.4	(0.8)	0.9‡	(0.2)	0.4‡	(0.1)
Ontario	94.8	(0.7)	3.6	(0.6)	U‡	(0.1)	0.9	(0.2)	U‡	(0.1)	0.4‡	(0.1)
Quebec	93.1	(0.5)	3.0	(0.4)	0.6‡	(0.1)	1.9	(0.2)	U‡	(0.1)	1.1	(0.2)
New Brunswick	91.9	(0.0)	5.6	(0.0)	0.1‡	(0.0)	1.2‡	(0.0)	0.4‡	(0.0)	0.9‡	(0.0)
Nova Scotia	89.1	(0.1)	6.7	(0.1)	0.3‡	(0.0)	2.4	(0.0)	0.7‡	(0.0)	0.8‡	(0.0)
Prince Edward Island	95.4	(0.0)	3.6‡	(0.0)	0.2‡	(0.0)	0.3‡	(0.0)	0.0	(0.0)	0.4‡	(0.0)
Newfoundland and Labrador	87.5	(0.5)	6.5	(0.3)	2.4‡	(0.1)	1.6‡	(0.1)	0.3‡	(0.0)	1.6‡	(0.1)
Canada	92.0	(0.4)	4.4	(0.3)	0.3	(0.0)	2.3	(0.1)	0.4	(0.0)	0.7	(0.1)

‡ There are fewer than 30 observations.

U Too unreliable to be published

TABLE A.1.22 Percentage of students by their Indigenous identity as reported by students and language of school system

Anglophone school systems												
	Not Indigenous		First Nations		Inuit		Métis		Indigenous, multiple identities		Both Indigenous and non-Indigenous	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	90.6	(0.8)	5.7	(0.6)	U‡	(0.1)	2.4	(0.3)	0.3‡	(0.1)	0.8‡	(0.1)
Alberta	90.1	(1.2)	4.3	(0.9)	U‡	(0.1)	3.8	(0.4)	1.0‡	(0.2)	0.7‡	(0.2)
Saskatchewan	79.4	(1.7)	11.0	(1.3)	U‡	(0.1)	7.4	(0.6)	1.2‡	(0.2)	0.9‡	(0.2)
Manitoba	79.9	(1.4)	9.6	(1.0)	U‡	(0.1)	9.1	(0.8)	0.9‡	(0.2)	0.4‡	(0.1)
Ontario	94.9	(0.7)	3.6	(0.6)	U‡	(0.1)	0.8‡	(0.2)	U‡	(0.1)	0.4‡	(0.1)
Quebec	92.1	(0.7)	4.8	(0.5)	0.8‡	(0.2)	1.2‡	(0.2)	U‡	(0.0)	1.0‡	(0.2)
New Brunswick	92.1	(0.0)	6.1	(0.0)	0.0‡	(0.0)	0.6‡	(0.0)	0.2‡	(0.0)	0.9‡	(0.0)
Nova Scotia	89.1	(0.1)	6.8	(0.1)	0.3‡	(0.0)	2.3	(0.0)	0.7‡	(0.0)	0.8‡	(0.0)
Prince Edward Island	95.6	(0.0)	3.5‡	(0.0)	0.2‡	(0.0)	0.2‡	(0.0)	0.0	(0.0)	0.4‡	(0.0)
Newfoundland and Labrador	87.5	(0.5)	6.5	(0.3)	2.4‡	(0.1)	1.6‡	(0.1)	0.3‡	(0.0)	1.6‡	(0.1)
Canada	91.7	(0.4)	4.9	(0.4)	0.2	(0.0)	2.2	(0.1)	0.4	(0.1)	0.6	(0.1)
Francophone school systems												
	Not Indigenous		First Nations		Inuit		Métis		Indigenous, multiple identities		Both Indigenous and non-Indigenous	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	92.0	(0.0)	2.4‡	(0.0)	0.0	(0.0)	4.8‡	(0.0)	0.4‡	(0.0)	0.4‡	(0.0)
Alberta	96.4	(0.9)	U‡	(0.3)	U‡	(0.3)	U‡	(0.3)	1.2‡	(0.4)	U‡	(0.7)
Saskatchewan	86.1	(0.0)	0.0	(0.0)	0.0	(0.0)	12.8‡	(0.0)	0.0	(0.0)	1.1‡	(0.0)
Manitoba	73.1	(0.0)	0.3‡	(0.0)	0.6‡	(0.0)	23.7	(0.0)	1.1‡	(0.0)	1.1‡	(0.0)
Ontario	92.3	(0.8)	2.5	(0.4)	U‡	(0.1)	4.1	(0.4)	0.4‡	(0.1)	0.6‡	(0.1)
Quebec	93.2	(0.6)	2.7	(0.4)	0.6‡	(0.2)	2.0	(0.2)	U‡	(0.1)	1.1	(0.2)
New Brunswick	91.3	(0.0)	4.3	(0.0)	0.3‡	(0.0)	2.5‡	(0.0)	0.7‡	(0.0)	1.0‡	(0.0)
Nova Scotia	87.9	(0.9)	5.8‡	(0.4)	1.6‡	(0.4)	2.8‡	(0.3)	1.6‡	(0.4)	0.4‡	(0.1)
Canada	93.0	(0.5)	2.7	(0.4)	0.6‡	(0.1)	2.3	(0.2)	0.3	(0.1)	1.1	(0.2)

‡ There are fewer than 30 observations.

U Too unreliable to be published

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.1.23 Mathematics achievement by Indigenous identity as reported by students, Canada

	Mean score	SE
Not Indigenous	515*	(1.9)
First Nations	446	(5.3)
Inuit	473*	(8.8)
Métis	484*	(4.2)
Indigenous, multiple identities	457	(7.4)
Both Indigenous and non-Indigenous	487*	(9.1)

* Significant difference compared to the *First Nations* category

TABLE A.2.1.1 Distribution of students by questionnaire items constituting the attitude toward mathematics index, Canada

	Strongly disagree ¹				Disagree ²			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Strong correlation with mathematics achievement (> 0.2)								
I understand most of the mathematics I am taught	5.3	(0.2)	439*	(3.1)	11.5	(0.3)	455*	(2.3)
I like problem solving	12.5	(0.3)	467*	(2.3)	25.9	(0.4)	483*	(2.6)
I like doing mental mathematics	17.6	(0.4)	482*	(2.3)	31.9	(0.5)	495*	(2.5)
Weak or no correlation with mathematics achievement (< 0.2)								
I like doing paper-pencil calculations	13.8	(0.4)	482*	(2.4)	24.0	(0.4)	496*	(2.5)
I need to keep taking mathematics for the kind of job I want after I leave school	8.4	(0.3)	477*	(3.2)	19.6	(0.4)	498*	(2.2)
The mathematics I learn now will be useful in my everyday life	11.7	(0.3)	486*	(2.7)	26.4	(0.4)	508*	(2.0)
I like hands-on mathematics activities	11.2	(0.3)	487*	(2.9)	23.2	(0.4)	508*	(2.7)
I like mathematics questions that involve a lot of reading	34.0	(0.5)	500*	(1.9)	43.0	(0.5)	515*	(2.3)
I like to write or explain the methods or procedures I use in mathematics	20.9	(0.3)	504*	(2.5)	36.6	(0.5)	509*	(2.1)
I like estimating	18.1	(0.4)	503*	(2.7)	37.7	(0.5)	513*	(2.4)
	Agree ³				Strongly agree ⁴			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Strong correlation with mathematics achievement (> 0.2)								
I understand most of the mathematics I am taught	48.7	(0.5)	494*	(2.0)	34.4	(0.6)	562*	(2.1)
I like problem solving	45.8	(0.5)	520*	(1.9)	15.9	(0.4)	559*	(2.9)
I like doing mental mathematics	34.5	(0.4)	520*	(2.2)	16.0	(0.4)	550*	(2.4)
Weak or no correlation with mathematics achievement (< 0.2)								
I like doing paper-pencil calculations	43.3	(0.5)	514*	(2.0)	18.8	(0.4)	542*	(2.9)
I need to keep taking mathematics for the kind of job I want after I leave school	43.0	(0.4)	509*	(2.2)	29.0	(0.5)	530*	(2.4)
The mathematics I learn now will be useful in my everyday life	46.1	(0.5)	514*	(2.4)	15.8	(0.4)	522*	(2.7)
I like hands-on mathematics activities	46.1	(0.5)	513	(1.9)	19.6	(0.4)	520*	(3.0)
I like mathematics questions that involve a lot of reading	18.5	(0.4)	519	(3.1)	4.6	(0.2)	513	(5.2)
I like to write or explain the methods or procedures I use in mathematics	32.2	(0.5)	511	(2.6)	10.3	(0.3)	528*	(3.6)
I like estimating	35.9	(0.5)	510	(2.0)	8.3	(0.3)	516	(3.4)

* Significant difference between:

¹ "Strongly disagree" and "Strongly agree"

² "Disagree" and "Strongly disagree"

³ "Agree" and "Disagree"

⁴ "Strongly agree" and "Agree"

Note: Items have been sorted in descending order by correlation with mathematics achievement.

TABLE A.2.1.2 Attitude toward mathematics index scores

Canada and provinces	Index score	SE
British Columbia	49.0*	(0.2)
Alberta	49.8	(0.3)
Saskatchewan	50.7	(0.2)
Manitoba	50.4	(0.2)
Ontario	51.9*	(0.2)
Quebec	47.2*	(0.3)
New Brunswick	50.0	(0.0)
Nova Scotia	48.8*	(0.0)
Prince Edward Island	48.2*	(0.0)
Newfoundland and Labrador	47.6*	(0.1)
Canada	50.0	(0.1)

* Significant difference compared to Canada

TABLE A.2.1.3 Attitude toward mathematics index scores by language of the school system

Canada and provinces	Anglophone school systems		Francophone school systems		Difference** (A – F)
	Index score	SE	Index score	SE	
British Columbia	49.0*	(0.2)	51.0*	(0.0)	-2**
Alberta	49.8*	(0.3)	52.4*	(0.7)	-3**
Saskatchewan	50.7	(0.2)	53.9*	(0.0)	-3**
Manitoba	50.3	(0.2)	52.2*	(0.0)	-2**
Ontario	51.8*	(0.2)	52.8*	(0.2)	-1**
Quebec	47.4*	(0.3)	47.2*	(0.3)	0
New Brunswick	50.1*	(0.0)	49.8*	(0.0)	0**
Nova Scotia	48.6*	(0.0)	51.9*	(0.4)	-3**
Prince Edward Island	48.2*	(0.0)	--	--	--
Newfoundland and Labrador	47.6*	(0.1)	--	--	--
Canada	50.6	(0.1)	47.9	(0.2)	3**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.2.1.4 Attitude toward mathematics index scores by gender

Canada and provinces	Females		Males		Difference** (F – M)
	Index score	SE	Index score	SE	
British Columbia	48.4*	(0.2)	49.5*	(0.3)	-1**
Alberta	49.5	(0.3)	50.1	(0.4)	-1
Saskatchewan	50.6*	(0.3)	50.8	(0.3)	0
Manitoba	49.9	(0.2)	50.9	(0.3)	-1**
Ontario	51.2*	(0.3)	52.5*	(0.3)	-1**
Quebec	47.2*	(0.3)	47.2*	(0.3)	0
New Brunswick	50.5*	(0.0)	49.5*	(0.0)	1**
Nova Scotia	48.8*	(0.0)	48.8*	(0.1)	0
Prince Edward Island	48.1*	(0.0)	48.3*	(0.0)	0**
Newfoundland and Labrador	48.3*	(0.2)	46.9*	(0.2)	1**
Canada	49.6	(0.2)	50.4	(0.2)	-1**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

TABLE A.2.1.5 Mathematics achievement by the attitude toward mathematics index, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	477*	(2.0)	502*	(2.6)	524*	(2.5)	541*	(2.6)
Language of the school system								
Anglophone	464*	(2.4)	494*	(3.0)	518*	(2.9)	534*	(3.0)
Francophone	508*	(3.8)	534*	(4.2)	551*	(4.0)	570*	(4.0)
Gender								
Female	477*	(2.5)	501*	(3.8)	526*	(2.8)	539*	(3.3)
Male	477*	(2.5)	504*	(2.8)	522*	(3.7)	542*	(3.2)

* Significant difference between:

¹ Bottom quarter and top quarter

² Second quarter and bottom quarter

³ Third quarter and second quarter

⁴ Top quarter and third quarter

TABLE A.2.2.1 Distribution of students by questionnaire items constituting the confidence with mathematical processes index, Canada

	Not at all confident ¹				Somewhat confident ²				Very confident ³			
	%	SE	Mean score	SE	%	SE	Mean score	SE	%	SE	Mean score	SE
Strong correlation with mathematics achievement (> 0.2)												
Paper-pencil calculations	7.3	(0.3)	441*	(3.2)	49.4	(0.5)	488*	(1.9)	43.3	(0.5)	549*	(2.0)
Problem solving	11.3	(0.3)	448*	(3.1)	49.0	(0.5)	493*	(1.9)	39.7	(0.6)	550*	(2.0)
Mental math	19.6	(0.4)	471*	(2.8)	52.1	(0.5)	507*	(1.9)	28.3	(0.5)	545*	(2.2)
Reading to understand the problem to be solved	11.1	(0.3)	459*	(3.9)	53.7	(0.6)	504*	(1.8)	35.2	(0.5)	538*	(2.2)
Explaining how I solved a problem	20.2	(0.4)	477*	(2.7)	51.1	(0.5)	509*	(1.9)	28.7	(0.5)	537*	(2.3)
Estimation	16.9	(0.4)	478*	(3.0)	55.3	(0.5)	508*	(2.0)	27.8	(0.5)	536*	(2.3)

* Significant difference between:

¹ "Not at all confident" and "Very confident"

² "Somewhat confident" and "Not at all confident"

³ "Very confident" and "Somewhat confident"

Note: Items have been sorted in descending order by correlation with mathematics achievement.

TABLE A.2.2.2 Confidence with mathematical processes index scores

Canada and provinces	Index score	SE
British Columbia	49.4	(0.2)
Alberta	50.0	(0.3)
Saskatchewan	49.9	(0.2)
Manitoba	50.2	(0.3)
Ontario	51.4*	(0.3)
Quebec	47.9*	(0.2)
New Brunswick	49.5*	(0.0)
Nova Scotia	49.7	(0.0)
Prince Edward Island	50.3	(0.0)
Newfoundland and Labrador	48.9*	(0.1)
Canada	50.1	(0.1)

* Significant difference compared to Canada

TABLE A.2.2.3 Confidence with mathematical processes index scores by language of the school system

Canada and provinces	Anglophone school systems		Francophone school systems		Difference** (A – F)
	Index score	SE	Index score	SE	
British Columbia	49.4*	(0.2)	49.4*	(0.0)	0
Alberta	50.0	(0.3)	51.1*	(0.5)	-1
Saskatchewan	49.9	(0.2)	50.3*	(0.0)	0
Manitoba	50.2	(0.3)	50.7*	(0.0)	-1
Ontario	51.4*	(0.3)	50.8*	(0.2)	1
Quebec	49.2*	(0.3)	47.8*	(0.2)	1**
New Brunswick	50.1*	(0.0)	48.0	(0.0)	2**
Nova Scotia	49.6*	(0.0)	51.4*	(0.2)	-2**
Prince Edward Island	50.4	(0.0)	--	--	--
Newfoundland and Labrador	48.9*	(0.1)	--	--	--
Canada	50.6	(0.1)	48.1	(0.2)	2**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.2.2.4 Confidence with mathematical processes index scores by gender

Canada and provinces	Females		Males		Difference** (F – M)
	Index score	SE	Index score	SE	
British Columbia	48.1	(0.3)	50.8	(0.3)	-3**
Alberta	48.6	(0.4)	51.3	(0.3)	-3**
Saskatchewan	48.5	(0.3)	51.2	(0.3)	-3**
Manitoba	48.8	(0.3)	51.5	(0.3)	-3**
Ontario	50.0*	(0.4)	52.8*	(0.3)	-3**
Quebec	46.3*	(0.3)	49.5*	(0.3)	-3**
New Brunswick	48.3	(0.0)	50.7*	(0.0)	-2**
Nova Scotia	48.6	(0.0)	51.0*	(0.0)	-2**
Prince Edward Island	49.2*	(0.0)	51.7	(0.0)	-3**
Newfoundland and Labrador	48.4	(0.2)	49.3*	(0.1)	-1**
Canada	48.6	(0.2)	51.5	(0.1)	-3**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

TABLE A.2.2.5 Mathematics achievement by the confidence with mathematical processes index, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	467*	(2.3)	491*	(2.3)	529*	(2.4)	559*	(2.2)
Language of the school system								
Anglophone	453*	(2.7)	482*	(2.7)	520*	(2.8)	556*	(2.5)
Francophone	505*	(3.5)	524*	(3.7)	563*	(3.8)	583*	(4.5)
Gender								
Female	469*	(2.8)	498*	(2.4)	529*	(2.9)	560*	(3.3)
Male	463*	(2.7)	484*	(3.2)	529*	(3.0)	559*	(2.6)

* Significant difference between:

¹ Bottom quarter and top quarter

² Second quarter and bottom quarter

³ Third quarter and second quarter

⁴ Top quarter and third quarter

TABLE A.2.3.1 Distribution of students by questionnaire items constituting the confidence using technology index, Canada

	Not at all confident ¹				Somewhat confident ²				Very confident ³			
	%	SE	Mean score	SE	%	SE	Mean score	SE	%	SE	Mean score	SE
Strong correlation with mathematics achievement (> 0.2)												
Using calculators	2.5	(0.2)	434*	(6.0)	19.2	(0.4)	470*	(2.5)	78.3	(0.5)	523*	(1.8)
Weak or no correlation with mathematics achievement (< 0.2)												
Using computers	5.9	(0.2)	471*	(4.2)	31.2	(0.5)	498*	(2.1)	62.9	(0.5)	520*	(2.0)
Coding/programming	40.7	(0.5)	507*	(2.3)	41.0	(0.6)	511*	(2.2)	18.4	(0.4)	518*	(2.4)

* Significant difference between:

¹ "Not at all confident" and "Very confident"

² "Somewhat confident" and "Not at all confident"

³ "Very confident" and "Somewhat confident"

Note: Items have been sorted in descending order by correlation with mathematics achievement.

