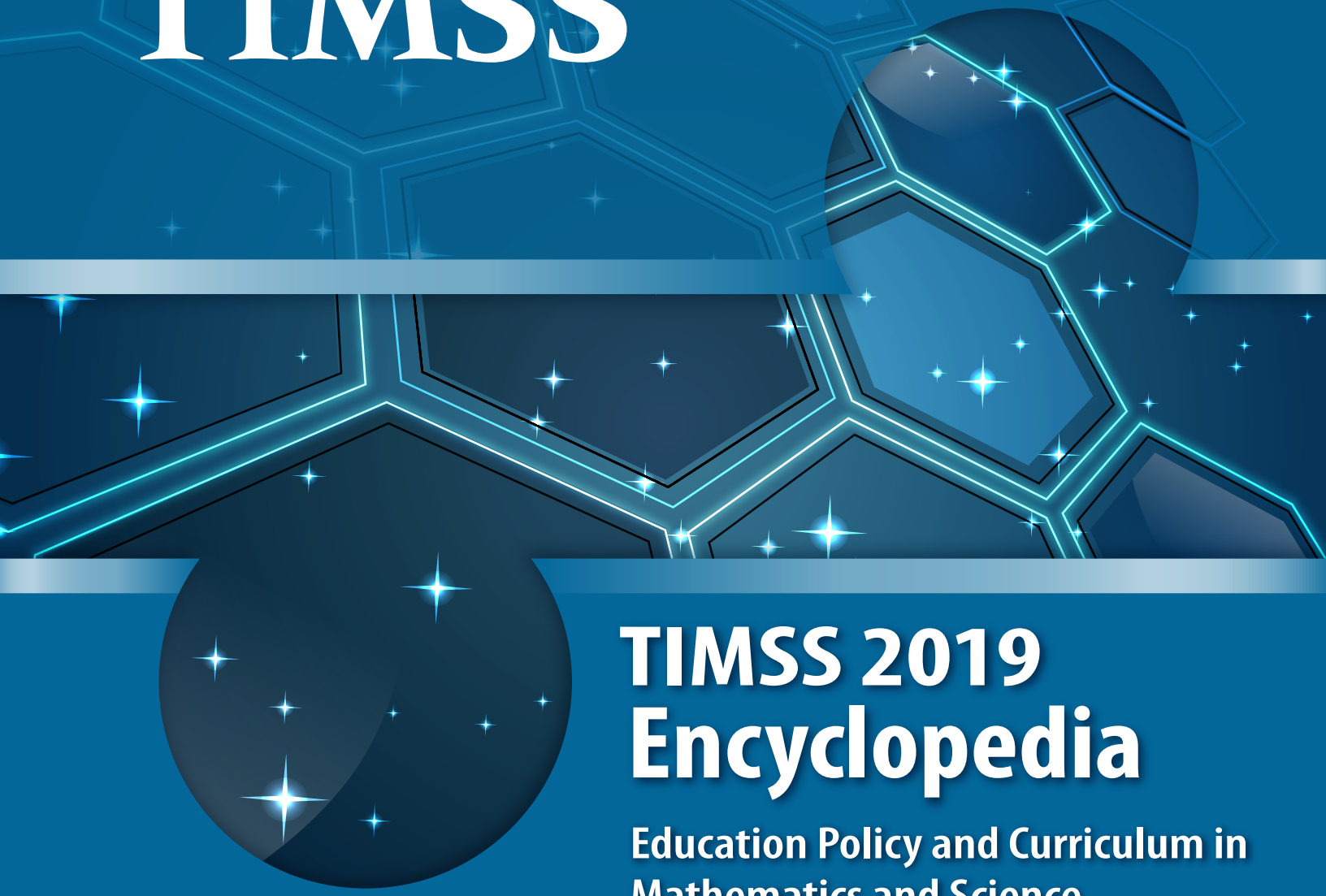
TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY

TIMSS



TIMSS 2019 Encyclopedia

Education Policy and Curriculum in Mathematics and Science

Dana L. Kelly
Victoria A.S. Centurino
Michael O. Martin
Ina V.S. Mullis, Editors

IEA

TIMSS & PIRLS International Study Center
Lynch School of Education
BOSTON COLLEGE