TABLE A.2.3.2 Confidence using technology index scores

Canada and provinces	Index score	SE
British Columbia	49.3*	(0.2)
Alberta	50.0	(0.3)
Saskatchewan	49.8	(0.2)
Manitoba	49.3	(0.2)
Ontario	50.7*	(0.2)
Quebec	49.3*	(0.2)
New Brunswick	49.6*	(0.0)
Nova Scotia	49.6*	(0.0)
Prince Edward Island	50.3	(0.0)
Newfoundland and Labrador	49.1*	(0.1)
Canada	50.0	(0.1)

* Significant difference compared to Canada

TABLE A.2.3.3 Confidence using technology index scores by language of the school system

Canada and provinces	Anglophone school systems		Francophone school systems		Difference** (A – F)
	Index score	SE	Index score	SE	
British Columbia	49.3*	(0.2)	50.2*	(0.0)	-1**
Alberta	50.0	(0.3)	50.0	(0.9)	0
Saskatchewan	49.9	(0.2)	47.1*	(0.0)	3**
Manitoba	49.3*	(0.2)	49.4	(0.0)	0
Ontario	50.8*	(0.3)	50.0	(0.2)	1**
Quebec	49.4	(0.3)	49.2	(0.2)	0
New Brunswick	49.9	(0.0)	49.0	(0.0)	1**
Nova Scotia	49.6*	(0.0)	48.8	(0.2)	1**
Prince Edward Island	50.3	(0.0)	--	--	--
Newfoundland and Labrador	49.1*	(0.1)	--	--	--
Canada	50.2	(0.1)	49.3	(0.2)	1**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.2.3.4 Confidence using technology index scores by gender

Canada and provinces	Females		Males		Difference** (F – M)
	Index score	SE	Index score	SE	
British Columbia	47.6*	(0.3)	51.0	(0.3)	-3**
Alberta	48.4	(0.4)	51.5	(0.3)	-3**
Saskatchewan	48.6	(0.3)	51.0	(0.3)	-2**
Manitoba	48.0	(0.3)	50.6*	(0.3)	-3**
Ontario	48.9	(0.4)	52.6*	(0.3)	-4**
Quebec	48.2	(0.2)	50.4*	(0.3)	-2**
New Brunswick	48.5	(0.0)	50.8*	(0.0)	-2**
Nova Scotia	48.4	(0.0)	50.9*	(0.0)	-3**
Prince Edward Island	50.5*	(0.0)	50.1*	(0.0)	0**
Newfoundland and Labrador	48.3	(0.1)	49.8*	(0.1)	-2**
Canada	48.5	(0.2)	51.5	(0.1)	-3**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

TABLE A.2.3.5 Mathematics achievement by the confidence using technology index, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	481*	(2.5)	515*	(2.4)	528*	(2.3)	523*	(2.4)
Language of the school system								
Anglophone	471*	(2.9)	507*	(2.8)	522*	(2.7)	517	(2.7)
Francophone	517*	(4.0)	539*	(4.2)	549*	(3.8)	547	(4.2)
Gender								
Female	485*	(2.8)	513*	(3.1)	527*	(2.5)	519*	(3.5)
Male	476*	(3.2)	517*	(3.0)	529*	(3.3)	525	(2.7)

* Significant difference between:

¹ Bottom quarter and top quarter

² Second quarter and bottom quarter

³ Third quarter and second quarter

⁴ Top quarter and third quarter

TABLE A.2.4.1 Distribution of students by questionnaire items constituting the student effort index, Canada

	Strongly disagree ¹				Disagree ²			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Strong correlation with mathematics achievement (> 0.2)								
I am prepared for my assessments	4.5	(0.2)	462*	(4.8)	12.7	(0.3)	478*	(2.7)
I keep studying until I understand the material	5.8	(0.3)	475*	(4.4)	21.4	(0.4)	487*	(2.3)
Weak or no correlation with mathematics achievement (< 0.2)								
I pay attention in class	3.2	(0.2)	477*	(6.2)	10.8	(0.3)	496*	(3.3)
I practise concepts that have not been taught in class	18.5	(0.4)	498*	(2.5)	38.0	(0.5)	507*	(1.8)
I keep my work well-organized	8.0	(0.3)	491*	(3.9)	22.6	(0.4)	502*	(2.9)
I avoid distractions when I am studying	8.9	(0.3)	495*	(4.4)	35.7	(0.5)	512*	(2.2)
	Agree ³				Strongly agree ⁴			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Strong correlation with mathematics achievement (> 0.2)								
I am prepared for my assessments	59.1	(0.5)	507*	(1.9)	23.8	(0.5)	547*	(2.2)
I keep studying until I understand the material	48.5	(0.5)	511*	(2.0)	24.3	(0.6)	540*	(2.3)
Weak or no correlation with mathematics achievement (< 0.2)								
I pay attention in class	59.8	(0.5)	506*	(2.0)	26.2	(0.5)	532*	(2.2)
I practise concepts that have not been taught in class	31.2	(0.4)	510	(2.6)	12.3	(0.4)	545*	(3.3)
I keep my work well-organized	44.6	(0.5)	511*	(1.9)	24.7	(0.5)	526*	(2.4)
I avoid distractions when I am studying	41.9	(0.5)	510	(1.9)	13.4	(0.4)	521*	(3.0)

* Significant difference between:

¹ "Strongly disagree" and "Strongly agree"

² "Disagree" and "Strongly disagree"

³ "Agree" and "Disagree"

⁴ "Strongly agree" and "Agree"

Note: Items have been sorted in descending order by correlation with mathematics achievement.

TABLE A.2.4.2 Student effort index scores

Canada and provinces	Index score	SE
British Columbia	49.8	(0.2)
Alberta	49.7	(0.3)
Saskatchewan	50.2	(0.2)
Manitoba	50.2	(0.2)
Ontario	51.0*	(0.3)
Quebec	48.6*	(0.3)
New Brunswick	50.1	(0.0)
Nova Scotia	48.5*	(0.0)
Prince Edward Island	47.7*	(0.0)
Newfoundland and Labrador	48.3*	(0.1)
Canada	50.0	(0.1)

* Significant difference compared to Canada

TABLE A.2.4.3 Student effort index scores by language of the school system

Canada and provinces	Anglophone school systems		Francophone school systems		Difference** (A – F)
	Index score	SE	Index score	SE	
British Columbia	49.8	(0.2)	50.1*	(0.0)	0
Alberta	49.7	(0.3)	50.3	(0.6)	-1
Saskatchewan	50.2	(0.2)	50.9*	(0.0)	-1**
Manitoba	50.1	(0.2)	52.2*	(0.0)	-2**
Ontario	51.0*	(0.3)	52.0*	(0.3)	-1**
Quebec	48.8*	(0.2)	48.6*	(0.3)	0
New Brunswick	49.7*	(0.0)	51.1*	(0.0)	-1**
Nova Scotia	48.4*	(0.0)	50.9*	(0.4)	-3**
Prince Edward Island	47.6*	(0.0)	--	--	--
Newfoundland and Labrador	48.3*	(0.1)	--	--	--
Canada	50.3	(0.2)	49.0	(0.3)	1**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.2.4.4 Student effort index scores by gender

Canada and provinces	Females		Males		Difference** (F – M)
	Index score	SE	Index score	SE	
British Columbia	50.3	(0.3)	49.3	(0.3)	1**
Alberta	50.4	(0.4)	49.0	(0.3)	1**
Saskatchewan	51.2	(0.3)	49.3	(0.3)	2**
Manitoba	50.9	(0.3)	49.5	(0.3)	1**
Ontario	52.0*	(0.3)	50.1*	(0.3)	2**
Quebec	49.7*	(0.3)	47.5*	(0.3)	2**
New Brunswick	51.5*	(0.0)	48.7	(0.0)	3**
Nova Scotia	49.5*	(0.0)	47.3*	(0.0)	2**
Prince Edward Island	48.3*	(0.0)	46.9*	(0.0)	1**
Newfoundland and Labrador	49.0*	(0.1)	47.6*	(0.1)	1**
Canada	50.9	(0.2)	49.2	(0.2)	2**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

TABLE A.2.4.5 Mathematics achievement by the student effort index, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	487*	(2.7)	508*	(2.4)	513	(2.3)	538*	(2.3)
Language of the school system								
Anglophone	476*	(3.1)	500*	(2.8)	507*	(2.7)	533*	(2.7)
Francophone	520*	(4.2)	540*	(3.9)	534	(4.2)	557*	(4.1)
Gender								
Female	481*	(3.4)	507*	(3.0)	509	(2.8)	533*	(2.8)
Male	491*	(2.9)	509*	(2.9)	516*	(3.0)	543*	(3.5)

* Significant difference between:

¹ Bottom quarter and top quarter

² Second quarter and bottom quarter

³ Third quarter and second quarter

⁴ Top quarter and third quarter

TABLE A.2.4.6 Distribution of students by hours per week spent on homework, Canada

	No homework is assigned		Less than 30 minutes		Between 30 minutes and 1 hour		Between 1 and 2 hours		Between 2 and 3 hours		More than 3 hours	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
In mathematics	15.1	(0.6)	25.9	(0.5)	33.5	(0.5)	15.0	(0.4)	5.6	(0.3)	4.9	(0.2)
In each of your other school subjects	10.7	(0.5)	20.6	(0.6)	31.8	(0.5)	20.0	(0.5)	8.4	(0.3)	8.6	(0.4)

TABLE A.2.4.7 Distribution and scores of students by frequency of homework completion, Canada

	%	SE	Mean score	SE
Never	1.8	(0.1)	482*	(6.8)
Rarely	7.6	(0.3)	478*	(5.6)
Sometimes	23.4	(0.5)	483*	(2.5)
Often	67.2	(0.6)	530	(1.9)

* Significant difference compared to the *often* category

TABLE A.2.4.8 Distribution of students by the number of days absent or late for school, Canada

	0–2 days				3–5 days			
	%	SE	Mean	SE	%	SE	Mean	SE
For reasons that are not school-related	22.9	(0.5)	517	(2.7)	25.4	(0.4)	518	(2.2)
For school-related activities	47.5	(0.7)	505	(2.2)	31.3	(0.6)	518	(2.3)
	6–9 days				10–14 days			
	%	SE	Mean	SE	%	SE	Mean	SE
For reasons that are not school-related	19.8	(0.3)	514	(2.5)	14.0	(0.4)	504	(2.9)
For school-related activities	12.8	(0.4)	525	(3.3)	5.1	(0.3)	513	(5.3)
	15–20 days				More than 20 days			
	%	SE	Mean	SE	%	SE	Mean	SE
For reasons that are not school-related	8.7	(0.3)	498	(3.3)	9.3	(0.3)	493	(3.5)
For school-related activities	1.8	(0.1)	501	(6.1)	1.5	(0.1)	473	(9.8)

TABLE A.2.4.9 Distribution and scores of students by the number of days absent or late for school in the past two weeks, Canada

	Never				1 or 2 times			
	%	SE	Mean	SE	%	SE	Mean	SE
I skipped a whole school day	77.4	(0.6)	519	(1.8)	17.5	(0.5)	490	(2.9)
I skipped some classes	84.4	(0.4)	517	(1.8)	12.0	(0.4)	488	(3.3)
I arrived late for school	58.8	(0.7)	526	(2.0)	26.3	(0.5)	499	(2.5)
	3 or 4 times				5 or more times			
	%	SE	Mean	SE	%	SE	Mean	SE
I skipped a whole school day	2.9	(0.2)	469	(6.1)	2.2	(0.2)	446	(5.3)
I skipped some classes	2.0	(0.1)	462	(7.1)	1.6	(0.1)	449	(8.1)
I arrived late for school	7.9	(0.3)	484	(3.1)	7.0	(0.3)	463	(3.5)

TABLE A.2.4.10 Distribution of students by hours per week spent on activities outside of school hours, Canada

	No time		Less than 1 hour		1–2 hours	
	%	SE	%	SE	%	SE
Playing mathematics-related games or puzzles	54.3	(0.5)	31.2	(0.5)	10.2	(0.3)
Doing extracurricular activities (e.g., clubs, music)	31.1	(0.5)	13.1	(0.3)	21.1	(0.4)
Doing community service	61.5	(0.6)	21.1	(0.4)	11.4	(0.4)
Doing physical activity (e.g., walking, sports)	4.3	(0.2)	11.2	(0.3)	22.1	(0.4)
Using a computer or device for personal reasons	1.5	(0.1)	4.4	(0.2)	13.1	(0.4)
Spending time with friends	6.2	(0.3)	8.0	(0.3)	15.4	(0.3)
	3–4 hours		5–6 hours		More than 6 hours	
	%	SE	%	SE	%	SE
Playing mathematics-related games or puzzles	2.6	(0.2)	0.7	(0.1)	0.9	(0.1)
Doing extracurricular activities (e.g., clubs, music)	14.7	(0.3)	7.3	(0.3)	12.6	(0.4)
Doing community service	3.8	(0.2)	1.0	(0.1)	1.1	(0.1)
Doing physical activity (e.g., walking, sports)	20.2	(0.4)	12.6	(0.3)	29.6	(0.6)
Using a computer or device for personal reasons	19.8	(0.4)	16.5	(0.4)	44.7	(0.5)
Spending time with friends	22.3	(0.4)	17.7	(0.4)	30.4	(0.5)

TABLE A.2.5.1 Distribution of students by questionnaire items constituting the knowledge of general terms in mathematics index, Canada

Strong correlation with mathematics achievement (> 0.2)								
	Never heard of it¹				Heard of it a few times²			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Percentage	1.3	(0.1)	409*	(6.3)	5.4	(0.4)	434*	(6.4)
Perimeter	2.3	(0.2)	428*	(5.7)	5.6	(0.2)	440	(4.7)
Equation	2.6	(0.2)	443*	(5.6)	4.4	(0.2)	433	(5.2)
Square root	1.6	(0.1)	421*	(5.9)	7.2	(0.3)	461*	(4.1)
Ratio	2.5	(0.2)	429*	(7.3)	8.3	(0.4)	471*	(3.7)
Factors	3.2	(0.2)	468*	(4.7)	11.7	(0.4)	482*	(3.0)
	Heard of it often³				Know this concept well⁴			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Percentage	27.4	(0.6)	472*	(1.9)	65.9	(0.8)	535*	(1.7)
Perimeter	19.8	(0.5)	462*	(1.7)	72.2	(0.6)	533*	(1.8)
Equation	18.0	(0.4)	461*	(2.5)	74.9	(0.6)	530*	(1.6)
Square root	25.9	(0.5)	476*	(2.3)	65.4	(0.7)	533*	(1.8)
Ratio	25.5	(0.5)	480*	(2.1)	63.6	(0.7)	532*	(1.8)
Factors	32.4	(0.5)	491*	(2.4)	52.7	(0.7)	533*	(1.9)

* Significant difference between:

¹ "Never heard of it" and "Know this concept well"

² "Heard of it a few times" and "Never heard of it"

³ "Heard of it often" and "Heard of it a few times"

⁴ "Know this concept well" and "Heard of it often"

Note: Items have been sorted in descending order by correlation with mathematics achievement.

TABLE A.2.5.2 Knowledge of general terms in mathematics index scores

Canada and provinces	Index score	SE
British Columbia	48.1*	(0.3)
Alberta	49.7	(0.4)
Saskatchewan	49.3	(0.3)
Manitoba	49.1*	(0.3)
Ontario	51.0*	(0.3)
Quebec	50.2	(0.2)
New Brunswick	49.3*	(0.0)
Nova Scotia	50.1	(0.0)
Prince Edward Island	48.8*	(0.0)
Newfoundland and Labrador	49.0*	(0.2)
Canada	50.1	(0.2)

* Significant difference compared to Canada

TABLE A.2.5.3 Knowledge of general terms in mathematics index scores by language of the school system

Canada and provinces	Anglophone school systems		Francophone school systems		Difference** (A – F)
	Index score	SE	Index score	SE	
British Columbia	48.1*	(0.3)	50.6	(0.0)	-2**
Alberta	49.7	(0.5)	50.6	(0.3)	-1
Saskatchewan	49.3	(0.3)	49.3*	(0.0)	0
Manitoba	49.0*	(0.3)	51.4*	(0.0)	-2**
Ontario	51.0*	(0.4)	51.7*	(0.3)	-1
Quebec	50.4	(0.4)	50.2*	(0.2)	0
New Brunswick	48.2*	(0.0)	52.0*	(0.0)	-4**
Nova Scotia	50.0	(0.0)	50.6	(0.4)	-1
Prince Edward Island	48.8*	(0.0)	--	--	--
Newfoundland and Labrador	49.0*	(0.2)	--	--	--
Canada	50.1	(0.2)	50.4	(0.2)	0

* Significant difference compared to Canada

** Significant difference within Canada or within the province

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.2.5.4 Knowledge of general terms in mathematics index scores by gender

Canada and provinces	Females		Males		Difference** (F – M)
	Index score	SE	Index score	SE	
British Columbia	48.5*	(0.4)	47.8*	(0.4)	1**
Alberta	50.4	(0.5)	49.1	(0.5)	1**
Saskatchewan	50.0	(0.3)	48.6	(0.4)	1**
Manitoba	49.9	(0.3)	48.3*	(0.4)	2**
Ontario	51.2	(0.4)	50.8*	(0.4)	0
Quebec	51.1	(0.3)	49.3	(0.3)	2**
New Brunswick	50.0*	(0.0)	48.6*	(0.0)	1**
Nova Scotia	51.1	(0.0)	48.9*	(0.1)	2**
Prince Edward Island	49.9*	(0.0)	47.4*	(0.0)	2**
Newfoundland and Labrador	50.6	(0.1)	47.4*	(0.2)	3**
Canada	50.6	(0.2)	49.6	(0.2)	1**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

TABLE A.2.5.5 Mathematics achievement by the knowledge of general terms in mathematics index, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	454*	(2.5)	506*	(1.8)	539*	(2.6)	553*	(2.1)
Language of the school system								
Anglophone	446*	(2.8)	496*	(2.1)	534*	(3.2)	549*	(2.5)
Francophone	490*	(4.0)	531*	(3.7)	562*	(4.0)	570	(4.2)
Gender								
Female	453*	(2.9)	504*	(2.4)	537*	(3.2)	547*	(2.5)
Male	455*	(2.9)	509*	(2.5)	541*	(3.2)	559*	(2.8)

* Significant difference between:

¹ Bottom quarter and top quarter

² Second quarter and bottom quarter

³ Third quarter and second quarter

⁴ Top quarter and third quarter

TABLE A.2.6.1 Distribution of students by questionnaire items constituting the knowledge of geometry and measurement terms index, Canada

	Never heard of it ¹				Heard of it a few times ²			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Strong correlation with mathematics achievement (> 0.2)								
Familiar with mathematics terms: quadrant	17.1	(0.5)	476*	(2.4)	21.1	(0.5)	493*	(2.7)
Familiar with mathematics terms: Cartesian plane	30.2	(1.0)	484*	(2.4)	15.3	(0.4)	496*	(3.0)
	Heard of it often ³				Know this concept well ⁴			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Familiar with mathematics terms: quadrant	23.4	(0.4)	498	(2.3)	38.4	(0.8)	544*	(2.1)
Familiar with mathematics terms: Cartesian plane	18.1	(0.4)	496	(2.7)	36.5	(1.0)	547*	(2.2)

* Significant difference between:

¹ "Never heard of it" and "Know this concept well"

² "Heard of it a few times" and "Never heard of it"

³ "Heard of it often" and "Heard of it a few times"

⁴ "Know this concept well" and "Heard of it often"

Note: Items have been sorted in descending order by correlation with mathematics achievement.

TABLE A.2.6.2 Knowledge of geometry and measurement terms index scores

Canada and provinces	Index score	SE
British Columbia	44.2*	(0.3)
Alberta	50.2	(0.4)
Saskatchewan	47.0*	(0.4)
Manitoba	46.4*	(0.3)
Ontario	49.1*	(0.4)
Quebec	57.8*	(0.2)
New Brunswick	48.1*	(0.0)
Nova Scotia	46.0*	(0.1)
Prince Edward Island	54.2*	(0.0)
Newfoundland and Labrador	42.8*	(0.1)
Canada	50.1	(0.2)

* Significant difference compared to Canada

TABLE A.2.6.3 Knowledge of geometry and measurement terms index scores by language of the school system

Canada and provinces	Anglophone school systems		Francophone school systems		Difference** (A – F)
	Index score	SE	Index score	SE	
British Columbia	44.1*	(0.3)	52.4*	(0.0)	-8**
Alberta	50.1*	(0.4)	52.5*	(0.4)	-2**
Saskatchewan	46.9*	(0.4)	52.0*	(0.0)	-5**
Manitoba	46.4*	(0.3)	47.2*	(0.0)	-1**
Ontario	48.9	(0.5)	52.7*	(0.3)	-4**
Quebec	56.6*	(0.2)	58.0*	(0.2)	-1**
New Brunswick	46.2*	(0.0)	52.8*	(0.0)	-7**
Nova Scotia	45.7*	(0.0)	52.3*	(0.4)	-7**
Prince Edward Island	54.4*	(0.0)	--	--	--
Newfoundland and Labrador	42.7*	(0.1)	--	--	--
Canada	48.2	(0.3)	57.2	(0.2)	-9**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.2.6.4 Knowledge of geometry and measurement terms index scores by gender

Canada and provinces	Females		Males		Difference** (F – M)
	Index score	SE	Index score	SE	
British Columbia	43.7*	(0.3)	44.6*	(0.3)	-1**
Alberta	49.9	(0.5)	50.4	(0.4)	0
Saskatchewan	46.1*	(0.4)	47.7*	(0.3)	-2**
Manitoba	46.0*	(0.4)	46.9*	(0.3)	-1**
Ontario	48.6*	(0.5)	49.5	(0.5)	-1**
Quebec	58.3*	(0.3)	57.4*	(0.2)	1**
New Brunswick	47.7*	(0.0)	48.5*	(0.0)	-1**
Nova Scotia	45.8*	(0.1)	46.1*	(0.1)	0**
Prince Edward Island	54.4*	(0.0)	53.9*	(0.0)	1**
Newfoundland and Labrador	41.8*	(0.1)	43.7*	(0.1)	-2**
Canada	49.9	(0.3)	50.3	(0.2)	0

* Significant difference compared to Canada

** Significant difference within Canada or within the province

TABLE A.2.6.5 Mathematics achievement by the knowledge of geometry and measurement terms index, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	486*	(2.6)	497*	(2.2)	516*	(2.4)	553*	(2.5)
Language of the school system								
Anglophone	486*	(2.7)	497*	(2.5)	512*	(2.8)	546*	(3.7)
Francophone	475*	(6.3)	503*	(4.0)	527*	(4.0)	562*	(3.5)
Gender								
Female	482*	(3.1)	498*	(3.2)	516*	(3.0)	552*	(2.9)
Male	489*	(3.1)	497*	(2.6)	517*	(3.0)	554*	(3.2)

* Significant difference between:

¹ Bottom quarter and top quarter

² Second quarter and bottom quarter

³ Third quarter and second quarter

⁴ Top quarter and third quarter

TABLE A.2.7.1 Distribution of students by questionnaire items constituting the teacher-directed mathematics activities index, Canada

	Never ¹				Rarely ²			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Strong correlation with mathematics achievement (> 0.2)								
Solve problems	1.7	(0.1)	434*	(7.1)	5.7	(0.2)	460*	(3.2)
Work individually	1.7	(0.1)	441*	(6.9)	5.0	(0.3)	468*	(4.1)
Practise skills	3.5	(0.2)	470*	(6.3)	11.3	(0.3)	484*	(2.6)
Weak or no correlation with mathematics achievement (< 0.2)								
Pay attention to the teacher doing examples and giving explanations	1.8	(0.1)	457*	(7.3)	5.1	(0.2)	483*	(4.8)
Observe teacher-guided problem solving and investigations	2.4	(0.2)	466*	(6.8)	8.2	(0.3)	493*	(4.2)
Use calculators	1.8	(0.2)	468*	(8.2)	4.3	(0.2)	490*	(4.8)
Copy notes	6.0	(0.3)	513	(4.8)	15.4	(0.5)	518	(3.1)
	Sometimes ³				Often ⁴			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Strong correlation with mathematics achievement (> 0.2)								
Solve problems	29.3	(0.5)	483*	(2.1)	63.3	(0.6)	532*	(1.9)
Work individually	26.1	(0.5)	488*	(2.9)	67.3	(0.6)	526*	(1.7)
Practise skills	36.3	(0.5)	497*	(2.2)	48.9	(0.7)	532*	(1.8)
Weak or no correlation with mathematics achievement (< 0.2)								
Pay attention to the teacher doing examples and giving explanations	25.6	(0.5)	492*	(2.6)	67.5	(0.6)	523*	(1.6)
Observe teacher-guided problem solving and investigations	36.0	(0.5)	500	(2.3)	53.4	(0.6)	524*	(1.7)
Use calculators	24.7	(0.7)	493	(3.0)	69.1	(0.8)	521*	(1.7)
Copy notes	31.1	(0.6)	508*	(2.3)	47.6	(0.9)	512	(2.0)

* Significant difference between:

¹ "Never" and "Often"

² "Rarely" and "Never"

³ "Sometimes" and "Rarely"

⁴ "Often" and "Sometimes"

Note: Items have been sorted in descending order by correlation with mathematics achievement.