Exhibit 1: Years of School: Grades Provided and Compulsory Schooling*

Reported by National Research Coordinators

Country	Grades Provided	Compulsory Ages and/or Grades
Albania	Grades 1–12	Ages 6–15; Grades 1–9
Armenia	Grades 1–12	Grades 1–12
Australia	Years 1–12	Ages 6–17; Years 1–10
Austria	Grades 1–11 or 12	Ages 6–15; Grades 1–9
Azerbaijan	Grades 1–11	Ages 6–15; Grades 1–9
Bahrain	Grades 1–12	Grades 1–9
Belgium (Flemish)	Grades 1–12	Ages 6–18; Grades 1–12
Bosnia and Herzegovina	Grades 1–9	Grades 1–9
Bulgaria	Grades 1–12	Ages 7–16; Grades 1–10
Canada	Grades 1–11 or 12	Ages 6 or 7–16 or 18
Chile	Grades 1–12	Ages 6–18; Grades 1–12
Chinese Taipei	Grades 1–12	Ages 6–15; Grades 1–9
Croatia	Grades 1–11, 12, or 13	Ages 6 or 7–14 or 15; Grades 1–8
Cyprus	Grades 1–12	Ages 5.7–15; Grades 1–9
Czech Republic	Grades 1–13	Ages 6–15; Grades 1–9
Denmark	Grades 0–12	Ages 6–16; Grades 0–9
Egypt	Grades 1–12	Grades 1–9
England	Years 1–13	Ages 5–18
Finland	Grades 1–12	Grades 1–9
France	Grades 1–12	Ages 6–16
Georgia	Grades 1–12	Ages 6–15; Grades 1–9
Germany	Grades 1–12 or 13	Grades 1–9 or 10
Hong Kong SAR	Primary 1–Secondary 6 (Grades 1–12)	Primary 1–Secondary 3 (Grades 1–9)
Hungary	Grades 1–12 or 13	Ages 6–16
Iran, Islamic Rep. of	Grades 1–12	Grades 1–9
Ireland	First Class–Sixth Year (Grades 1–12)	Ages 6–16
Israel	Grades 1–12	Ages 5–16
Italy	Grades 1–13	Ages 6–16; Grades 1–10
Japan	Grades 1–12	Ages 6–15; Grades 1–9
Jordan	Grades 1–12	Ages 6–16; Grades 1–10
Kazakhstan	Grades 1–12	Grades 1–9
Korea, Rep. of	Grades 1–12	Ages 6–14; Grades 1–9
Kosovo	Grades 1–12	Ages 6–14; Grades 1–9
Kuwait	Grades 1–12	Ages 5.5–17; Grades 1–12
Latvia	Grades 1–12	Ages 5–16; Grades 1–9
Lebanon	Grades 1–12	Ages 6–15; Grades 1–9
Lithuania	Grades 1–12	Ages 6 or 7–16; Grades 1–10
Malaysia	Grades 1–11	Ages 6–11; Grades 1–6
Malta	Years 1–13	Ages 5–16; Years 1–11
Montenegro	Grades 1–13	Ages 6–15; Grades 1–9
Morocco	Grades 1–12	Ages 6–15; Grades 1–9
Netherlands	Grades 1–10, 11, or 12	Ages 5–16 or 18
New Zealand	Years 1–13	Ages 6–16
North Macedonia	Grades 1–12 or 13	Ages 6–17 or 18; Grades 1–12 or 13
Northern Ireland	Years 1–12	Ages 4–16; Years 1–12
Norway	Grades 1–13	Ages 6–15; Grades 1–10

*Does not include compulsory preprimary education.

Exhibit 1: Years of School: Grades Provided and Compulsory Schooling*

Reported by National Research Coordinators

(Continued)

Country	Grades Provided	Compulsory Ages and/or Grades
Oman	Grades 1–12	Ages 6–16; Grades 1–10
Pakistan	Grades 1–12	Ages 5–16; Grades 1–10
Philippines	Grades 1–12	Ages 6–17; Grades 1–12
Poland	Grades 1–11, 12, or 13	Ages 6–18
Portugal	Grades 1–12	Grades 1–12
Qatar	Grades 1–12	Ages 6 or 7–15; Grades 1–9
Romania	Grades 1–12 or 13	Ages 6–16; Grades 1–10
Russian Federation	Grades 1–11	Ages 6.5–17 or 18; Grades 1–11
Saudi Arabia	Grades 1–12	Ages 6–18; Grades 1–9
Serbia	Grades 1–12	Ages 7–15; Primary 1–8
Singapore	Primary 1–Secondary 5 (Grades 1–10)	Ages 6–14; Primary 1–6
Slovak Republic	Grades 1–12, 13, or 14	Ages 6–16; Grades 1–10
South Africa	Grades 1–12	Ages 6–15; Grades 1–9
Spain	Grades 1–12	Ages 6–16; Grades 1–10
Sweden	Grades 1–12	Ages 7–16; Grades 1–9
Turkey	Grades 1–12	Grades 1–12
United Arab Emirates	Grades 1–12	Grades 1–9
United States	Grades 1–12	Varies by state (commonly ages 6 or 7 to 16–19)
Benchmarking Participants		
Ontario, Canada	Grades 1–12	Ages 6–18
Quebec, Canada	Grades 1–11	Ages 6–16
Moscow City, Russian Fed.	Grades 1–11	Ages 6.5–18
Gauteng, South Africa	Same as South Africa	
Western Cape, South Africa	Same as South Africa	
Madrid, Spain	Same as Spain	
Abu Dhabi, UAE	Same as United Arab Emirates	
Dubai, UAE	Same as United Arab Emirates	