TABLE A.2.7.2 Teacher-directed mathematics activities index scores

Canada and provinces	Index score	SE
British Columbia	49.4	(0.2)
Alberta	49.7	(0.3)
Saskatchewan	49.6	(0.2)
Manitoba	48.9*	(0.3)
Ontario	49.8	(0.3)
Quebec	51.6*	(0.3)
New Brunswick	49.2*	(0.0)
Nova Scotia	49.7	(0.0)
Prince Edward Island	48.7*	(0.0)
Newfoundland and Labrador	50.0	(0.1)
Canada	50.1	(0.1)

* Significant difference compared to Canada

TABLE A.2.7.3 Teacher-directed mathematics activities index scores by language of the school system

Canada and provinces	Anglophone school systems		Francophone school systems		Difference** (A – F)
	Index score	SE	Index score	SE	
British Columbia	49.4	(0.2)	51.6	(0.0)	-2**
Alberta	49.7	(0.3)	51.1	(0.9)	-1
Saskatchewan	49.6	(0.2)	48.7*	(0.0)	1**
Manitoba	48.9	(0.3)	50.8	(0.0)	-2**
Ontario	49.8	(0.3)	49.6*	(0.3)	0
Quebec	50.8*	(0.3)	51.7*	(0.3)	-1
New Brunswick	48.7*	(0.0)	50.6*	(0.0)	-2**
Nova Scotia	49.7	(0.0)	50.4	(0.4)	-1
Prince Edward Island	48.7*	(0.0)	--	--	--
Newfoundland and Labrador	49.9	(0.1)	--	--	--
Canada	49.7	(0.2)	51.5	(0.3)	-2**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

Note: Due to small sample sizes, results for students in the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.2.7.4 Teacher-directed mathematics activities index scores by gender

Canada and provinces	Females		Males		Difference** (F – M)
	Index score	SE	Index score	SE	
British Columbia	50.3*	(0.3)	48.5	(0.3)	2**
Alberta	50.9	(0.4)	48.7	(0.4)	2**
Saskatchewan	51.2	(0.3)	48.2	(0.3)	3**
Manitoba	49.8*	(0.3)	48.1	(0.4)	2**
Ontario	51.1	(0.3)	48.6	(0.3)	2**
Quebec	53.5*	(0.3)	49.7	(0.4)	4**
New Brunswick	50.8*	(0.0)	47.5*	(0.0)	3**
Nova Scotia	51.3	(0.0)	48.0*	(0.1)	3**
Prince Edward Island	50.1*	(0.0)	47.1*	(0.0)	3**
Newfoundland and Labrador	51.0	(0.1)	48.9	(0.2)	2**
Canada	51.4	(0.2)	48.8	(0.2)	3**

* Significant difference compared to Canada

** Significant difference within Canada or within the province

TABLE A.2.7.5 Mathematics achievement by the teacher-directed mathematics activities index, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	474*	(2.6)	515*	(2.7)	529*	(1.9)	536*	(2.2)
Language of the school system								
Anglophone	470*	(2.9)	510*	(3.3)	522*	(2.2)	528*	(2.6)
Francophone	497*	(4.7)	533*	(3.5)	554*	(3.5)	558	(3.9)
Gender								
Female	464*	(3.3)	507*	(2.8)	525*	(2.4)	536*	(2.6)
Male	481*	(3.1)	522*	(3.9)	534*	(2.8)	536	(3.1)

* Significant difference between:

¹ Bottom quarter and top quarter

² Second quarter and bottom quarter

³ Third quarter and second quarter

⁴ Top quarter and third quarter

TABLE A.2.8 Distribution of students who reported using what they learned in mathematics in other subjects, Canada

	Yes		No	
	%	SE	%	SE
Science	86.1	(0.4)	13.9	(0.4)
Technology	72.7	(0.5)	27.3	(0.5)
Art	39.0	(0.7)	61.0	(0.7)
Social studies	27.0	(0.5)	73.0	(0.5)
Health and physical education	24.4	(0.5)	75.6	(0.5)
Music/band	23.9	(0.6)	76.1	(0.6)
Language arts	20.7	(0.5)	79.3	(0.5)

TABLE A.2.9 Distribution of students by type of mathematics homework assigned, Canada

	Never or almost never		2 or 3 times per month		1 to 3 times per week		Daily or almost daily	
	%	SE	%	SE	%	SE	%	SE
Paper-pencil calculations	13.0	(0.4)	21.6	(0.6)	31.5	(0.6)	33.8	(0.8)
Word problems	15.4	(0.5)	28.3	(0.6)	34.0	(0.6)	22.3	(0.7)
Studying for assessments	9.8	(0.4)	39.7	(0.6)	35.8	(0.5)	14.7	(0.4)
New concepts not taught in class	47.4	(0.6)	28.4	(0.5)	16.4	(0.4)	7.9	(0.3)
Collaborative problem-solving activities	34.0	(0.6)	35.4	(0.6)	23.0	(0.6)	7.6	(0.3)
Viewing videos online (e.g., YouTube, Vimeo) to review concepts	50.4	(0.9)	29.2	(0.6)	13.3	(0.5)	7.1	(0.3)
Creating problems	50.1	(0.7)	30.5	(0.6)	14.5	(0.5)	4.9	(0.2)
Participation in online discussion forums or blogs	69.9	(0.7)	17.1	(0.5)	9.0	(0.4)	4.0	(0.2)
Projects	40.0	(0.7)	44.3	(0.7)	11.7	(0.4)	3.9	(0.3)
Activities using concrete or virtual manipulatives	56.4	(0.7)	28.3	(0.6)	11.3	(0.4)	3.9	(0.2)

TABLE A.2.10.1 Distribution of students by type of mathematics assessment method, Canada

	Never		Rarely		Sometimes		Often	
	%	SE	%	SE	%	SE	%	SE
Homework	10.7	(0.4)	18.7	(0.7)	30.3	(0.6)	40.3	(1.0)
Teacher-developed classroom assessments	7.7	(0.3)	19.5	(0.4)	45.3	(0.4)	27.5	(0.5)
Individual student assignments/projects	14.7	(0.4)	21.8	(0.4)	38.5	(0.6)	25.0	(0.6)
Common assessments (i.e., any assessment used by two or more teachers)	14.2	(0.4)	24.5	(0.5)	38.0	(0.5)	23.3	(0.6)
Self-assessment	21.7	(0.5)	24.1	(0.4)	33.8	(0.5)	20.5	(0.5)
Group assignments/projects	17.5	(0.5)	26.0	(0.5)	40.4	(0.6)	16.1	(0.5)
Performance assessments (include tasks with a real-world application)	22.5	(0.4)	29.6	(0.5)	35.1	(0.5)	12.8	(0.4)
Peer assessment	28.9	(0.6)	30.8	(0.5)	31.1	(0.6)	9.2	(0.4)
Student portfolios and/or journals	41.0	(0.7)	27.7	(0.5)	22.5	(0.5)	8.9	(0.5)

TABLE A.2.10.2 Distribution of students by use of scoring rubrics in mathematics, Canada

	Yes				No			
	%	SE	Mean score	SE	%	SE	Mean score	SE
Do you know what a scoring rubric is for marking assessments or assignments?	76.7	(0.6)	520	(1.9)	23.3	(0.6)	481*	(2.3)
Do you sometimes use a rubric when you start an assignment in your mathematics class?	48.9	(0.8)	517	(2.8)	51.1	(0.8)	523*	(1.8)

* Significant difference

TABLE A.2.10.3 Mathematics achievement of students by the frequency that teachers use rubrics, Canada

	%	SE	Mean score	SE
Never	13.8	(0.5)	522*	(3.0)
Rarely	24.8	(0.6)	511*	(2.2)
Sometimes	32.2	(0.6)	512*	(2.3)
Often	29.1	(1.0)	535	(2.9)

* Significant difference compared to the *often* category

TABLE A.2.11.1 Distribution of students by teacher feedback and support in mathematics class, Canada

	Never		Rarely		Sometimes		Often	
	%	SE	%	SE	%	SE	%	SE
Useful hints or strategies to solve a problem	5.0	(0.2)	10.8	(0.4)	38.4	(0.5)	45.8	(0.6)
Details about how your assessments or assignments will be marked	6.5	(0.2)	13.4	(0.4)	36.3	(0.5)	43.8	(0.7)
Regular feedback to help you improve your learning	8.0	(0.3)	15.2	(0.4)	36.5	(0.5)	40.2	(0.7)
An opportunity to redo or resubmit work	14.9	(0.6)	23.7	(0.5)	37.1	(0.6)	24.3	(0.7)

TABLE A.2.11.2 Mathematics achievement of students by teacher feedback and support in mathematics class, Canada

	Never or rarely ¹		Sometimes ²		Often ³	
	Mean score	SE	Mean score	SE	Mean score	SE
Useful hints or strategies to solve a problem	498*	(3.0)	507*	(2.4)	520*	(2.0)
Details about how your assessments or assignments will be marked	508*	(2.6)	507	(2.2)	517*	(2.2)
Regular feedback to help you improve your learning	515	(2.6)	508*	(2.0)	512	(2.6)
An opportunity to redo or resubmit work	524*	(2.4)	505*	(2.3)	501	(2.6)

* Significant difference between:

¹ "Never or rarely" and "Often"

² "Sometimes" and "Never or rarely"

³ "Often" and "Sometimes"

TABLE A.2.12 Distribution and scores of students by students' sense of belonging in school, Canada

	Strongly disagree ¹				Disagree ²			
	%	SE	Mean	SE	%	SE	Mean	SE
I like school	9.6	(0.3)	478*	(2.9)	21.1	(0.4)	501*	(2.7)
At school, I am treated fairly	4.6	(0.2)	466*	(4.3)	14.8	(0.4)	492*	(2.6)
School staff care about me	5.3	(0.2)	479*	(4.2)	14.2	(0.4)	503*	(2.9)
At school, I feel that I belong	6.8	(0.3)	475*	(3.6)	16.8	(0.4)	495*	(2.6)
At school, I make friends easily	6.0	(0.2)	491*	(4.7)	14.9	(0.4)	507*	(4.3)
At school, I have a friend or friends whom I can trust	3.2	(0.2)	473*	(6.2)	4.9	(0.2)	501*	(5.8)
	Agree ³				Strongly agree ⁴			
	%	SE	Mean	SE	%	SE	Mean	SE
I like school	57.0	(0.5)	515*	(1.9)	12.3	(0.4)	527*	(3.4)
At school, I am treated fairly	58.8	(0.5)	512*	(1.9)	21.7	(0.5)	526*	(2.6)
School staff care about me	59.1	(0.5)	513*	(1.9)	21.4	(0.5)	515	(2.5)
At school, I feel that I belong	56.7	(0.5)	514*	(2.0)	19.7	(0.4)	522*	(2.6)
At school, I make friends easily	46.6	(0.5)	513	(1.9)	32.5	(0.5)	511	(2.2)
At school, I have a friend or friends whom I can trust	35.8	(0.5)	508	(2.3)	56.1	(0.5)	514*	(1.9)

* Significant difference between:

¹ "Strongly disagree" and "Strongly agree"

² "Disagree" and "Strongly disagree"

³ "Agree" and "Disagree"

⁴ "Strongly agree" and "Agree"

TABLE A.2.13.1 Distribution of students by type of problems encountered in mathematics class or assignment, Canada

	Never		Rarely		Sometimes		Often	
	%	SE	%	SE	%	SE	%	SE
Level 1 problems: How often encountered in mathematics lessons?	3.6	(0.2)	10.4	(0.3)	43.2	(0.6)	42.7	(0.7)
Level 1 problems: How often encountered on assessments?	4.0	(0.2)	12.6	(0.4)	44.9	(0.5)	38.5	(0.7)
Level 3 problems: How often encountered in mathematics lessons?	5.5	(0.2)	16.6	(0.3)	45.5	(0.5)	32.3	(0.6)
Level 3 problems: How often encountered on assessments?	6.7	(0.3)	17.3	(0.4)	46.2	(0.5)	29.8	(0.5)

Note: Level 1 problems describe scenarios and provide all the information required to solve them. Level 3 problems do not describe scenarios but require the use of mathematical knowledge to form conclusions.

TABLE A.2.13.2 Mathematics achievement of students by type of problems encountered in mathematics class or assignment, Canada

	Never or rarely ¹		Sometimes ²		Often ³	
	Mean score	SE	Mean score	SE	Mean score	SE
Level 1 problems: How often encountered in mathematics lessons?	464*	(3.3)	501*	(1.8)	537*	(2.0)
Level 1 problems: How often encountered on assessments?	471*	(3.1)	505*	(1.8)	536*	(2.1)
Level 3 problems: How often encountered in mathematics lessons?	503*	(3.2)	508	(2.0)	523*	(2.2)
Level 3 problems: How often encountered on assessments?	509*	(2.9)	506	(2.0)	523*	(2.2)

* Significant difference between:

¹ "Never or rarely" and "Often"

² "Sometimes" and "Never or rarely"

³ "Often" and "Sometimes"

Note: Level 1 problems describe scenarios and provide all the information required to solve them. Level 3 problems do not describe scenarios but require the use of mathematical knowledge to form conclusions.

TABLE A.3.1.1 Class size in Grade 8/Secondary II mathematics classes

	Fewer than 15		15–19		20–24		25–29		30 or more	
	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces										
British Columbia	3.3‡	(2.2)	10.1‡	(3.1)	36.0	(4.5)	39.9	(4.4)	10.6‡	(2.8)
Alberta	4.4‡	(3.7)	9.5‡	(3.3)	19.3‡	(4.1)	39.1	(4.8)	27.7	(4.2)
Saskatchewan	14.4‡	(3.7)	22.3	(3.9)	24.4	(4.0)	27.3	(3.9)	11.5‡	(2.7)
Manitoba	9.3‡	(2.6)	21.1	(3.7)	39.0	(4.3)	22.5	(3.6)	8.0‡	(2.3)
Ontario	6.8‡	(2.3)	5.5‡	(1.8)	30.3	(4.5)	43.5	(4.5)	13.9‡	(3.0)
Quebec	5.4‡	(2.3)	9.1‡	(2.9)	14.7‡	(3.2)	53.9	(4.6)	16.9‡	(3.2)
New Brunswick	7.9‡	(2.2)	16.5	(3.4)	29.3	(5.2)	34.9	(5.6)	11.4‡	(3.8)
Nova Scotia	6.3‡	(2.0)	17.9‡	(4.2)	36.4	(5.4)	37.1	(5.6)	2.3‡	(1.0)
Prince Edward Island	8.4‡	(4.2)	7.6‡	(4.3)	56.5‡	(13.2)	27.5‡	(12.4)	0.0	(0.0)
Newfoundland and Labrador	20.2	(3.8)	8.3‡	(2.5)	17.7‡	(4.7)	46.9‡	(7.3)	6.8‡	(4.4)
Canada	6.5	(1.2)	9.2	(1.1)	26.9	(2.2)	42.4	(2.3)	15.1	(1.6)

‡ There are fewer than 30 observations.

TABLE A.3.1.2 Achievement in mathematics by class size, Canada

	Mean score	SE
Fewer than 15	469	(18.5)
15–19	501	(9.2)
20–24	500	(3.8)
25–29	510*	(3.1)
30 or more	525*	(4.6)

* Significant difference compared to the *fewer than 15* category

TABLE A.3.1.3 Class size in Grade 8/Secondary II mathematics classes by language of the school system

Anglophone school systems										
	Fewer than 15		15–19		20–24		25–29		30 or more	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	3.2‡	(2.2)	10.0‡	(3.1)	36.1	(4.5)	40.0	(4.5)	10.7‡	(2.8)
Alberta	3.9‡	(3.8)	9.6‡	(3.4)	19.1‡	(4.2)	39.2	(4.9)	28.1	(4.3)
Saskatchewan	14.0‡	(3.8)	22.3‡	(4.0)	24.5	(4.0)	27.6	(3.9)	11.6‡	(2.8)
Manitoba	8.5‡	(2.6)	21.4‡	(3.8)	39.3	(4.4)	22.8	(3.7)	8.0‡	(2.4)
Ontario	6.7‡	(2.4)	5.4‡	(1.9)	29.9	(4.7)	44.1	(4.7)	13.9‡	(3.2)
Quebec	18.7‡	(6.2)	13.6‡	(5.2)	26.8‡	(7.5)	35.4‡	(9.0)	5.4‡	(4.2)
New Brunswick	6.8‡	(2.6)	15.7‡	(4.2)	28.3‡	(6.4)	41.4‡	(7.0)	7.8‡	(3.7)
Nova Scotia	5.9‡	(2.0)	18.4‡	(4.4)	37.1	(5.6)	36.5	(5.7)	2.1‡	(1.0)
Prince Edward Island	5.0‡	(3.1)	6.7‡	(4.3)	60.0‡	(14.0)	28.3‡	(13.4)	0.0	(0.0)
Newfoundland and Labrador	19.9	(3.8)	8.3‡	(2.5)	17.8‡	(4.7)	47.1‡	(7.4)	6.9‡	(4.4)
Canada	6.8	(1.4)	9.3	(1.3)	29.2	(2.6)	40.3	(2.6)	14.4	(1.8)
Francophone school systems										
	Fewer than 15		15–19		20–24		25–29		30 or more	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	22.2‡	(13.9)	33.3‡	(15.7)	22.2‡	(13.9)	22.2‡	(13.9)	0.0	(0.0)
Alberta	36.0‡	(15.2)	0.0	(0.0)	36.0‡	(17.6)	28.0‡	(19.1)	0.0	(0.0)
Saskatchewan	57.1‡	(18.7)	28.6‡	(17.1)	14.3‡	(13.2)	0.0	(0.0)	0.0	(0.0)
Manitoba	38.9‡	(11.5)	11.1‡	(7.4)	27.8‡	(10.6)	11.1‡	(7.4)	11.1‡	(7.4)
Ontario	9.7‡	(2.6)	6.5‡	(2.0)	37.4	(7.0)	31.6‡	(6.3)	14.8‡	(6.3)
Quebec	3.5‡	(2.4)	8.5‡	(3.2)	12.9‡	(3.4)	56.5	(5.1)	18.6‡	(3.6)
New Brunswick	11.0‡	(3.9)	18.7‡	(5.4)	31.9‡	(8.0)	17.6‡	(6.4)	20.9‡	(9.1)
Nova Scotia	14.3‡	(10.4)	7.1‡	(7.3)	21.4‡	(15.0)	50.0‡	(20.8)	7.1‡	(7.3)
Prince Edward Island	--	--	--	--	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--
Canada	5.4	(2.0)	8.6	(2.7)	16.9	(3.0)	51.4	(4.3)	17.8	(3.1)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.3.2.1 Percentage of teachers indicating that other adults were present in their mathematics class

	Never		Up to 1/4 of the time		Up to 1/2 of the time		Most or all the time	
	%	SE	%	SE	%	SE	%	SE
Canada and provinces								
British Columbia	40.7	(4.6)	23.6	(4.0)	12.7‡	(3.1)	23.1	(3.9)
Alberta	42.2	(5.0)	24.1	(4.1)	9.0‡	(2.9)	24.6‡	(5.0)
Saskatchewan	46.5	(4.7)	15.7‡	(3.2)	9.7‡	(2.9)	28.1	(4.1)
Manitoba	36.5	(4.3)	32.7	(4.1)	9.9‡	(2.5)	20.8	(3.7)
Ontario	66.0	(4.4)	20.3	(3.3)	6.5‡	(2.3)	7.2‡	(3.2)
Quebec	62.3	(4.6)	27.3	(4.2)	7.3‡	(2.7)	3.1‡	(1.3)
New Brunswick	42.7	(5.6)	23.9	(4.7)	10.3‡	(3.5)	23.1	(4.7)
Nova Scotia	33.3	(5.3)	51.0	(5.6)	9.8‡	(2.7)	6.0‡	(2.7)
Prince Edward Island	39.7‡	(13.6)	51.9‡	(13.7)	4.6‡	(2.8)	3.8‡	(2.8)
Newfoundland and Labrador	43.6	(7.0)	49.8	(7.2)	4.6‡	(1.9)	2.0‡	(1.0)
Canada	55.7	(2.3)	24.2	(1.8)	8.0	(1.2)	12.1	(1.6)

‡ There are fewer than 30 observations.

TABLE A.3.2.2 Achievement in mathematics by presence of other adults in the mathematics classroom, Canada

	Mean score	SE
Never	515	(3.5)
Up to 1/4 of the time	501*	(3.2)
Up to 1/2 of the time	487*	(7.6)
Most or all the time	484*	(9.2)

* Significant difference compared to the *never* category

TABLE A.3.3 Percentage of teachers and mathematics achievement by accomodations and modifications used in mathematics classrooms, Canada

	Never				Rarely			
	%	SE	Mean	SE	%	SE	Mean	SE
Program modifications (e.g., altering course expectations)	13.4	(1.5)	540	(5.8)	8.3	(1.1)	520*	(5.7)
More time in which to accomplish a task	1.2‡	(0.5)	561	(13.8)	1.0‡	(0.3)	543	(21.7)
Adapted teaching methods	1.7‡	(0.5)	547	(12.0)	3.2	(0.7)	543	(9.9)
Withdrawal of student from class (e.g., for a short-term, targeted intervention)	25.6	(2.2)	518	(4.5)	26.1	(2.0)	512	(4.3)
Assistive technologies	21.5	(1.7)	516	(6.7)	24.3	(1.9)	515	(4.9)
Help of an education assistant (e.g., teaching aide, interpreter)	38.8	(2.3)	519	(4.5)	13.7	(1.7)	501*	(5.7)
	Sometimes				Often			
	%	SE	Mean	SE	%	SE	Mean	SE
Program modifications (e.g., altering course expectations)	30.8	(2.1)	509*	(3.7)	47.6	(2.4)	492*	(3.9)
More time in which to accomplish a task	22.3	(1.9)	523*	(4.8)	75.5	(1.9)	499*	(2.9)
Adapted teaching methods	36.1	(2.2)	517*	(3.5)	59.1	(2.3)	496*	(3.4)
Withdrawal of student from class (e.g., for a short-term, targeted intervention)	33.5	(2.2)	495*	(4.8)	14.8	(1.5)	498*	(6.3)
Assistive technologies	35.4	(2.3)	501*	(3.1)	18.9	(1.9)	493*	(6.3)
Help of an education assistant (e.g., teaching aide, interpreter)	22.4	(1.8)	508	(3.7)	25.0	(2.0)	488*	(5.3)

* Significant difference compared to the *never* category

‡ There are fewer than 30 observations.

TABLE A.3.4.1 Percentage of teachers by number of grade levels in their mathematics classrooms

	One grade only		Two grade levels		Three or more grade levels	
	%	SE	%	SE	%	SE
Canada and provinces						
British Columbia	73.7	(4.1)	12.8‡	(3.1)	13.5‡	(3.3)
Alberta	70.0	(4.6)	14.9‡	(3.5)	15.1‡	(3.7)
Saskatchewan	55.8	(4.6)	32.0	(4.5)	12.2‡	(3.0)
Manitoba	55.9	(4.4)	29.3	(4.2)	14.7‡	(3.1)
Ontario	60.4	(4.6)	30.6	(4.5)	9.0‡	(2.6)
Quebec	94.2	(1.8)	4.9‡	(1.7)	0.9‡	(0.5)
New Brunswick	60.6	(5.4)	24.4	(4.8)	15.0‡	(3.8)
Nova Scotia	85.8	(3.3)	11.1‡	(3.0)	3.1‡	(1.5)
Prince Edward Island	77.1‡	(10.9)	13.7‡	(10.0)	9.2‡	(5.4)
Newfoundland and Labrador	80.7	(5.7)	12.0‡	(4.5)	7.3‡	(3.9)
Canada	69.6	(2.3)	21.2	(2.2)	9.2	(1.3)

‡ There are fewer than 30 observations.

TABLE A.3.4.2 Achievement in mathematics by number of grade levels, Canada

	Mean score	SE
One grade only	512	(2.8)
Two grade levels	494*	(5.8)
Three or more grade levels	490*	(9.6)

* Significant difference compared to the *one grade only* category**TABLE A.3.5.1** Percentage of teachers by number of days taught by a substitute teacher

	5 or fewer days		6–9 days		10–19 days		20 or more days	
	%	SE	%	SE	%	SE	%	SE
Canada and provinces								
British Columbia	61.8	(4.4)	20.7	(3.6)	10.5‡	(2.8)	7.0‡	(2.4)
Alberta	54.6	(5.0)	23.2	(4.0)	12.7‡	(3.2)	9.6‡	(2.8)
Saskatchewan	51.5	(4.6)	26.9	(4.1)	16.3‡	(3.7)	5.3‡	(2.2)
Manitoba	44.1	(4.4)	38.3	(4.3)	11.2‡	(2.8)	6.5‡	(2.1)
Ontario	44.2	(4.5)	34.1	(4.5)	16.4	(3.3)	5.2‡	(1.8)
Quebec	74.7	(4.0)	16.6‡	(3.4)	6.0‡	(2.2)	2.7‡	(1.1)
New Brunswick	47.8	(5.5)	33.4	(5.5)	5.7‡	(1.9)	13.2‡	(4.0)
Nova Scotia	40.3	(5.5)	39.3	(5.5)	13.3‡	(3.8)	7.1‡	(2.4)
Prince Edward Island	30.5‡	(12.2)	35.1‡	(13.5)	17.6‡	(9.3)	16.8‡	(11.3)
Newfoundland and Labrador	36.5	(6.4)	38.6	(7.0)	23.9‡	(6.8)	1.0‡	(0.7)
Canada	52.9	(2.3)	28.2	(2.2)	13.0	(1.6)	5.8	(1.0)

‡ There are fewer than 30 observations.

TABLE A.3.5.2 Achievement in mathematics by number of days taught by a substitute teacher, Canada

	Mean score	SE
5 or fewer days	511*	(3.9)
6–9 days	505*	(4.0)
10–19 days	489	(5.3)
20 or more days	511*	(7.0)

* Significant difference compared to the 10 to 19 days category

TABLE A.3.6.1 Percentage of teachers by reasons for lost instructional time, Canada

	Never		Rarely		Sometimes		Often	
	%	SE	%	SE	%	SE	%	SE
Student misbehaviour	13.9	(1.6)	34.3	(2.2)	33.7	(2.3)	18.1	(1.7)
Other disruptions (e.g., announcements, assemblies, visits)	2.0	(0.5)	44.6	(2.3)	46.8	(2.4)	6.6	(1.2)
Discussions unrelated to the mathematics lesson	9.2	(1.3)	60.6	(2.3)	27.1	(2.0)	3.2	(0.8)

TABLE A.3.6.2 Achievement in mathematics by reasons for lost instructional time, Canada

	Never or rarely				Sometimes or often			
	%	SE	Mean	SE	%	SE	Mean	SE
Student misbehaviour	48.2	(2.3)	518	(3.7)	51.8	(2.3)	495*	(3.1)
Other disruptions (e.g., announcements, assemblies, visits)	46.5	(2.3)	513	(2.9)	53.5	(2.3)	500*	(3.8)
Discussions unrelated to the mathematics lesson	69.7	(2.1)	509	(3.1)	30.3	(2.1)	499	(4.1)

* Significant difference compared to the *never or rarely* category

TABLE A.3.7.1 Percentage of teachers by gender self-identification

Canada and provinces	Female		Male		Another way		I prefer not to say	
	%	SE	%	SE	%	SE	%	SE
British Columbia	47.4	(4.6)	51.7	(4.6)	0.0	(0.0)	0.9‡	(0.8)
Alberta	37.5	(4.8)	57.6	(5.0)	0.0	(0.0)	4.9‡	(2.4)
Saskatchewan	42.3	(4.5)	56.5	(4.5)	0.0	(0.0)	1.2‡	(0.9)
Manitoba	32.8	(4.1)	65.3	(4.1)	0.0	(0.0)	1.9‡	(1.3)
Ontario	37.8	(4.3)	60.8	(4.3)	0.0	(0.0)	1.4‡	(0.9)
Quebec	33.3	(4.4)	66.0	(4.4)	0.0	(0.0)	0.7‡	(0.7)
New Brunswick	35.1	(5.2)	63.7	(5.3)	1.2‡	(1.2)	0.0	(0.0)
Nova Scotia	37.1	(5.3)	61.8	(5.4)	0.0	(0.0)	1.1‡	(1.1)
Prince Edward Island	44.3‡	(13.6)	55.7‡	(13.6)	0.0	(0.0)	0.0	(0.0)
Newfoundland and Labrador	49.1	(7.2)	50.9	(7.2)	0.0	(0.0)	0.0	(0.0)
Canada	38.0	(2.2)	60.3	(2.2)	0.0‡	(0.0)	1.6‡	(0.5)

‡ There are fewer than 30 observations.

TABLE A.3.7.2 Achievement in mathematics by gender self-identification of teacher, Canada

	Mean score	SE
Female	509	(3.1)
Male	503	(3.6)
Another way	--	--
I prefer not to say	540*	(13.8)

* Significant difference compared to the *female* category

Note: Due to sample size and confidentiality issues, mathematics achievement of the one class whose teacher chose to identify themselves in another way is not reported.

TABLE A.3.8.1 Percentage of teachers and mathematics achievement by academic credentials, Canada

	Yes				No			
	%	SE	Mean	SE	%	SE	Mean	SE
BA	35.0	(2.4)	501	(4.3)	65.0	(2.4)	509	(3.0)
BEd or equivalent (e.g., at least one year of teacher training)	88.3	(1.4)	505	(2.7)	11.7	(1.4)	514	(6.0)
BSc	24.1	(1.9)	507	(6.0)	75.9	(1.9)	506	(2.7)
Other bachelor's degree	12.8	(1.5)	513	(6.2)	87.2	(1.5)	505	(2.7)
MEd	9.3	(1.1)	506	(6.7)	90.7	(1.1)	506	(2.6)
Other master's degree	8.9	(1.7)	511	(6.6)	91.1	(1.7)	506	(2.6)
PhD or equivalent	0.7‡	(0.3)	544	(20.5)	99.3	(0.3)	506	(2.5)
Other degree or diploma	8.0	(1.2)	497	(6.5)	92.0	(1.2)	507	(2.6)

‡ There are fewer than 30 observations.

TABLE A.3.8.2 Percentage of teachers by courses taken during postsecondary studies, Canada

	0 courses		1–2 courses		3–5 courses		6–9 courses		10 or more courses	
	%	SE	%	SE	%	SE	%	SE	%	SE
Courses in mathematics or mathematics-related subjects (mathematics content)	12.4	(1.9)	30.9	(2.2)	23.9	(1.9)	12.7	(1.3)	20.0	(1.6)
Mathematics teaching-methodology courses (mathematics pedagogy)	21.8	(2.0)	51.7	(2.3)	19.5	(1.6)	4.7	(0.8)	2.3	(0.5)

TABLE A.3.8.3 Percentage of teachers by areas of study during formal pre-service education or training, Canada

	Not at all		Overview or introduction to the topic		Area of emphasis	
	%	SE	%	SE	%	SE
Mathematics	10.9	(1.7)	47.4	(2.3)	41.7	(2.2)
Pedagogy/teaching mathematics	13.5	(1.8)	52.6	(2.3)	34.0	(2.1)
Educational psychology	5.9	(1.0)	71.1	(2.1)	23.0	(2.0)
Remedial mathematics	46.1	(2.4)	47.6	(2.4)	6.4	(1.3)
Special education	32.4	(2.1)	47.7	(2.4)	19.9	(2.1)
Assessment methods	4.9	(0.8)	68.8	(2.1)	26.3	(2.0)

TABLE A.3.8.4 Percentage of teachers by years of teaching experience

	Fewer than 5 years		5–10 years		11–15 years		16–20 years		More than 20 years	
	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces										
British Columbia	17.2‡	(3.5)	19.7‡	(3.5)	17.8	(3.4)	21.3‡	(3.8)	24.1	(4.1)
Alberta	19.8‡	(4.7)	26.0	(4.5)	18.2‡	(3.7)	15.9‡	(3.4)	20.1‡	(3.8)
Saskatchewan	20.3‡	(3.7)	21.8	(3.7)	18.2‡	(3.5)	14.0‡	(3.1)	25.8	(4.2)
Manitoba	21.5	(3.6)	16.2‡	(3.3)	26.1	(3.9)	14.3‡	(3.2)	21.9	(3.6)
Ontario	15.3	(3.1)	24.7	(4.3)	21.6	(3.6)	17.8	(3.2)	20.5	(3.7)
Quebec	9.3‡	(2.5)	12.2‡	(3.0)	25.5	(4.1)	22.5	(3.9)	30.5	(4.3)
New Brunswick	7.9‡	(2.8)	19.1	(4.0)	35.2	(5.6)	16.2‡	(4.0)	21.7‡	(4.5)
Nova Scotia	11.4‡	(3.7)	30.6	(5.1)	30.6	(5.1)	13.0‡	(3.9)	14.4‡	(3.7)
Prince Edward Island	1.5‡	(1.6)	6.1‡	(4.8)	19.1‡	(10.4)	35.1‡	(13.6)	38.2‡	(13.4)
Newfoundland and Labrador	10.4‡	(4.5)	20.8‡	(5.4)	19.6‡	(5.2)	17.8‡	(5.6)	31.4‡	(7.1)
Canada	15.1	(1.6)	21.5	(2.1)	22.0	(1.8)	18.4	(1.7)	23.0	(1.9)

‡ There are fewer than 30 observations.

TABLE A.3.8.5 Achievement in mathematics by teacher's years of teaching experience, Canada

	Mean score	SE
Fewer than 5 years	490	(8.3)
5–10 years	503	(4.0)
11–15 years	510*	(4.7)
16–20 years	515*	(5.8)
More than 20 years	509*	(5.2)

* Significant difference compared to the *fewer than 5 years* category

TABLE A.3.8.6 Percentage of teachers by proportion of schedule assigned to mathematics

Canada and provinces	Less than 20%		20–39%		40–69%		70% or more	
	%	SE	%	SE	%	SE	%	SE
British Columbia	8.5‡	(2.6)	29.7	(4.4)	26.8	(4.1)	35.0	(4.3)
Alberta	8.5‡	(2.6)	22.6‡	(5.0)	34.0	(4.7)	34.9	(4.7)
Saskatchewan	27.0	(4.2)	49.3	(4.6)	16.4‡	(3.4)	7.2‡	(2.5)
Manitoba	16.9‡	(3.4)	31.9	(4.1)	32.1	(4.1)	19.1‡	(3.6)
Ontario	9.5‡	(2.6)	53.2	(4.5)	25.6	(3.8)	11.7	(2.6)
Quebec	0.6‡	(0.4)	1.4‡	(0.9)	13.2‡	(3.0)	84.8	(3.2)
New Brunswick	7.8‡	(3.5)	14.7	(3.0)	33.8	(5.0)	43.8	(5.7)
Nova Scotia	1.1‡	(1.1)	6.6‡	(2.6)	37.6	(5.6)	54.7	(5.6)
Prince Edward Island	0.0	(0.0)	43.5‡	(13.4)	39.7‡	(13.5)	16.8‡	(11.2)
Newfoundland and Labrador	5.9‡	(3.9)	8.3‡	(2.7)	18.5‡	(4.2)	67.3	(6.0)
Canada	8.4	(1.2)	33.6	(2.4)	25.0	(1.9)	33.0	(2.0)

‡ There are fewer than 30 observations.

TABLE A.3.8.7 Achievement in mathematics by proportion of teacher's schedule assigned to mathematics, Canada

	Mean score	SE
Less than 20%	496	(8.0)
20–39%	494	(5.4)
40–69%	509*	(3.8)
70% or more	520*	(3.4)

* Significant difference compared to the 20 to 39% category

TABLE A.3.8.8 Percentage of teachers by self-assessed specialization in mathematics

	Yes, based on education only		Yes, based on experience only		Yes, based on education and experience		No, I do not consider myself a mathematics specialist	
Canada and provinces	%	SE	%	SE	%	SE	%	SE
British Columbia	2.9‡	(1.5)	30.1	(4.2)	39.9	(4.5)	27.1	(4.2)
Alberta	6.9‡	(4.0)	26.5	(4.4)	43.2	(4.9)	23.4	(4.2)
Saskatchewan	1.0‡	(0.9)	27.8	(4.0)	32.6	(4.5)	38.6	(4.4)
Manitoba	2.2‡	(1.2)	25.2	(3.8)	44.3	(4.4)	28.4	(4.0)
Ontario	1.6‡	(0.8)	23.2	(3.6)	34.9	(4.2)	40.3	(4.7)
Quebec	2.5‡	(1.4)	19.8	(3.7)	72.4	(4.1)	5.3‡	(1.8)
New Brunswick	5.4‡	(2.7)	30.5	(5.1)	38.1	(5.5)	26.1	(4.7)
Nova Scotia	7.7‡	(3.0)	13.9‡	(4.0)	69.3	(5.2)	9.1‡	(3.3)
Prince Edward Island	0.0	(0.0)	6.1‡	(3.9)	42.0‡	(13.4)	51.9‡	(13.7)
Newfoundland and Labrador	2.0‡	(1.0)	7.0‡	(2.8)	81.9	(4.2)	9.1‡	(2.9)
Canada	2.8	(0.7)	23.7	(1.9)	45.3	(2.3)	28.2	(2.3)

‡ There are fewer than 30 observations.