Exhibit 2: National Policies on Age of School Entry and Promotion

Reported by National Research Coordinators

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Albania	Children must be 6 years old by August 31 to begin school in September.	Most children begin school at age 6, but some begin at age 7 because their parents feel they will benefit from being more mature.	No change	No policy
Armenia	Children begin school in the calendar year of their sixth birthday.	Follows policy	No change	No policy
Australia	Varies by state, but generally children begin school by age 6. Children in all states are expected to begin a pre-primary or Foundation Year (Preparatory, Transition, Kindergarten, Reception, or Preprimary) from between 4 years and 5 months and 5 years by January 1. Thus, minimum age at entry to primary school (Year 1) ranges from 5 years and 5 months to 6 years (as of January 1) across the states.	Most children begin school in the year following attainment of the minimum age, but children among the youngest in their cohort (born in the first 4–6 months of the calendar year) may start a year later based on either advice from preprimary staff or the judgment of parents, usually because of developmental reasons.	All states now include a full year of preprimary education within the primary school setting. Prior to 2014, children in South Australia began Year 0 (Reception) in the school term after their fifth birthday. Beginning in 2014, all children start at the beginning of the school year if they are 5 years old by May 1. The Northern Territory has also moved to a single point of entry at the start of the school year. Queensland introduced Year 0 (Preparatory) in 2007 and made it compulsory in 2017. Western Australia introduced Year 0 (Preprimary) in 2002 and made it compulsory in 2013.	Varies by state, but generally, automatic promotion in Grades 1–8.
Austria	Children begin school if they are 6 years old before September 1. For prematurely born children, the calculated date of birth may be used instead of the actual date of birth.	Parents may request earlier/later admission, but school authorities ultimately make this decision (in some cases, based on medical or psychological tests).	As of 2009, children must attend kindergarten the year before beginning primary school. This policy does not affect primary education but prolongs compulsory education.	Until 2018, promotion was automatic for Grades 1–3 and dependent on academic progress through upper secondary school. Beginning in 2019, promotion is only automatic for Grade 1, then dependent on academic progress.
Azerbaijan	Children begin school in September if they will be 6 years old by December 31.	Children typically begin school at age 6, but parents may delay enrollment until age 7.	Before June 12, 2018, children had to be 6 years old to begin school. Now children can begin school before age 6.	Promotion is automatic in the primary level (1–4) and the lower secondary level (5–9). No examinations are taken at Grades 1–9. Students may apply to finish school one year earlier at Grade 3, 8, or 10 and can apply only once in every school year. They need to meet 6 requirements to be approved, and the decisions will be made by the school principal, management, and teachers. No special examinations are taken for this process. If approved, the student will be at Grade 3, 8, or 10 in the first semester and at Grades 4, 9, or 11 in the second semester.
Bahrain	Children must be 6 years old by the start of the academic year to begin school.	Most children begin school at age 6. Children who enroll in school after age 6 take an examination for grade placement.	Since 2017, children born in November may begin school at the start of the academic year before their sixth birthday.	Automatic promotion for Grades 1–3. For Grades 4–8, students must achieve 60% in the 4 core subjects (mathematics, science, Arabic, and English) and 50% in the other subjects to progress to the next grade. In some cases, students who fail core subjects but pass Arabic may be promoted with a plan to ensure they pass the classes to which they are promoted.

Exhibit 2: National Policies on Age of School Entry and Promotion

Reported by National Research Coordinators

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(Continued)