TABLE A.3.8.9 Achievement in mathematics by teacher's self-assessed specialization in mathematics, Canada

	Mean score	SE
Yes, based on education only	470	(30.8)
Yes, based on experience only	511	(4.8)
Yes, based on education and experience	510*	(3.0)
No, I do not consider myself a mathematics specialist	499	(4.9)

* Significant difference compared to the *no, I do not consider myself a mathematics specialist* category

TABLE A.3.9.1 Percentage of teachers by number of days of professional development activities related to the teaching of mathematics in the past five years

Canada and provinces	0 days		1–2 days		3–4 days		5–8 days		9 or more days	
	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	6.2‡	(2.1)	20.9‡	(4.0)	22.3	(3.8)	21.8	(3.7)	28.8	(4.2)
Alberta	10.6‡	(2.9)	15.5‡	(3.4)	22.6‡	(4.8)	25.9	(4.3)	25.5	(4.4)
Saskatchewan	12.0‡	(3.3)	33.7	(4.3)	28.4	(4.1)	14.3‡	(3.2)	11.7‡	(2.8)
Manitoba	6.4‡	(2.0)	14.7‡	(3.1)	29.6	(4.0)	21.7	(3.7)	27.6	(4.0)
Ontario	4.6‡	(1.7)	8.9‡	(2.5)	21.4	(3.7)	27.3	(4.4)	37.8	(4.3)
Quebec	17.9‡	(3.7)	20.9	(3.7)	25.5	(4.1)	14.2‡	(3.2)	21.6	(3.8)
New Brunswick	23.8‡	(5.0)	27.6	(5.2)	22.6	(4.4)	10.0‡	(2.7)	16.0‡	(4.0)
Nova Scotia	4.3‡	(2.6)	12.3‡	(3.8)	23.0‡	(4.9)	26.5‡	(5.0)	33.9	(5.1)
Prince Edward Island	0.0	(0.0)	12.2‡	(10.0)	3.1‡	(2.3)	22.9‡	(11.4)	61.8‡	(13.3)
Newfoundland and Labrador	7.8‡	(3.5)	11.4‡	(4.4)	28.1‡	(6.5)	37.8	(7.2)	14.9‡	(4.3)
Canada	8.8	(1.1)	15.0	(1.5)	23.1	(1.9)	23.1	(2.1)	30.0	(2.1)

‡ There are fewer than 30 observations.

TABLE A.3.9.2 Percentage of teachers by types of professional development and their perceived impact on student learning, Canada

	Yes		No		Impact on student learning							
					None		A little		Some		A lot	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Academic courses (e.g., university)	28.7	(2.1)	71.3	(2.1)	2.4‡	(1.0)	18.0	(3.7)	47.9	(4.3)	31.7	(3.8)
Workshops or conferences	92.1	(1.2)	7.9	(1.2)	2.0‡	(0.6)	14.1	(1.6)	57.1	(2.5)	26.8	(2.4)
Professional learning communities	75.4	(2.0)	24.6	(2.0)	2.3‡	(0.8)	20.1	(2.1)	47.1	(2.8)	30.6	(2.7)
Development of common assessment items	68.6	(2.1)	31.4	(2.1)	2.2‡	(0.9)	19.4	(2.4)	52.6	(3.0)	25.7	(2.3)
Online training (e.g., webinars, videos)	36.6	(2.3)	63.4	(2.3)	6.2‡	(1.9)	33.1	(3.7)	48.9	(3.9)	11.8	(2.4)
Integration of technology into teaching	78.5	(1.8)	21.5	(1.8)	2.6‡	(0.8)	19.7	(1.9)	47.8	(2.8)	29.9	(2.7)
Formative assessment (assessment for learning, assessment as learning)	73.1	(2.2)	26.9	(2.2)	1.2‡	(0.5)	17.6	(2.1)	46.5	(2.7)	34.8	(2.5)
Differentiated instruction/resources to adapt to students' interests and needs	77.5	(1.8)	22.5	(1.8)	1.4‡	(0.6)	21.2	(2.1)	44.4	(2.8)	33.0	(2.6)
Implementation of new resources	65.2	(2.1)	34.8	(2.1)	1.4‡	(0.7)	19.6	(2.3)	51.2	(3.1)	27.8	(3.0)
Teaching strategies	81.2	(1.6)	18.8	(1.6)	0.8‡	(0.5)	13.8	(1.7)	55.8	(2.6)	29.6	(2.3)
Mathematics content knowledge	55.9	(2.3)	44.1	(2.3)	1.1‡	(0.7)	18.3	(2.5)	48.7	(3.5)	32.0	(3.4)
Responding to assessment data (school, provincial, national, international)	58.7	(2.2)	41.3	(2.2)	11.5	(2.2)	35.3	(3.3)	41.0	(3.2)	12.2	(1.9)
Receiving support in mathematics teaching (e.g., lead teachers, coaches, mentors, numeracy specialists)	61.5	(2.2)	38.5	(2.2)	4.5‡	(1.6)	20.5	(2.5)	50.1	(3.3)	24.9	(2.6)
Receiving instructional feedback from an administrator	53.1	(2.4)	46.9	(2.4)	7.0	(1.7)	30.2	(3.2)	45.7	(3.6)	17.2	(2.5)
Mental health literacy/well-being	58.3	(2.3)	41.7	(2.3)	3.2	(0.9)	29.0	(2.8)	48.5	(3.2)	19.3	(2.6)
Social-emotional learning/self-regulation	47.0	(2.4)	53.0	(2.4)	3.4‡	(1.1)	29.2	(3.2)	48.7	(3.6)	18.8	(2.9)

‡ There are fewer than 30 observations.

TABLE A.3.9.3 Percentage of teachers by types of collaboration with other mathematics teachers, Canada

	Never or almost never		Several times per year		2 or 3 times per month		1 to 3 times per week		Daily or almost daily	
	%	SE	%	SE	%	SE	%	SE	%	SE
Discussion of how to teach a particular topic	11.9	(1.5)	27.8	(2.1)	24.0	(1.9)	23.4	(1.9)	12.9	(1.9)
Collaboration on planning and preparing instructional materials	21.1	(1.8)	29.2	(2.1)	23.8	(2.0)	18.0	(2.0)	7.9	(1.1)
Sharing what I have learned about my teaching experiences	13.7	(1.5)	35.2	(2.2)	25.0	(2.0)	18.2	(2.0)	7.9	(1.1)
Visiting another classroom to learn more about teaching	72.6	(2.2)	17.7	(2.0)	4.7	(0.9)	3.8	(0.9)	1.1‡	(0.3)
Analyzing assessment data and using it to inform instruction	26.5	(2.0)	43.6	(2.3)	17.2	(2.0)	9.3	(1.3)	3.5	(0.8)
Working together on scoring student work	59.4	(2.3)	28.4	(2.3)	8.2	(1.2)	3.0	(0.7)	0.9‡	(0.3)
Developing common assessments	34.2	(2.2)	40.1	(2.3)	16.5	(1.6)	6.0	(1.1)	3.3	(0.8)

‡ There are fewer than 30 observations.

TABLE A.3.10 Percentage of teachers by confidence in their ability to do mathematics and to help students understand mathematics, Canada

	Not at all confident		Somewhat confident		Very confident	
	%	SE	%	SE	%	SE
Confident in their ability to do mathematics						
Paper-pencil calculations	0.2‡	(0.2)	7.9	(1.4)	91.8	(1.5)
Mental math	1.7‡	(0.6)	24.7	(2.0)	73.6	(2.1)
Estimation	0.3‡	(0.2)	16.5	(1.8)	83.2	(1.8)
Solve complex problems	1.6‡	(0.8)	30.1	(2.1)	68.3	(2.2)
Use technology	4.9	(0.9)	41.0	(2.3)	54.1	(2.3)
Coding/programming	54.8	(2.3)	36.4	(2.2)	8.9	(1.2)
Use online platforms for instruction and/or assessment	15.0	(1.6)	51.4	(2.3)	33.6	(2.2)
Encourage students to use technology or online resources	8.4	(1.1)	50.0	(2.3)	41.6	(2.3)
Confidence in their ability to help students develop understanding in mathematics						
Numbers and operations	0.0	(0.0)	7.5	(1.1)	92.5	(1.1)
Geometry and measurement	0.2‡	(0.2)	14.8	(1.7)	85.0	(1.7)
Patterns and relationships (algebra)	0.2‡	(0.2)	12.2	(1.6)	87.6	(1.6)
Data management and probability (statistics)	0.7‡	(0.3)	15.6	(1.5)	83.7	(1.5)

‡ There are fewer than 30 observations.

TABLE A.3.11.1 Percentage of teachers by level of agreement with statements about factors influencing student performance in mathematics, Canada

	Strongly disagree		Disagree		Agree		Strongly agree	
	%	SE	%	SE	%	SE	%	SE
Natural ability	6.1	(1.1)	39.1	(2.3)	49.3	(2.3)	5.6	(1.0)
Work ethic	0.5‡	(0.3)	1.4‡	(0.5)	46.2	(2.3)	51.9	(2.3)
Teaching	0.0‡	(0.0)	3.2	(0.7)	74.2	(2.0)	22.6	(1.9)
Parents/guardians	1.4‡	(0.5)	15.2	(1.6)	64.5	(2.2)	18.8	(1.8)
Peer influence	0.8‡	(0.4)	17.5	(1.7)	66.3	(2.2)	15.5	(1.7)
Prior knowledge	0.0‡	(0.0)	2.7	(0.8)	70.7	(2.1)	26.6	(2.0)
Availability of help outside the classroom	3.4	(0.8)	25.8	(2.0)	61.9	(2.2)	9.0	(1.3)
Learning from the errors they make	0.8‡	(0.4)	3.2	(0.8)	60.0	(2.2)	36.0	(2.2)
My high expectations for all students	0.7‡	(0.3)	10.6	(1.3)	57.6	(2.3)	31.1	(2.2)

‡ There are fewer than 30 observations.

TABLE A.3.11.2 Percentage of teachers by level of agreement with statements about attitudes related to teaching and learning mathematics, Canada

	Strongly disagree		Disagree		Agree		Strongly agree	
	%	SE	%	SE	%	SE	%	SE
It is possible for all students to succeed in mathematics	0.8‡	(0.3)	6.6	(1.1)	40.5	(2.2)	52.1	(2.3)
Success in mathematics requires hard work	0.0‡	(0.0)	4.9	(0.9)	49.2	(2.3)	45.9	(2.4)
Success in mathematics requires natural ability	14.1	(1.5)	65.0	(2.2)	18.7	(1.8)	2.2‡	(0.7)
Practice is important for student learning in mathematics	0.1‡	(0.1)	0.3‡	(0.2)	28.6	(2.1)	71.0	(2.1)
Because calculators are easily available, there is less need to emphasize basic computational skills in teaching mathematics	38.2	(2.2)	49.7	(2.3)	10.2	(1.3)	1.8‡	(0.5)
There is not enough emphasis on basic computational skills in the early grades	3.0	(0.8)	23.1	(1.9)	41.3	(2.3)	32.5	(2.3)
Student success in mathematics requires good teaching	0.0‡	(0.0)	2.3	(0.5)	55.6	(2.3)	42.0	(2.3)
By the time students reach Grade 8/Secondary II, the emphasis in mathematics teaching should be more on problem solving	1.0‡	(0.5)	27.5	(2.1)	55.6	(2.3)	16.0	(1.7)
Students should not be allowed to use calculators until they have mastered basic computational skills	8.9	(1.4)	43.9	(2.3)	35.6	(2.3)	11.5	(1.4)
Students should be given the opportunity to engage in computational thinking (e.g., programming, coding, robotics) in the mathematics classroom	2.0‡	(0.5)	17.1	(1.6)	58.1	(2.3)	22.8	(2.0)

‡ There are fewer than 30 observations.

TABLE A.3.12.1 Percentage of teachers by resources used in mathematics instruction, Canada

	Never		Rarely		Sometimes		Often	
	%	SE	%	SE	%	SE	%	SE
Mathematics curriculum documents	5.1	(0.9)	10.5	(1.2)	28.2	(2.1)	56.2	(2.3)
Textbooks	11.2	(1.4)	17.4	(1.7)	33.8	(2.4)	37.6	(2.2)
Teachers' guides	13.9	(1.5)	28.5	(2.1)	36.2	(2.3)	21.3	(1.8)
Worksheets	1.8‡	(0.8)	13.6	(1.7)	45.8	(2.4)	38.8	(2.2)
Other print resources	3.5	(0.8)	12.7	(1.5)	48.9	(2.4)	34.9	(2.2)
Calculators	0.7‡	(0.3)	6.0	(1.0)	33.9	(2.2)	59.4	(2.3)
Computer software	18.3	(1.5)	32.9	(2.1)	36.0	(2.3)	12.8	(1.8)
Web-based resources (other than worksheets)	12.4	(1.3)	27.2	(2.0)	43.1	(2.3)	17.2	(2.2)
Measuring devices (e.g., protractors, balances)	3.5	(0.7)	21.5	(1.6)	59.4	(2.3)	15.5	(2.1)
Interactive white boards	26.7	(2.1)	12.9	(1.6)	21.4	(1.9)	39.1	(2.3)
Packaged instructional programs (e.g., Fountas and Pinnell, Leaps and Bounds, Jump Math)	51.7	(2.4)	24.8	(2.2)	17.0	(1.9)	6.6	(1.3)
Activities you have designed	2.1	(0.5)	7.2	(0.9)	45.5	(2.3)	45.2	(2.4)
Online platforms (e.g., Google Classroom)	26.0	(1.8)	20.3	(2.1)	26.7	(2.1)	27.0	(2.1)

‡ There are fewer than 30 observations.

TABLE A.3.12.2 Percentage of teachers by use of variety of opportunities for students to show understanding in mathematics, Canada

	Never or almost never		2 or 3 times per month		1 to 3 times per week		Daily or almost daily	
	%	SE	%	SE	%	SE	%	SE
Give oral explanations	1.9‡	(0.5)	8.3	(1.2)	27.7	(2.0)	62.1	(2.2)
Give written explanations	1.6	(0.5)	9.9	(1.2)	33.8	(2.3)	54.7	(2.3)
Use mathematical language	0.3‡	(0.2)	1.6	(0.4)	16.5	(1.6)	81.6	(1.6)
Justify their reasoning	0.3‡	(0.1)	5.9	(0.9)	28.6	(2.0)	65.2	(2.2)
Make generalizations and conjectures	8.0	(1.2)	23.2	(1.9)	37.0	(2.3)	31.7	(2.2)
Make connections among multiple representations (e.g., concrete, pictorial, symbolic, abstract, text)	3.2	(0.7)	20.0	(1.9)	41.4	(2.3)	35.5	(2.3)
Integrate technology in their learning	20.5	(1.7)	36.0	(2.2)	29.0	(2.2)	14.5	(1.8)
Analyze sources of errors and identify ways to overcome them	5.6	(1.1)	18.4	(1.6)	43.8	(2.3)	32.2	(2.2)

‡ There are fewer than 30 observations.

TABLE A.3.12.3 Percentage of teachers by amount of time in mathematics class spent on mathematics subdomains, Canada

	Less than average time				More than average time			
	%	SE	Mean	SE	%	SE	Mean	SE
Numbers and operations	53.8	(2.3)	515	(3.7)	46.2	(2.3)	496*	(3.2)
Geometry and measurement	51.6	(2.3)	502	(3.5)	48.4	(2.3)	510	(3.6)
Patterns and relationships (algebra)	53.2	(2.3)	501	(3.3)	46.8	(2.3)	512*	(3.8)
Data management and probability (statistics)	51.4	(2.3)	504	(3.0)	48.6	(2.3)	508	(4.0)

* Significant difference

TABLE A.3.12.4 Percentage of teachers by understanding of vertical articulation, Canada

	Strongly disagree		Disagree		Agree		Strongly agree	
	%	SE	%	SE	%	SE	%	SE
I have a deep understanding of the mathematics concepts taught in earlier grades and how they connect to the Grade 8/Secondary II mathematics curriculum.	1.3‡	(0.4)	7.1	(1.0)	48.4	(2.3)	43.1	(2.3)
I have a deep understanding of the mathematics concepts taught in later grades and how they connect to the Grade 8/Secondary II mathematics curriculum.	2.2	(0.6)	20.2	(2.1)	45.6	(2.3)	32.0	(2.1)

‡ There are fewer than 30 observations.

TABLE A.3.13.1 Percentage of teachers by time they expect students to spend on mathematics homework each week

	I do not assign mathematics homework		Less than 30 minutes		Between 30 minutes and 1 hour		Between 1 and 2 hours		More than 2 hours	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	13.9‡	(3.2)	10.5‡	(2.7)	30.5	(4.3)	30.8	(4.3)	14.4‡	(3.3)
Alberta	14.7‡	(3.8)	26.0‡	(4.8)	25.3	(4.2)	28.0	(4.3)	6.0‡	(2.3)
Saskatchewan	24.7	(3.9)	29.6	(4.2)	30.3	(4.4)	14.0‡	(3.2)	1.6‡	(1.0)
Manitoba	23.6	(3.9)	22.1	(3.6)	30.0	(4.1)	19.7	(3.5)	4.7‡	(1.9)
Ontario	7.8‡	(2.2)	19.5	(4.2)	25.0	(3.8)	31.3	(4.1)	16.4	(3.3)
Quebec	5.6‡	(2.0)	8.6‡	(2.8)	34.2	(4.5)	37.2	(4.5)	14.3	(3.0)
New Brunswick	34.7	(5.2)	18.6	(4.0)	31.2	(5.2)	14.4‡	(4.6)	1.2‡	(0.8)
Nova Scotia	11.3‡	(3.4)	20.0‡	(4.8)	27.6	(5.0)	29.5	(5.1)	11.6‡	(3.5)
Prince Edward Island	3.1‡	(2.3)	35.1‡	(13.0)	32.1‡	(13.5)	29.8‡	(12.3)	0.0	(0.0)
Newfoundland and Labrador	14.6‡	(5.5)	5.9‡	(2.1)	10.5‡	(3.8)	44.4	(7.1)	24.6‡	(6.4)
Canada	11.1	(1.2)	17.9	(2.1)	27.7	(2.0)	30.4	(2.1)	12.9	(1.6)

‡ There are fewer than 30 observations.

TABLE A.3.13.2 Achievement in mathematics by time teachers expect students to spend on mathematics homework each week, Canada

	Mean score	SE
I do not assign mathematics homework	477	(7.2)
Less than 30 minutes	491	(7.5)
Between 30 minutes and 1 hour	510*	(3.6)
Between 1 and 2 hours	518*	(4.3)
More than 2 hours	514*	(5.1)

* Significant difference compared to the *less than 30 minutes* category

TABLE A.3.13.3 Percentage of teachers by types of homework assigned, Canada

	Never or almost never		2 or 3 times per month		1 to 3 times per week		Daily or almost daily	
	%	SE	%	SE	%	SE	%	SE
Paper-pencil calculations	10.5	(1.5)	22.4	(2.3)	42.1	(2.5)	25.1	(2.1)
Word problems	4.2	(1.5)	29.8	(2.3)	45.0	(2.5)	21.0	(2.0)
Projects	55.1	(2.6)	40.6	(2.5)	4.0‡	(1.2)	0.3‡	(0.3)
Creating problems	58.1	(2.5)	35.2	(2.4)	6.4	(1.4)	0.3‡	(0.1)
Studying for assessments	8.2	(1.2)	70.9	(2.1)	17.0	(1.8)	3.9	(0.7)
Activities using concrete or virtual manipulatives (e.g., base-ten blocks, colour tiles, geometric solids)	49.6	(2.5)	31.7	(2.3)	14.3	(1.8)	4.4	(1.1)
New concepts not taught in class	75.8	(2.1)	16.3	(1.7)	6.6	(1.3)	1.3‡	(0.5)
Collaborative problem-solving activities	46.5	(2.5)	31.7	(2.3)	17.5	(2.0)	4.4	(1.0)
Participation in online discussion forums or blogs	89.3	(1.6)	8.5	(1.5)	1.9‡	(0.7)	0.3‡	(0.2)
Viewing videos online (e.g., YouTube, Vimeo) to review concepts	54.0	(2.5)	32.8	(2.4)	11.0	(2.0)	2.2‡	(0.6)

‡ There are fewer than 30 observations.

TABLE A.3.13.4 Percentage of teachers by frequency of monitoring student homework, Canada

	Never		Rarely		Sometimes		Often	
	%	SE	%	SE	%	SE	%	SE
Monitor whether or not the homework has been completed	2.3‡	(0.8)	6.3	(1.0)	29.0	(2.2)	62.5	(2.4)
Collect and correct the homework	14.3	(1.7)	25.3	(2.3)	32.9	(2.3)	27.4	(2.2)
Have a class discussion on the homework	0.5‡	(0.2)	2.4	(0.4)	23.4	(2.2)	73.7	(2.2)
Provide individual student feedback on the homework	3.3	(0.8)	18.9	(1.9)	47.3	(2.5)	30.4	(2.3)
Have students correct their homework in class	5.1	(1.0)	9.2	(1.3)	31.7	(2.4)	54.0	(2.5)
Use homework to contribute to students' marks or grades	50.3	(2.5)	22.3	(2.0)	17.5	(1.8)	10.0	(1.4)

‡ There are fewer than 30 observations.

TABLE A.3.14.1 Percentage of teachers by types of questions used on mathematics assessment, Canada

	Never		Rarely		Sometimes		Often	
	%	SE	%	SE	%	SE	%	SE
Selected-response items (e.g., true/false, multiple choice)	9.5	(1.3)	27.9	(2.1)	35.7	(2.3)	26.8	(2.1)
Short-response items (e.g., one or two words, one-step problems, short sentences)	0.0‡	(0.0)	5.6	(1.1)	40.2	(2.3)	54.1	(2.3)
Extended-response items requiring multi-step solutions	0.2‡	(0.1)	2.2‡	(0.7)	26.6	(2.0)	71.0	(2.0)
Extended-response items requiring an explanation or justification	1.1‡	(0.5)	6.7	(0.9)	37.8	(2.2)	54.4	(2.3)
Extended-response items requiring students to generate problems	22.0	(1.8)	31.3	(2.1)	35.8	(2.3)	10.9	(1.5)

‡ There are fewer than 30 observations.

TABLE A.3.14.2 Achievement in mathematics by frequency of teachers' use of extended-response items requiring multi-step solutions, Canada

	Mean score	SE
Never or rarely	444	(32.0)
Sometimes	493	(4.9)
Often	513*	(2.6)

* Significant difference compared to the *sometimes* category

TABLE A.3.14.3 Percentage of teachers by mathematics assessment used to measure different levels of thinking, Canada

	Never		Rarely		Sometimes		Often	
	%	SE	%	SE	%	SE	%	SE
Knowledge of facts and concepts (e.g., recall, identify, label)	0.5‡	(0.2)	7.8	(1.2)	33.0	(2.1)	58.8	(2.2)
Ability to apply knowledge and understanding (e.g., solve a problem, apply information to a new context)	0.0	(0.0)	0.9‡	(0.6)	16.0	(1.6)	83.1	(1.7)
Ability to explain, justify, evaluate, and generalize	0.8‡	(0.4)	6.7	(1.0)	32.1	(2.0)	60.4	(2.2)

‡ There are fewer than 30 observations.

TABLE A.3.15.1 Percentage of teachers by challenges to mathematics teaching, Canada

	Not at all		A little		More than a little		A lot	
	%	SE	%	SE	%	SE	%	SE
The range of student abilities in the class	3.1	(0.7)	23.0	(1.9)	33.2	(2.3)	40.7	(2.3)
Students coming from a wide variety of backgrounds (e.g., socioeconomic, linguistic, cultural, etc.)	26.4	(2.2)	28.8	(2.0)	23.0	(1.9)	21.9	(1.9)
Disruptive students	15.0	(1.6)	36.9	(2.2)	24.2	(2.2)	23.8	(1.9)
Time of day for instruction	36.6	(2.3)	36.5	(2.3)	15.8	(1.5)	11.1	(1.4)
Pressure from parents/guardians	55.6	(2.3)	32.1	(2.2)	9.1	(1.2)	3.2	(0.7)
Curriculum inappropriate for the grade level	66.7	(2.1)	23.0	(1.9)	7.9	(1.2)	2.4	(0.6)
Shortage of computer hardware or software	51.9	(2.3)	27.4	(2.2)	11.6	(1.5)	9.1	(1.4)
Inadequate physical facilities	72.8	(2.0)	16.7	(1.6)	7.7	(1.3)	2.8	(0.7)
Too much content in the curriculum	34.6	(2.2)	33.4	(2.1)	22.1	(2.0)	9.9	(1.5)
Large class sizes	27.9	(2.0)	24.3	(2.1)	23.7	(2.1)	24.1	(1.9)
Low morale in the school	54.4	(2.3)	27.7	(2.2)	11.7	(1.5)	6.2	(1.0)
Concerns for personal safety or the safety of students	82.0	(1.8)	13.0	(1.5)	3.1	(0.8)	1.8‡	(0.7)
Inadequate resources for lesson planning	55.2	(2.3)	32.7	(2.2)	7.9	(1.3)	4.2	(1.0)
Insufficient time for planning	26.9	(2.0)	36.0	(2.3)	22.9	(2.0)	14.2	(1.5)
Limitations in my background in the subject	76.1	(2.1)	17.8	(2.0)	4.8	(0.9)	1.2	(0.3)
External assessments or standardized tests	58.1	(2.3)	27.4	(2.1)	10.8	(1.5)	3.7	(0.9)
Insufficient professional development	49.3	(2.3)	34.3	(2.3)	12.2	(1.5)	4.2	(1.0)
Inadequate collegial support (e.g., mentoring)	66.2	(2.2)	22.3	(1.8)	7.6	(1.3)	3.9	(0.9)
Inadequate support from school administrators	72.9	(2.0)	18.2	(1.7)	6.9	(1.1)	2.1‡	(0.6)
Shortage of resources for mathematics instruction	43.9	(2.3)	36.4	(2.3)	12.3	(1.5)	7.5	(1.2)

‡ There are fewer than 30 observations.

TABLE A.3.15.2 Relationship between the challenges to teaching index and mathematics achievement, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	530*	(4.4)	512*	(4.1)	495*	(5.5)	486	(4.9)
Language of the school system								
Anglophone	523*	(4.9)	509*	(4.7)	486*	(6.2)	483	(5.4)
Francophone	562*	(8.0)	524*	(7.9)	523	(10.2)	504	(8.6)

* Significant difference between:

¹ Bottom quarter and top quarter

² Second quarter and bottom quarter

³ Third quarter and second quarter

⁴ Top quarter and third quarter

TABLE A.4.1.1 Percentage of schools by size of communities in which they are located

	Rural/small town		Medium town		Small city		Medium city		Large city	
	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces										
British Columbia	17.3‡	(7.4)	10.2‡	(2.7)	26.5	(6.9)	24.4	(5.4)	21.6	(7.0)
Alberta	24.8‡	(7.9)	23.7‡	(6.4)	10.6‡	(3.3)	1.7‡	(0.8)	39.3	(6.4)
Saskatchewan	47.6	(5.1)	8.2‡	(2.0)	6.7‡	(2.1)	37.2	(4.6)	0.4‡	(0.4)
Manitoba	47.6	(5.3)	12.6‡	(3.2)	3.7‡	(1.4)	0.7‡	(0.7)	35.5	(4.7)
Ontario	13.9	(4.2)	26.5	(5.6)	12.3	(2.9)	27.4	(4.4)	19.9	(3.4)
Quebec	17.8‡	(5.9)	25.3	(4.5)	22.5	(4.1)	13.9‡	(3.1)	20.5	(5.1)
New Brunswick	53.9	(4.3)	21.7‡	(3.6)	20.6‡	(3.5)	3.7‡	(1.6)	0.0	(0.0)
Nova Scotia	45.1	(4.7)	32.7	(4.4)	6.2‡	(2.3)	15.1‡	(3.4)	0.9‡	(0.9)
Prince Edward Island	73.5‡	(9.3)	18.4‡	(8.3)	8.2‡	(5.5)	0.0	(0.0)	0.0	(0.0)
Newfoundland and Labrador	74.8	(4.5)	13.7‡	(3.5)	2.1‡	(1.5)	9.4‡	(3.0)	0.0	(0.0)
Canada	23.2	(2.6)	22.5	(3.2)	12.9	(1.7)	21.1	(2.4)	20.2	(2.1)

‡ There are fewer than 30 observations.

Note: Population of communities:

Rural/small town: fewer than 5,000

Medium town: 5,000–24,999

Small city: 25,000–99,999

Medium city: 100,000–499,999

Large city: over 500,000

TABLE A.4.1.2 Percentage of schools by size of communities in which they are located and language of school system

Anglophone school systems										
	Rural/small town		Medium town		Small city		Medium city		Large city	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	17.9‡	(7.6)	10.2‡	(2.8)	25.4	(7.1)	24.6	(5.5)	21.9‡	(7.2)
Alberta	24.9‡	(8.0)	24.0‡	(6.5)	10.6‡	(3.4)	1.2‡	(0.7)	39.3	(6.6)
Saskatchewan	47.8	(5.2)	8.3‡	(2.0)	6.3‡	(2.1)	37.3	(4.7)	0.4‡	(0.4)
Manitoba	46.5	(5.5)	12.9‡	(3.3)	3.5‡	(1.5)	0.8‡	(0.8)	36.3	(4.9)
Ontario	13.0‡	(4.4)	27.0‡	(6.0)	11.9‡	(3.1)	28.1	(4.7)	20.0	(3.6)
Quebec	17.0‡	(5.2)	24.5‡	(5.9)	17.0‡	(5.2)	17.0‡	(5.2)	24.6‡	(5.9)
New Brunswick	50.6	(5.7)	18.2‡	(4.4)	26.0‡	(5.0)	5.2‡	(2.5)	0.0	(0.0)
Nova Scotia	45.6	(4.9)	33.0	(4.6)	5.8‡	(2.3)	14.6‡	(3.5)	1.0‡	(1.0)
Prince Edward Island	81.0‡	(8.6)	9.5‡	(6.4)	9.5‡	(6.4)	0.0	(0.0)	0.0	(0.0)
Newfoundland and Labrador	75.5	(4.4)	13.8‡	(3.6)	2.1‡	(1.5)	8.5‡	(2.9)	0.0	(0.0)
Canada	22.9	(2.9)	22.5	(3.6)	11.7	(1.9)	22.3	(2.7)	20.6	(2.3)
Francophone school systems										
	Rural/small town		Medium town		Small city		Medium city		Large city	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	0.0	(0.0)	9.1‡	(8.7)	63.6‡	(14.5)	18.2‡	(11.6)	9.1‡	(8.7)
Alberta	20.0‡	(12.7)	10.0‡	(9.5)	10.0‡	(9.5)	20.0‡	(12.7)	40.0‡	(15.5)
Saskatchewan	33.3‡	(19.3)	0.0	(0.0)	33.3‡	(19.3)	33.3‡	(19.3)	0.0	(0.0)
Manitoba	66.7‡	(12.2)	6.7‡	(6.4)	6.7‡	(6.4)	0.0	(0.0)	20.0‡	(10.3)
Ontario	30.0	(4.6)	19.0‡	(3.9)	19.0‡	(3.9)	14.0‡	(3.5)	18.0‡	(3.8)
Quebec	18.0‡	(7.0)	25.5‡	(5.2)	23.6	(4.9)	13.3‡	(3.6)	19.6‡	(6.0)
New Brunswick	58.4	(6.6)	26.5‡	(5.9)	13.3‡	(4.7)	1.8‡	(1.8)	0.0	(0.0)
Nova Scotia	40.0‡	(15.5)	30.0‡	(14.5)	10.0‡	(9.5)	20.0‡	(12.7)	0.0	(0.0)
Prince Edward Island	--	--	--	--	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--
Canada	25.6	(4.2)	23.0	(3.2)	21.3	(3.0)	12.8	(2.3)	17.3	(3.7)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

Note: Population of communities:

Rural/small town: fewer than 5,000

Medium town: 5,000–24,999

Small city: 25,000–99,999

Medium city: 100,000–499,999

Large city: over 500,000

TABLE A.4.1.3 Achievement in mathematics by size of communities in which schools are located, Canada

	Mean score	SE
Rural/small town	481	(6.8)
Medium town	497	(5.9)
Small city	507*	(6.5)
Medium city	510*	(6.6)
Large city	516*	(5.2)

* Significant difference compared to the *rural/small town* category

Note: Population of communities:

Rural/small town: fewer than 5,000

Medium town: 5,000–24,999

Small city: 25,000–99,999

Medium city: 100,000–499,999

Large city: over 500,000

TABLE A.4.2.1 Percentage of public and private schools

	Public		Private	
	%	SE	%	SE
Canada and provinces				
British Columbia	71.1	(8.7)	28.9‡	(8.7)
Alberta	88.5	(5.9)	11.5‡	(5.9)
Saskatchewan	97.6	(1.8)	2.4‡	(1.8)
Manitoba	87.2	(3.8)	12.8‡	(3.8)
Ontario	94.2	(3.5)	5.8‡	(3.5)
Quebec	70.7	(5.5)	29.3	(5.5)
New Brunswick	100.0	(0.0)	0.0	(0.0)
Nova Scotia	100.0	(0.0)	0.0	(0.0)
Prince Edward Island	100.0‡	(0.0)	0.0	(0.0)
Newfoundland and Labrador	96.8	(1.8)	3.2‡	(1.8)
Canada	90.2	(2.2)	9.8	(2.2)

‡ There are fewer than 30 observations.

TABLE A.4.2.2 Percentage of public and private schools by language of school system

	Anglophone school systems				Francophone school systems			
	Public		Private		Public		Private	
	%	SE	%	SE	%	SE	%	SE
Canada and provinces								
British Columbia	70.2	(8.9)	29.8‡	(8.9)	100.0‡	(0.0)	0.0	(0.0)
Alberta	88.2	(6.1)	11.8‡	(6.1)	100.0‡	(0.0)	0.0	(0.0)
Saskatchewan	97.5	(1.8)	2.5‡	(1.8)	100.0‡	(0.0)	0.0	(0.0)
Manitoba	86.5	(4.0)	13.5‡	(4.0)	100.0‡	(0.0)	0.0	(0.0)
Ontario	93.9	(3.7)	6.1‡	(3.7)	100.0	(0.0)	0.0	(0.0)
Quebec	71.5	(6.2)	28.5‡	(6.2)	70.5	(6.5)	29.5‡	(6.5)
New Brunswick	100.0	(0.0)	0.0	(0.0)	100.0	(0.0)	0.0	(0.0)
Nova Scotia	100.0	(0.0)	0.0	(0.0)	100.0‡	(0.0)	0.0	(0.0)
Prince Edward Island	100.0‡	(0.0)	0.0	(0.0)	--	--	--	--
Newfoundland and Labrador	96.8	(1.8)	3.2‡	(1.8)	--	--	--	--
Canada	91.2	(2.4)	8.8	(2.4)	82.7	(4.1)	17.3‡	(4.1)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.4.2.3 Achievement in mathematics by school governance, Canada

	Mean score	SE
Public	497	(2.9)
Private	540*	(9.7)

* Significant difference compared to the *public* category

TABLE A.4.3.1 Percentage of schools by total enrolment

	100 or fewer		101–500		501–1,000		More than 1,000	
	%	SE	%	SE	%	SE	%	SE
Canada and provinces								
British Columbia	2.3‡	(1.6)	52.8	(7.4)	28.2	(5.2)	16.7	(3.3)
Alberta	15.2‡	(7.7)	49.0	(7.2)	34.4	(6.0)	1.4‡	(0.7)
Saskatchewan	9.5‡	(3.5)	83.0	(3.8)	7.3‡	(1.7)	0.2‡	(0.2)
Manitoba	5.0‡	(3.2)	80.5	(3.8)	13.7	(2.5)	0.8‡	(0.5)
Ontario	4.4‡	(3.3)	66.8	(4.7)	26.0	(3.9)	2.8‡	(1.0)
Quebec	2.3‡	(1.2)	43.2	(6.1)	27.2	(4.4)	27.4	(4.0)
New Brunswick	8.2‡	(2.4)	72.7	(3.9)	19.1‡	(3.4)	0.0	(0.0)
Nova Scotia	2.6‡	(1.5)	79.1	(3.8)	18.3‡	(3.6)	0.0	(0.0)
Prince Edward Island	18.4‡	(8.3)	61.2‡	(10.1)	20.4‡	(8.2)	0.0	(0.0)
Newfoundland and Labrador	23.1‡	(4.3)	66.4	(4.8)	10.5‡	(3.2)	0.0	(0.0)
Canada	6.2	(2.0)	64.1	(2.8)	24.5	(2.2)	5.2	(0.7)

‡ There are fewer than 30 observations.

TABLE A.4.3.2 Percentage of schools by total enrolment, by language of the school system

Anglophone school systems								
	100 or fewer		101–500		501–1,000		More than 1,000	
	%	SE	%	SE	%	SE	%	SE
Canada and provinces								
British Columbia	1.5‡	(1.5)	52.8	(7.6)	28.5	(5.4)	17.2	(3.5)
Alberta	15.4‡	(7.9)	47.9	(7.3)	35.3	(6.2)	1.4‡	(0.7)
Saskatchewan	9.1‡	(3.6)	83.2	(3.8)	7.4‡	(1.7)	0.3‡	(0.3)
Manitoba	4.9‡	(3.3)	80.6	(4.0)	13.7	(2.6)	0.8‡	(0.6)
Ontario	3.6‡	(3.5)	66.9	(4.9)	26.7	(4.1)	2.8‡	(1.1)
Quebec	7.5‡	(3.6)	52.9‡	(6.9)	24.5‡	(5.9)	15.1‡	(4.9)
New Brunswick	6.5‡	(2.8)	70.1	(5.2)	23.4‡	(4.8)	0.0	(0.0)
Nova Scotia	2.9‡	(1.6)	79.0	(4.0)	18.1‡	(3.8)	0.0	(0.0)
Prince Edward Island	9.5‡	(6.4)	66.7‡	(10.3)	23.8‡	(9.3)	0.0	(0.0)
Newfoundland and Labrador	22.3‡	(4.3)	67.0	(4.9)	10.6‡	(3.2)	0.0	(0.0)
Canada	6.1	(2.3)	65.7	(3.1)	24.9	(2.5)	3.4	(0.7)
Francophone school systems								
	100 or fewer		101–500		501–1,000		More than 1,000	
	%	SE	%	SE	%	SE	%	SE
Canada and provinces								
British Columbia	27.3‡	(13.4)	54.5‡	(15.0)	18.2‡	(11.6)	0.0	(0.0)
Alberta	10.0‡	(9.5)	90.0‡	(9.5)	0.0	(0.0)	0.0	(0.0)
Saskatchewan	33.3‡	(19.3)	66.7‡	(19.3)	0.0	(0.0)	0.0	(0.0)
Manitoba	6.7‡	(6.4)	80.0‡	(10.3)	13.3‡	(8.8)	0.0	(0.0)
Ontario	17.8‡	(3.8)	65.3	(4.7)	13.9‡	(3.4)	3.0‡	(1.7)
Quebec	1.2‡	(1.2)	41.2‡	(7.4)	27.7	(5.2)	29.8	(4.8)
New Brunswick	10.6‡	(4.1)	76.1	(5.8)	13.3‡	(4.7)	0.0	(0.0)
Nova Scotia	0.0	(0.0)	80.0‡	(12.7)	20.0‡	(12.7)	0.0	(0.0)
Prince Edward Island	--	--	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--	--	--
Canada	7.4	(1.4)	52.8	(4.1)	21.5	(3.1)	18.2	(2.5)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.4.3.3 Achievement in mathematics by total enrolment, Canada

	Mean score	SE
100 or fewer	502	(13.4)
101–500	494	(3.8)
501–1,000	516*	(4.7)
More than 1,000	521*	(5.6)

* Significant difference compared to the 101 to 500 category

TABLE A.4.4.1 Percentage of schools by number of grade levels

	1–4 grades		5–8 grades		9 or more grades	
	%	SE	%	SE	%	SE
Canada and provinces						
British Columbia	23.4	(4.7)	38.9	(6.5)	37.7‡	(9.0)
Alberta	20.8	(4.0)	19.9‡	(4.6)	59.4	(6.4)
Saskatchewan	1.0‡	(0.5)	10.2‡	(2.3)	88.8	(2.4)
Manitoba	14.9	(2.6)	13.1‡	(3.6)	72.0	(4.2)
Ontario	6.1	(1.4)	8.1	(2.2)	85.7	(2.6)
Quebec	11.5‡	(3.3)	71.5	(5.7)	17.0‡	(5.4)
New Brunswick	21.7‡	(3.6)	13.5‡	(3.0)	64.8	(4.1)
Nova Scotia	35.4	(4.5)	20.2‡	(3.8)	44.5	(4.6)
Prince Edward Island	28.6‡	(9.2)	4.1‡	(4.0)	67.3‡	(9.5)
Newfoundland and Labrador	19.0‡	(4.0)	20.0‡	(4.1)	61.1	(5.0)
Canada	10.9	(1.1)	18.2	(1.7)	71.0	(2.1)

‡ There are fewer than 30 observations.

TABLE A.4.4.2 Percentage of schools by number of grade levels and language of school system

	Anglophone school systems					
	1–4 grades		5–8 grades		9 or more grades	
	%	SE	%	SE	%	SE
Canada and provinces						
British Columbia	24.1	(4.9)	39.5	(6.8)	36.3‡	(9.4)
Alberta	21.1	(4.1)	19.3‡	(4.7)	59.6	(6.5)
Saskatchewan	1.0‡	(0.5)	9.8‡	(2.3)	89.1	(2.4)
Manitoba	15.7	(2.7)	13.5‡	(3.8)	70.8	(4.4)
Ontario	6.3‡	(1.4)	6.6‡	(2.3)	87.2	(2.7)
Quebec	3.8‡	(2.6)	58.5	(6.8)	37.8‡	(6.7)
New Brunswick	32.5‡	(5.3)	16.9‡	(4.3)	50.6	(5.7)
Nova Scotia	39.0	(4.8)	18.1‡	(3.8)	42.9	(4.8)
Prince Edward Island	33.3‡	(10.3)	4.8‡	(4.6)	61.9‡	(10.6)
Newfoundland and Labrador	19.1‡	(4.1)	19.1‡	(4.1)	61.7	(5.0)
Canada	11.1	(1.2)	12.9	(1.6)	76.0	(2.1)
	Francophone school systems					
	1–4 grades		5–8 grades		9 or more grades	
	%	SE	%	SE	%	SE
Canada and provinces						
British Columbia	0.0	(0.0)	18.2‡	(11.6)	81.8‡	(11.6)
Alberta	10.0‡	(9.5)	40.0‡	(15.5)	50.0‡	(15.8)
Saskatchewan	0.0	(0.0)	33.3‡	(19.3)	66.7‡	(19.3)
Manitoba	0.0	(0.0)	6.7‡	(6.4)	93.3‡	(6.4)
Ontario	4.0‡	(1.9)	34.7	(4.7)	61.4	(4.8)
Quebec	13.0‡	(3.9)	74.1	(6.7)	12.9‡	(6.5)
New Brunswick	7.1‡	(3.4)	8.8‡	(3.8)	84.1	(4.9)
Nova Scotia	0.0	(0.0)	40.0‡	(15.5)	60.0‡	(15.5)
Prince Edward Island	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--
Canada	9.4‡	(2.4)	54.9	(4.2)	35.7	(4.0)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.4.4.3 Achievement in mathematics by number of grade levels, Canada

	Mean score	SE
1–4 grades	500	(3.9)
5–8 grades	512	(4.8)
9 or more grades	499*	(3.8)

* Significant difference compared to the 5–8 grades category

TABLE A.4.5.1 Percentage of schools by total enrolment of Grade 8/Secondary II students

	25 or fewer		26–50		51–75		76–100		101–200		More than 200	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces												
British Columbia	27.5‡	(9.8)	7.2‡	(3.8)	10.6‡	(4.0)	11.3‡	(3.4)	24.9	(4.7)	18.6	(3.5)
Alberta	30.4‡	(8.5)	16.4‡	(5.0)	18.7‡	(4.5)	14.5‡	(3.4)	15.8	(3.3)	4.2‡	(1.2)
Saskatchewan	55.0	(4.8)	34.1	(4.3)	8.7‡	(1.8)	0.2‡	(0.2)	1.7‡	(0.7)	0.2‡	(0.2)
Manitoba	44.0	(5.5)	21.3	(3.7)	14.0	(2.7)	9.4‡	(2.1)	10.6‡	(2.1)	0.7‡	(0.5)
Ontario	20.8	(5.7)	38.3	(5.3)	23.2	(3.8)	9.0‡	(2.1)	7.0	(1.5)	1.8‡	(0.5)
Quebec	13.8‡	(5.9)	10.2‡	(3.8)	5.5‡	(2.7)	10.6‡	(4.3)	32.8	(4.8)	27.1	(3.9)
New Brunswick	39.7	(4.2)	25.5	(3.8)	11.2‡	(2.7)	10.1‡	(2.7)	12.0‡	(2.8)	1.5‡	(1.1)
Nova Scotia	22.0‡	(3.9)	25.1‡	(4.0)	13.9‡	(3.2)	19.1‡	(3.7)	17.3‡	(3.5)	2.6‡	(1.5)
Prince Edward Island	55.1‡	(10.2)	8.2‡	(5.5)	16.3‡	(7.5)	0.0	(0.0)	20.4‡	(8.2)	0.0	(0.0)
Newfoundland and Labrador	52.6	(5.1)	17.9‡	(3.9)	6.3‡	(2.5)	6.3‡	(2.5)	9.5‡	(3.0)	7.4‡	(2.7)
Canada	26.9	(3.2)	28.8	(3.0)	17.8	(2.1)	9.4	(1.2)	11.7	(1.1)	5.4	(0.6)

‡ There are fewer than 30 observations.

TABLE A.4.5.2 Percentage of schools by enrolment of Grade 8/Secondary II students and language of the school system

Anglophone school systems												
	25 or fewer		26–50		51–75		76–100		101–200		More than 200	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces												
British Columbia	26.1‡	(10.2)	6.9‡	(3.9)	10.6‡	(4.1)	11.6‡	(3.5)	25.6	(4.9)	19.2	(3.7)
Alberta	29.9‡	(8.8)	16.0‡	(5.1)	18.9‡	(4.7)	14.7‡	(3.5)	16.2	(3.4)	4.3‡	(1.3)
Saskatchewan	55.0	(4.8)	33.9	(4.3)	8.8‡	(1.9)	0.3‡	(0.3)	1.8‡	(0.7)	0.3‡	(0.3)
Manitoba	42.7‡	(5.8)	21.0‡	(3.9)	14.8	(2.8)	9.9‡	(2.2)	11.3‡	(2.2)	0.4‡	(0.4)
Ontario	19.0‡	(6.1)	39.2	(5.6)	24.0	(4.1)	9.3‡	(2.2)	6.8‡	(1.5)	1.8‡	(0.5)
Quebec	26.4‡	(6.1)	20.8‡	(5.6)	11.3‡	(4.4)	9.4‡	(4.0)	20.7‡	(5.6)	11.3‡	(4.3)
New Brunswick	31.2‡	(5.3)	24.7‡	(4.9)	13.0‡	(3.8)	11.7‡	(3.7)	18.2‡	(4.4)	1.3‡	(1.3)
Nova Scotia	18.1‡	(3.8)	26.7‡	(4.3)	14.3‡	(3.4)	19.0‡	(3.8)	19.0‡	(3.8)	2.9‡	(1.6)
Prince Edward Island	47.6‡	(10.9)	9.5‡	(6.4)	19.0‡	(8.6)	0.0	(0.0)	23.8‡	(9.3)	0.0	(0.0)
Newfoundland and Labrador	52.1	(5.2)	18.1‡	(4.0)	6.4‡	(2.5)	6.4‡	(2.5)	9.6‡	(3.0)	7.4‡	(2.7)
Canada	26.6	(3.7)	30.8	(3.4)	19.5	(2.4)	9.5	(1.4)	10.1	(1.1)	3.5	(0.5)
Francophone school systems												
	25 or fewer		26–50		51–75		76–100		101–200		More than 200	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces												
British Columbia	72.7‡	(13.4)	18.2‡	(11.6)	9.1‡	(8.7)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Alberta	50.0‡	(15.8)	30.0‡	(14.5)	10.0‡	(9.5)	10.0‡	(9.5)	0.0	(0.0)	0.0	(0.0)
Saskatchewan	50.0‡	(20.4)	50.0‡	(20.4)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Manitoba	66.7‡	(12.2)	26.7‡	(11.4)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	6.7‡	(6.4)
Ontario	51.5	(5.0)	22.8‡	(4.2)	8.9‡	(2.8)	4.0‡	(1.9)	10.9‡	(3.1)	2.0‡	(1.4)
Quebec	11.2‡	(7.2)	8.1‡	(4.5)	4.4‡	(3.1)	10.8‡	(5.1)	35.2	(5.8)	30.2	(4.8)
New Brunswick	51.3‡	(6.7)	26.5‡	(5.9)	8.8‡	(3.8)	8.0‡	(3.9)	3.5‡	(2.5)	1.8‡	(1.8)
Nova Scotia	60.0‡	(15.5)	10.0‡	(9.5)	10.0‡	(9.5)	20.0‡	(12.7)	0.0	(0.0)	0.0	(0.0)
Prince Edward Island	--	--	--	--	--	--	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--	--	--
Canada	28.9	(4.1)	14.6	(2.9)	5.9‡	(2.0)	8.5‡	(3.1)	23.5	(3.3)	18.5	(2.5)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.4.5.3 Achievement in mathematics by total enrolment of Grade 8/Secondary II students, Canada

	Mean score	SE
25 or fewer	488	(7.7)
26–50	492	(4.6)
51–75	522*	(5.6)
76–100	505	(5.5)
101–200	511*	(4.7)
More than 200	518*	(4.3)

* Significant difference compared to the 25 or fewer category

TABLE A.4.6.1 Percentage of schools by proportion of second-language learners in schools

	0%		1–5%		6–10%		11–25%		26–50%		More than 50%	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	8.5‡	(3.8)	56.1	(7.3)	17.9‡	(4.4)	11.7‡	(2.9)	1.5‡	(0.8)	4.3‡	(2.8)
Alberta	14.9‡	(6.4)	26.0‡	(6.7)	24.5‡	(6.6)	16.7‡	(4.8)	9.3‡	(2.7)	8.6‡	(3.7)
Saskatchewan	20.3‡	(4.5)	42.2	(5.1)	9.1‡	(2.5)	16.5‡	(3.3)	7.2‡	(2.4)	4.7‡	(1.6)
Manitoba	16.3‡	(4.4)	39.8	(5.3)	9.8‡	(2.3)	11.2‡	(2.5)	12.2‡	(3.0)	10.7‡	(3.7)
Ontario	16.1	(4.3)	44.7	(5.3)	12.0‡	(3.1)	12.8	(2.8)	5.4‡	(2.0)	9.0	(3.7)
Quebec	52.1	(5.7)	20.8	(3.6)	3.7‡	(1.6)	9.2‡	(4.6)	3.6‡	(1.1)	10.7‡	(2.9)
New Brunswick	39.2	(4.3)	31.2	(4.0)	6.8‡	(2.2)	5.3‡	(2.0)	3.8‡	(1.7)	13.7‡	(3.0)
Nova Scotia	30.4	(4.3)	39.2	(4.6)	7.1‡	(2.4)	0.0	(0.0)	1.8‡	(1.2)	21.5‡	(3.9)
Prince Edward Island	22.4‡	(8.9)	53.1‡	(10.3)	8.2‡	(5.5)	4.1‡	(4.0)	0.0	(0.0)	12.2‡	(6.6)
Newfoundland and Labrador	54.2	(5.1)	14.9‡	(3.7)	1.1‡	(1.1)	2.1‡	(1.5)	0.0	(0.0)	27.7‡	(4.6)
Canada	20.7	(2.5)	39.7	(3.0)	12.3	(1.8)	12.4	(1.7)	5.7	(1.1)	9.3	(2.0)

‡ There are fewer than 30 observations.

TABLE A.4.6.2 Percentage of schools by proportion of second-language learners and language of the school system

Anglophone school systems												
	0%		1–5%		6–10%		11–25%		26–50%		More than 50%	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces												
British Columbia	7.9‡	(3.9)	57.6	(7.4)	18.1‡	(4.6)	11.2‡	(2.9)	1.2‡	(0.7)	3.9‡	(2.8)
Alberta	13.9‡	(6.6)	26.4‡	(6.9)	24.6‡	(6.8)	17.2‡	(4.9)	9.5‡	(2.7)	8.3‡	(3.8)
Saskatchewan	20.0‡	(4.5)	42.0	(5.1)	9.2‡	(2.6)	16.7‡	(3.3)	7.3‡	(2.4)	4.8‡	(1.6)
Manitoba	15.6‡	(4.6)	40.4	(5.5)	9.2‡	(2.3)	10.7‡	(2.5)	12.8‡	(3.1)	11.3‡	(3.9)
Ontario	15.2‡	(4.6)	46.2	(5.6)	12.2‡	(3.2)	12.9‡	(3.0)	5.0‡	(2.2)	8.4‡	(3.9)
Quebec	20.7‡	(5.6)	22.6‡	(5.7)	5.7‡	(3.2)	13.2‡	(4.7)	15.1‡	(4.9)	22.6‡	(5.7)
New Brunswick	28.0‡	(5.2)	40.0	(5.7)	9.3‡	(3.4)	5.3‡	(2.6)	5.3‡	(2.6)	12.0‡	(3.8)
Nova Scotia	30.1	(4.5)	39.8	(4.8)	7.8‡	(2.6)	0.0	(0.0)	1.9‡	(1.4)	20.4‡	(4.0)
Prince Edward Island	19.0‡	(8.6)	57.1‡	(10.8)	4.8‡	(4.6)	4.8‡	(4.6)	0.0	(0.0)	14.3‡	(7.6)
Newfoundland and Labrador	53.8	(5.2)	15.1‡	(3.7)	1.1‡	(1.1)	2.2‡	(1.5)	0.0	(0.0)	28.0‡	(4.7)
Canada	16.5	(2.8)	42.5	(3.4)	13.3	(2.1)	12.9	(1.8)	6.0	(1.3)	8.9	(2.3)
Francophone school systems												
	0%		1–5%		6–10%		11–25%		26–50%		More than 50%	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Canada and provinces												
British Columbia	27.3‡	(13.4)	9.1‡	(8.7)	9.1‡	(8.7)	27.3‡	(13.4)	9.1‡	(8.7)	18.2‡	(11.6)
Alberta	50.0‡	(15.8)	10.0‡	(9.5)	20.0‡	(12.7)	0.0	(0.0)	0.0	(0.0)	20.0‡	(12.7)
Saskatchewan	40.0‡	(21.9)	60.0‡	(21.9)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Manitoba	28.6‡	(12.1)	28.6‡	(12.1)	21.4‡	(11.0)	21.4‡	(11.0)	0.0	(0.0)	0.0	(0.0)
Ontario	30.0	(4.6)	20.0‡	(4.0)	9.0‡	(2.9)	12.0‡	(3.3)	11.0‡	(3.1)	18.0‡	(3.8)
Quebec	58.3	(6.5)	20.4	(4.2)	3.3‡	(1.8)	8.4‡	(5.4)	1.3‡	(0.7)	8.3‡	(3.2)
New Brunswick	54.0	(6.7)	19.5‡	(5.3)	3.5‡	(2.5)	5.3‡	(3.0)	1.8‡	(1.8)	15.9‡	(4.9)
Nova Scotia	33.3‡	(15.7)	33.3‡	(15.7)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	33.3‡	(15.7)
Prince Edward Island	--	--	--	--	--	--	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--	--	--
Canada	49.5	(4.2)	20.5	(2.7)	5.6‡	(1.4)	9.1‡	(3.3)	3.6‡	(0.9)	11.7	(2.3)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.4.7.1 Percentage of schools by proportion of students who identify as Indigenous in schools

	0%		1–5%		6–10%		11–25%		26–50%		More than 50%	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	12.5‡	(7.1)	36.9	(7.4)	12.9‡	(3.2)	25.9	(7.0)	6.4‡	(2.4)	5.4‡	(3.4)
Alberta	18.4‡	(6.9)	44.2	(7.0)	15.2‡	(4.1)	21.0‡	(6.3)	1.3‡	(1.3)	0.0	(0.0)
Saskatchewan	4.1‡	(2.0)	35.8	(4.8)	22.9	(4.3)	16.5‡	(3.5)	10.8‡	(2.8)	10.0‡	(3.3)
Manitoba	3.5‡	(2.6)	29.5	(4.7)	21.6	(4.6)	20.9	(3.6)	12.2‡	(2.9)	12.3‡	(4.5)
Ontario	27.9	(5.1)	57.9	(5.6)	3.8‡	(1.6)	8.9‡	(4.6)	1.2‡	(1.1)	0.4‡	(0.4)
Quebec	69.3	(4.7)	24.9	(4.0)	2.1‡	(1.2)	0.3‡	(0.3)	3.0‡	(2.7)	0.3‡	(0.3)
New Brunswick	32.2	(4.1)	56.6	(4.3)	4.5‡	(1.8)	2.2‡	(1.3)	4.5‡	(1.8)	0.0	(0.0)
Nova Scotia	3.7‡	(1.8)	62.0	(4.6)	22.6‡	(4.0)	9.9‡	(2.8)	1.8‡	(1.3)	0.0	(0.0)
Prince Edward Island	24.5‡	(8.7)	63.3‡	(9.8)	8.2‡	(5.5)	4.1‡	(4.0)	0.0	(0.0)	0.0	(0.0)
Newfoundland and Labrador	28.7‡	(4.7)	51.0	(5.2)	5.3‡	(2.3)	4.3‡	(2.1)	9.6‡	(3.0)	1.1‡	(1.1)
Canada	25.7	(3.0)	48.7	(3.1)	8.5	(1.2)	11.7	(2.6)	3.3	(0.7)	2.0‡	(0.5)

‡ There are fewer than 30 observations.

TABLE A.4.7.2 Percentage of schools by proportion of students who identify as Indigenous and language of the school system

Anglophone school systems												
	0%		1–5%		6–10%		11–25%		26–50%		More than 50%	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	12.9‡	(7.4)	36.9	(7.6)	12.7‡	(3.3)	25.3‡	(7.2)	6.6‡	(2.5)	5.5‡	(3.5)
Alberta	18.3‡	(7.0)	43.3	(7.1)	15.6‡	(4.2)	21.5‡	(6.5)	1.3‡	(1.3)	0.0	(0.0)
Saskatchewan	3.9‡	(2.0)	35.1	(4.9)	23.2	(4.3)	16.7‡	(3.6)	10.9‡	(2.9)	10.1‡	(3.4)
Manitoba	3.7‡	(2.7)	30.0	(4.9)	21.3‡	(4.9)	20.2	(3.7)	11.7‡	(3.0)	13.0‡	(4.7)
Ontario	28.4	(5.4)	57.7	(5.9)	3.2‡	(1.7)	9.1‡	(4.9)	1.2‡	(1.2)	0.4‡	(0.4)
Quebec	35.3‡	(6.7)	54.9‡	(7.0)	3.9‡	(2.7)	2.0‡	(1.9)	2.0‡	(1.9)	2.0‡	(1.9)
New Brunswick	23.4‡	(4.8)	61.0	(5.6)	6.5‡	(2.8)	1.3‡	(1.3)	7.8‡	(3.1)	0.0	(0.0)
Nova Scotia	3.0‡	(1.7)	59.4	(4.9)	24.8‡	(4.3)	10.9‡	(3.1)	2.0‡	(1.4)	0.0	(0.0)
Prince Edward Island	23.8‡	(9.3)	61.9‡	(10.6)	9.5‡	(6.4)	4.8‡	(4.6)	0.0	(0.0)	0.0	(0.0)
Newfoundland and Labrador	29.0‡	(4.7)	50.5	(5.2)	5.4‡	(2.3)	4.3‡	(2.1)	9.7‡	(3.1)	1.1‡	(1.1)
Canada	21.8	(3.4)	50.6	(3.5)	9.0	(1.3)	12.9	(2.9)	3.4	(0.8)	2.3‡	(0.6)
Francophone school systems												
	0%		1–5%		6–10%		11–25%		26–50%		More than 50%	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	0.0	(0.0)	36.4‡	(14.5)	18.2‡	(11.6)	45.5‡	(15.0)	0.0	(0.0)	0.0	(0.0)
Alberta	20.0‡	(12.7)	80.0‡	(12.7)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Saskatchewan	16.7‡	(15.2)	83.3‡	(15.2)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Manitoba	0.0	(0.0)	20.0‡	(10.3)	26.7‡	(11.4)	33.3‡	(12.2)	20.0‡	(10.3)	0.0	(0.0)
Ontario	18.0‡	(3.8)	62.0	(4.9)	14.0‡	(3.5)	5.0‡	(2.2)	1.0‡	(1.0)	0.0	(0.0)
Quebec	76.0	(5.1)	19.0‡	(4.2)	1.8‡	(1.3)	0.0	(0.0)	3.2‡	(3.2)	0.0	(0.0)
New Brunswick	44.2‡	(6.6)	50.4‡	(6.7)	1.8‡	(1.8)	3.5‡	(2.5)	0.0	(0.0)	0.0	(0.0)
Nova Scotia	11.1‡	(10.5)	88.9‡	(10.5)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Prince Edward Island	--	--	--	--	--	--	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--	--	--
Canada	53.4	(4.1)	35.6	(3.5)	5.4‡	(1.2)	3.0‡	(0.8)	2.6‡	(1.9)	0.0	(0.0)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.4.8.1 Percentage of schools by semester and full-year classes

Canada and provinces	Semester		Full year	
	%	SE	%	SE
British Columbia	22.6	(5.2)	77.4	(5.2)
Alberta	2.7‡	(1.5)	97.3	(1.5)
Saskatchewan	0.6‡	(0.6)	99.4	(0.6)
Manitoba	0.0	(0.0)	100.0	(0.0)
Ontario	0.4‡	(0.4)	99.6	(0.4)
Quebec	2.8‡	(2.2)	97.2	(2.2)
New Brunswick	0.0	(0.0)	100.0	(0.0)
Nova Scotia	0.9‡	(0.9)	99.1	(0.9)
Prince Edward Island	8.2‡	(5.5)	91.8‡	(5.5)
Newfoundland and Labrador	0.0	(0.0)	100.0	(0.0)
Canada	2.4	(0.5)	97.6	(0.5)

‡ There are fewer than 30 observations.

TABLE A.4.8.2 Percentage of schools by semester and full-year classes and language of school system

Canada and provinces	Anglophone school systems				Francophone school systems			
	Semester		Full year		Semester		Full year	
	%	SE	%	SE	%	SE	%	SE
British Columbia	22.4‡	(5.4)	77.6	(5.4)	27.3‡	(13.4)	72.7‡	(13.4)
Alberta	2.8‡	(1.6)	97.2	(1.6)	0.0	(0.0)	100.0‡	(0.0)
Saskatchewan	0.7‡	(0.7)	99.3	(0.7)	0.0	(0.0)	100.0‡	(0.0)
Manitoba	0.0	(0.0)	100.0	(0.0)	0.0	(0.0)	100.0‡	(0.0)
Ontario	0.4‡	(0.4)	99.6	(0.4)	1.0‡	(1.0)	99.0	(1.0)
Quebec	1.9‡	(1.9)	98.1	(1.9)	3.0‡	(2.6)	97.0	(2.6)
New Brunswick	0.0	(0.0)	100.0	(0.0)	0.0	(0.0)	100.0	(0.0)
Nova Scotia	1.0‡	(1.0)	99.0	(1.0)	0.0	(0.0)	100.0‡	(0.0)
Prince Edward Island	9.5‡	(6.4)	90.5‡	(6.4)	--	--	--	--
Newfoundland and Labrador	0.0	(0.0)	100.0	(0.0)	--	--	--	--
Canada	2.4	(0.5)	97.6	(0.5)	2.5‡	(1.6)	97.5	(1.6)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.4.9.1 Percentage of schools by minutes of mathematics instruction per week

	150 or fewer		151–200		201–250		251–300		More than 300	
Canada and provinces	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	2.5‡	(1.5)	33.9	(7.1)	32.1	(7.5)	16.2‡	(6.9)	15.3‡	(4.4)
Alberta	1.5‡	(1.5)	18.4‡	(6.4)	50.0	(7.2)	23.3‡	(6.2)	6.7‡	(3.1)
Saskatchewan	2.2‡	(1.7)	10.9‡	(2.9)	34.7	(4.7)	34.5	(4.8)	17.8‡	(4.1)
Manitoba	0.0	(0.0)	6.5‡	(2.0)	19.9	(4.0)	41.4	(5.0)	32.3	(5.1)
Ontario	0.1‡	(0.1)	6.3‡	(3.5)	8.6‡	(3.7)	69.1	(5.5)	15.8	(4.3)
Quebec	1.9‡	(1.5)	7.6‡	(2.3)	62.9	(5.4)	17.0	(3.2)	10.6‡	(4.8)
New Brunswick	0.8‡	(0.8)	0.0	(0.0)	9.1‡	(2.5)	46.8	(4.3)	43.4	(4.3)
Nova Scotia	0.9‡	(0.9)	2.7‡	(1.5)	3.8‡	(1.9)	78.4	(3.9)	14.3‡	(3.3)
Prince Edward Island	0.0	(0.0)	4.1‡	(4.0)	0.0	(0.0)	75.5‡	(8.7)	20.4‡	(8.2)
Newfoundland and Labrador	1.1‡	(1.1)	1.1‡	(1.1)	7.4‡	(2.7)	63.9	(5.0)	26.6‡	(4.6)
Canada	0.8‡	(0.3)	9.8	(2.1)	22.4	(2.4)	50.9	(3.1)	16.1	(2.4)

‡ There are fewer than 30 observations.

TABLE A.4.9.2 Percentage of schools by minutes of mathematics instruction offered each week and language of the school system

Anglophone school systems										
Canada and provinces	150 or fewer		151–200		201–250		251–300		More than 300	
	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	2.6‡	(1.5)	32.7	(7.3)	32.5	(7.7)	16.7‡	(7.1)	15.5‡	(4.5)
Alberta	1.6‡	(1.6)	18.0‡	(6.6)	50.2	(7.4)	23.3‡	(6.3)	6.9‡	(3.1)
Saskatchewan	2.2‡	(1.7)	10.8‡	(3.0)	34.3	(4.7)	34.7	(4.9)	18.0‡	(4.2)
Manitoba	0.0	(0.0)	5.7‡	(2.1)	20.2‡	(4.2)	40.3	(5.3)	33.8	(5.3)
Ontario	0.0	(0.0)	6.4‡	(3.6)	8.7‡	(3.9)	70.1	(5.9)	14.8‡	(4.5)
Quebec	0.0	(0.0)	7.7‡	(3.7)	55.8‡	(6.9)	30.8‡	(6.4)	5.8‡	(3.2)
New Brunswick	0.0	(0.0)	0.0	(0.0)	10.4‡	(3.5)	74.0	(5.0)	15.6‡	(4.1)
Nova Scotia	1.0‡	(1.0)	2.9‡	(1.7)	1.0‡	(1.0)	80.4	(3.9)	14.7‡	(3.5)
Prince Edward Island	0.0	(0.0)	4.8‡	(4.6)	0.0	(0.0)	71.4‡	(9.9)	23.8‡	(9.3)
Newfoundland and Labrador	1.1‡	(1.1)	1.1‡	(1.1)	6.5‡	(2.5)	64.5	(5.0)	26.9‡	(4.6)
Canada	0.6‡	(0.3)	10.0	(2.3)	19.5	(2.6)	54.6	(3.5)	15.3	(2.7)
Francophone school systems										
Canada and provinces	150 or fewer		151–200		201–250		251–300		More than 300	
	%	SE	%	SE	%	SE	%	SE	%	SE
British Columbia	0.0	(0.0)	72.7‡	(13.4)	18.2‡	(11.6)	0.0	(0.0)	9.1‡	(8.7)
Alberta	0.0	(0.0)	33.3‡	(15.7)	44.4‡	(16.6)	22.2‡	(13.9)	0.0	(0.0)
Saskatchewan	0.0	(0.0)	16.7‡	(15.2)	66.7‡	(19.3)	16.7‡	(15.2)	0.0	(0.0)
Manitoba	0.0	(0.0)	20.0‡	(10.3)	13.3‡	(8.8)	60.0‡	(12.7)	6.7‡	(6.4)
Ontario	2.0‡	(1.4)	6.1‡	(2.4)	7.1‡	(2.6)	52.5	(5.0)	32.3	(4.7)
Quebec	2.2‡	(1.8)	7.6‡	(2.7)	64.3	(6.4)	14.3‡	(3.4)	11.6‡	(5.7)
New Brunswick	1.8‡	(1.8)	0.0	(0.0)	7.2‡	(3.5)	9.0‡	(3.8)	82.0	(5.2)
Nova Scotia	0.0	(0.0)	0.0	(0.0)	30.0‡	(14.5)	60.0‡	(15.5)	10.0‡	(9.5)
Prince Edward Island	--	--	--	--	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--
Canada	1.9‡	(1.1)	8.5	(1.8)	43.1	(4.4)	24.9	(2.9)	21.6	(3.6)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.4.9.3 Achievement in mathematics by minutes of mathematics instruction per week, Canada

	Mean score	SE
Fewer than 200	484	(14.5)
201–250	508	(3.8)
251–300	504	(4.0)
More than 300	499	(3.5)

TABLE A.4.10.1 Percentage of schools by daily mathematics instruction

	Mathematics instruction offered daily		Mathematics instruction not offered daily	
	%	SE	%	SE
Canada and provinces				
British Columbia	41.3	(7.5)	58.7	(7.5)
Alberta	77.5	(5.0)	22.5‡	(5.0)
Saskatchewan	85.5	(3.1)	14.5‡	(3.1)
Manitoba	93.7	(2.0)	6.3‡	(2.0)
Ontario	98.4	(1.0)	1.6‡	(1.0)
Quebec	9.7‡	(2.2)	90.3	(2.2)
New Brunswick	97.0	(1.5)	3.0‡	(1.5)
Nova Scotia	98.2	(1.2)	1.8‡	(1.2)
Prince Edward Island	91.8‡	(5.5)	8.2‡	(5.5)
Newfoundland and Labrador	89.5	(3.2)	10.5‡	(3.2)
Canada	82.7	(1.6)	17.3	(1.6)

‡ There are fewer than 30 observations.

TABLE A.4.10.2 Percentage of schools by daily mathematics instruction and language of school system

	Anglophone school systems				Francophone school systems			
	Mathematics instruction offered daily		Mathematics instruction not offered daily		Mathematics instruction offered daily		Mathematics instruction not offered daily	
Canada and provinces	%	SE	%	SE	%	SE	%	SE
British Columbia	41.7	(7.7)	58.3	(7.7)	27.3‡	(13.4)	72.7‡	(13.4)
Alberta	78.7	(5.1)	21.3‡	(5.1)	30.0‡	(14.5)	70.0‡	(14.5)
Saskatchewan	86.7	(3.1)	13.3‡	(3.1)	0.0	(0.0)	100.0‡	(0.0)
Manitoba	93.4	(2.2)	6.6‡	(2.2)	100.0‡	(0.0)	0.0	(0.0)
Ontario	98.5	(1.0)	1.5‡	(1.0)	95.0	(2.2)	5.0‡	(2.2)
Quebec	39.6‡	(6.7)	60.4	(6.7)	3.7‡	(1.8)	96.3	(1.8)
New Brunswick	98.7	(1.3)	1.3‡	(1.3)	94.6	(3.0)	5.4‡	(3.0)
Nova Scotia	98.1	(1.4)	1.9‡	(1.4)	100.0‡	(0.0)	0.0	(0.0)
Prince Edward Island	90.5‡	(6.4)	9.5‡	(6.4)	--	--	--	--
Newfoundland and Labrador	89.4	(3.2)	10.6‡	(3.2)	--	--	--	--
Canada	89.1	(1.4)	10.9	(1.4)	37.8	(3.5)	62.2	(3.5)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

TABLE A.4.10.3 Achievement in mathematics by daily mathematics instruction, Canada

	Mean score	SE
Mathematics instruction offered daily	497	(3.3)
Mathematics instruction not offered daily	521*	(4.4)

* Significant difference compared to the *mathematics instruction offered daily* category

TABLE A.4.11.1 Percentage of schools by enrichment and extracurricular activities, Canada

	Activities not provided		Activities provided	
	%	SE	%	SE
Enrichment activities				
Mathematics interventions	22.5	(2.4)	77.5	(2.4)
Tutoring for students who have difficulty with mathematics	44.2	(3.2)	55.8	(3.2)
Enrichment mathematics	62.5	(2.8)	37.5	(2.8)
Clubs				
Robotics/coding club	54.6	(3.0)	45.4	(3.0)
Chess club	65.8	(2.9)	34.2	(2.9)
Academic club (other than mathematics)	70.0	(2.5)	30.0	(2.5)
Mathematics club	79.7	(2.2)	20.3	(2.2)
Debating club or debating activities	87.1	(1.5)	12.9	(1.5)
Other clubs	16.2	(2.5)	83.8	(2.5)
Other extracurricular activities				
Volunteering or service activities	30.2	(3.0)	69.8	(3.0)
Band, orchestra, or choir	35.7	(3.1)	64.3	(3.1)
Play, improv, or school musical	41.5	(3.1)	58.5	(3.1)
Yearbook, newspaper, or magazine	48.9	(3.1)	51.1	(3.1)
Mathematics competitions	58.8	(3.0)	41.2	(3.0)

TABLE A.4.11.2 Relationship between the enrichment and extracurricular activities index and mathematics achievement, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	486*	(5.1)	495	(6.4)	498	(7.4)	522*	(4.2)
Language of the school system								
Anglophone	484*	(5.5)	495	(6.8)	494	(8.6)	520*	(5.1)
Francophone	506*	(9.7)	504	(12.9)	520	(6.3)	532	(4.6)

* Significant difference between:

¹ Bottom quarter and top quarter² Second quarter and bottom quarter³ Third quarter and second quarter⁴ Top quarter and third quarter

TABLE A.4.12 Percentage of schools by challenges to providing instruction due to shortage or inadequacy of resources, Canada

	Never		Rarely		Sometimes		Often	
	%	SE	%	SE	%	SE	%	SE
Instructional materials (e.g., textbooks)	38.1	(3.1)	36.6	(2.9)	23.6	(2.5)	1.7‡	(0.6)
Budget for supplies	29.9	(2.8)	36.4	(3.0)	27.7	(2.9)	5.9	(1.2)
School building and grounds	52.9	(3.1)	32.2	(3.0)	13.7	(2.0)	1.2‡	(0.3)
Instructional space	48.7	(3.1)	31.1	(3.0)	17.0	(2.1)	3.2	(0.9)
Computers for mathematics instruction	40.4	(3.2)	30.8	(2.6)	24.2	(2.7)	4.6	(1.2)
Sufficient Internet access (e.g., bandwidth)	50.4	(3.1)	31.4	(2.7)	13.2	(1.7)	5.0	(1.2)
Library materials relevant to mathematics instruction	38.9	(3.1)	40.9	(3.1)	18.7	(2.2)	1.5	(0.4)
Digital resources/software for mathematics	35.3	(3.2)	37.3	(2.8)	24.3	(2.7)	3.1	(0.9)
Qualified mathematics teachers	36.7	(3.0)	31.9	(2.7)	27.1	(3.0)	4.3	(1.1)
Qualified education assistants	28.6	(2.9)	25.7	(2.4)	35.1	(3.1)	10.6	(1.6)
Mathematics specialist to support mathematics teachers	24.3	(2.3)	30.1	(2.6)	32.3	(3.1)	13.3	(2.6)
Availability of qualified substitute/occasional teachers	10.5	(2.2)	19.2	(2.0)	38.0	(2.9)	32.3	(3.1)

‡ There are fewer than 30 observations.

TABLE A.4.13.1 Percentage of schools by challenges to learning index, Canada

	Not at all		A little		More than a little		A lot	
	%	SE	%	SE	%	SE	%	SE
Challenges to learning index								
Student absenteeism (all excused absences)	11.3	(2.2)	48.8	(3.1)	27.1	(3.2)	12.9	(1.8)
Class composition	23.6	(2.9)	52.3	(3.1)	19.4	(2.6)	4.8	(0.9)
Students intimidating or bullying other students	39.4	(3.2)	51.6	(3.1)	7.7	(1.6)	1.3‡	(0.6)
Students skipping classes	62.2	(2.9)	29.8	(2.7)	5.7	(1.1)	2.4	(0.7)
Student use of alcohol or illegal drugs	78.5	(2.0)	19.0	(1.8)	1.6	(0.5)	0.9‡	(0.5)
Other factors								
Teachers' low expectations of students	53.1	(3.1)	36.3	(2.9)	8.8	(1.5)	1.8‡	(0.6)
Poor student-teacher relations	42.1	(3.2)	48.4	(3.1)	8.4	(1.6)	1.1	(0.3)
Disruption of classes by students	16.2	(2.4)	56.9	(3.0)	18.5	(2.1)	8.5	(1.8)
Teachers not meeting individual students' needs	26.7	(2.8)	56.7	(3.1)	14.8	(2.0)	1.8	(0.4)
Teacher absenteeism	46.6	(3.1)	38.5	(2.9)	12.1	(2.7)	2.9‡	(0.9)
Students lacking respect for teachers	35.0	(2.9)	51.8	(3.1)	9.8	(1.6)	3.5	(1.3)
Staff resisting change	25.0	(2.6)	55.9	(3.0)	14.3	(1.9)	4.8	(1.1)
Teachers being too strict with students	67.0	(2.8)	30.4	(2.7)	2.1	(0.5)	0.5‡	(0.4)
Lack of time to provide instructional leadership for staff	22.2	(2.6)	39.4	(3.0)	28.2	(3.0)	10.2	(1.7)

‡ There are fewer than 30 observations.

TABLE A.4.13.2 Relationship between the challenges to learning index and mathematics achievement, Canada

	Bottom quarter ¹		Second quarter ²		Third quarter ³		Top quarter ⁴	
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE
Canada overall	515*	(4.4)	518	(4.8)	490*	(7.8)	483	(5.1)
Language of the school system								
Anglophone	511*	(4.7)	520	(5.1)	487*	(8.7)	474	(5.7)
Francophone	542*	(6.2)	503*	(9.9)	515	(5.2)	522	(6.2)

* Significant difference between:

¹ Bottom quarter and top quarter

² Second quarter and bottom quarter

³ Third quarter and second quarter

⁴ Top quarter and third quarter

TABLE A.4.14.1 Percentage of schools by proportion of students absent on a typical day for reasons other than school-sponsored activities

	Less than 5%		5–10%		More than 10%	
	%	SE	%	SE	%	SE
Canada and provinces						
British Columbia	45.1	(8.1)	44.8	(7.6)	10.2‡	(3.1)
Alberta	57.4	(7.3)	30.3	(6.6)	12.3‡	(5.8)
Saskatchewan	48.2	(5.1)	41.0	(5.1)	10.7‡	(3.2)
Manitoba	49.4	(5.2)	43.7	(5.3)	6.9‡	(2.7)
Ontario	40.9	(5.3)	54.1	(5.4)	5.0‡	(1.8)
Quebec	67.7	(5.7)	29.2	(5.7)	3.0‡	(1.1)
New Brunswick	49.8	(4.3)	41.2	(4.3)	9.0‡	(2.5)
Nova Scotia	37.2	(4.6)	57.4	(4.7)	5.4‡	(2.2)
Prince Edward Island	36.2‡	(10.2)	63.8‡	(10.2)	0.0	(0.0)
Newfoundland and Labrador	36.1	(5.0)	51.1	(5.2)	12.8‡	(3.4)
Canada	46.5	(3.1)	46.6	(3.2)	6.8	(1.3)

‡ There are fewer than 30 observations.

TABLE A.4.14.2 Percentage of schools by proportion of students absent on a typical day for reasons other than school-sponsored activities and language of school system

Anglophone school systems						
	Less than 5%		5–10%		More than 10%	
	%	SE	%	SE	%	SE
Canada and provinces						
British Columbia	44.2	(8.3)	45.3	(7.9)	10.5‡	(3.2)
Alberta	57.2	(7.5)	30.2	(6.7)	12.6‡	(5.9)
Saskatchewan	47.7	(5.1)	41.4	(5.1)	10.9‡	(3.2)
Manitoba	47.2	(5.4)	45.5	(5.5)	7.3‡	(2.9)
Ontario	39.3	(5.5)	55.6	(5.7)	5.1‡	(1.9)
Quebec	51.0‡	(7.0)	39.2‡	(6.8)	9.8‡	(4.2)
New Brunswick	32.5‡	(5.3)	54.5	(5.7)	13.0‡	(3.8)
Nova Scotia	34.3	(4.7)	60.8	(4.8)	4.9‡	(2.1)
Prince Edward Island	35.0‡	(10.7)	65.0‡	(10.7)	0.0	(0.0)
Newfoundland and Labrador	35.5	(5.0)	51.6	(5.2)	12.9‡	(3.5)
Canada	43.1	(3.4)	49.4	(3.5)	7.5	(1.5)
Francophone school systems						
	Less than 5%		5–10%		More than 10%	
	%	SE	%	SE	%	SE
Canada and provinces						
British Columbia	72.7‡	(13.4)	27.3‡	(13.4)	0.0	(0.0)
Alberta	66.7‡	(15.7)	33.3‡	(15.7)	0.0	(0.0)
Saskatchewan	83.3‡	(15.2)	16.7‡	(15.2)	0.0	(0.0)
Manitoba	86.7‡	(8.8)	13.3‡	(8.8)	0.0	(0.0)
Ontario	68.4	(4.7)	28.6‡	(4.6)	3.1‡	(1.7)
Quebec	71.0	(6.7)	27.3‡	(6.8)	1.7‡	(1.0)
New Brunswick	73.5	(5.9)	23.0‡	(5.6)	3.5‡	(2.5)
Nova Scotia	66.7‡	(15.7)	22.2‡	(13.9)	11.1‡	(10.5)
Prince Edward Island	--	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--	--
Canada	70.8	(4.2)	27.0	(4.2)	2.2‡	(0.8)

‡ There are fewer than 30 observations.

Note: Due to small sample sizes, results for the francophone school systems are not reported for Prince Edward Island and Newfoundland and Labrador; however they are included in the calculations for the overall Canadian and provincial means.