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Belgium (Flemish)	Children begin school on September 1 of the calendar year of their sixth birthday.	Follows policy	In the past, children were required to attend at least 220 half-days in an accredited Dutch-language kindergarten before beginning school. Since the start of the 2018–2019 school year, children should attend at least 250 half-days. If a child does not meet this requirement, the primary school's class council decides whether the child begins school or remains in preprimary education for another year.	Promotion is dependent on academic progress across primary school and Grades 7–8. In primary school, students may repeat a maximum of 2 school years. If a student has obtained a certificate of primary education, they can go to the first grade A (Grade 7) or the first grade B of full-time secondary education. If students have not obtained a certificate of primary education by age 12, they may be automatically promoted to the first grade B. Grade B focuses on students with learning disabilities or students who are less apt at theoretical education and prefer practically-oriented education. When successfully finishing the first grade B, these students can either go to the prevocational year or to the first grade A (Grade 7).
Bosnia and Herzegovina	Children must be 6 years old by September 1 to begin school in September.	Entry may be postponed 1 or more years for children with psychophysical difficulties.	No change	No policy
Bulgaria	Children begin school during the calendar year of their seventh birthday.	Children may begin at age 6 at the discretion of their parent/guardian.	No change	Automatic promotion for Grades 1–4; promotion dependent on academic progress for Grades 5–12.
Canada	Varies by province, but most students begin school in the year they will be 6 years old.	Students in many provinces begin school before the compulsory age.	In 2013, Saskatchewan changed the compulsory age minimum from 7 years to 6 years to recognize current practices and to increase consistency with other provinces. The official policies in other provinces have not changed.	In most provinces, the decision to promote or retain students typically resides with the schools and school boards/districts, in consultation with parents/guardians, teachers, and school principals. However, in British Columbia, students are automatically promoted until Grade 10.
Chile	Children begin school in March if they will be 6 years old by March 31. School principals can admit younger children with sixth birthdays before July 1 of the corresponding year.	Parents may decide to delay enrollment. Teachers also may recommend that parents delay enrollment for children who are not yet ready for school.	No change	Promotion for Grades 2–11 is dependent on academic progress and attendance. Students must have a minimum grade point average of 4.0 of 7.0 and attend at least 85% of the school year. Promotion for Grades 1–2 and 11–12 is automatic, but in exceptional cases, principals may limit promotion for students who present a significant delay in reading, writing, and/or mathematics.
Chinese Taipei	Children must begin school in the fall of the year of their sixth birthday if their birthday is on or before September 1.	Legal representatives can apply for early enrollment for intellectually gifted children over age 5 or a 1-year delay in enrollment for 6-year-old children with disabilities. In either case, children must take an assessment provided by the committee responsible for their placement.	No change	Automatic promotion for Grades 1–8. Legal representatives of intellectually gifted students may apply for accelerated promotion in specific learning areas or all learning areas. Elementary schooling years can only be shortened to 5 years.

Exhibit 2: National Policies on Age of School Entry and Promotion

Reported by National Research Coordinators

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(Continued)

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Croatia	Children who are 6 years old by April 1 must begin school in September of that year.	Parents can request to enroll children who are slightly younger than age 6 on April 1 or to delay enrollment (usually for medical conditions). All requests must be approved by an expert committee.	No change	Promotion is dependent on academic progress. Schools must organize additional classes for students with insufficient marks in 1 or 2 subjects (10–25 hours per subject). Following additional classes, students in Grades 1–3 with 1 insufficient mark can still progress to the next grade, while students in Grades 4–8 must take a correction examination to determine their promotion or retention. In Grades 1–3, students can complete 2 grades in 1 school year if an objective assessment establishes that the student's knowledge is comparable or beyond that of students in the higher grade. In Grades 4–8, students can complete 2 grades in 1 school year if they take overall class examinations in prescribed subjects.
Cyprus	Children can begin school in September if they are 5 years and 8 months old by September 1.	Parents can apply to the Director of Primary Education to delay enrollment for 1 year.	No change	In primary school, students may be required to repeat a particular grade based on academic or socioemotional progress, or parents can request that their child completes an additional year of school. In secondary school, promotion is dependent on academic progress and minimum attendance requirements.
Czech Republic	Children begin school at age 6. Children with birthdays before September 1 begin at the start of the academic year, while children with birthdays September–December begin at the start of the following academic year.	Parents can request to delay enrollment for 1 year or to enroll children who will turn 6 years old by December 31, with proof of the child's pedagogical and psychological readiness.	No change	Promotion is dependent on academic progress. Repeating the same grade is allowed only once in Stage 1 (primary level) Years 1–5 and only once in Stage 2 (lower secondary level) Years 6–9.
Denmark	Children can begin school during the calendar year of their sixth birthday.	Parents may request early enrollment for mature children whose fifth birthdays are before October 1, with approval from the school principal. Parents also may request a 1-year delay in enrollment for developmentally challenged children, with approval from the municipal council.	No change	Automatic promotion for Grades 1–8.
Egypt	Children must be 6 years old by the beginning of October to begin school in September.	Follows policy	No change	Automatic promotion for Grades 1–9.
England	Children can begin school the September following their fourth birthday and must begin by the prescribed day (December 31, March 31, or August 31) following their fifth birthday.	Parents may delay their child's enrollment or arrange for the child to attend part-time until age 5. Children who turn 5 years old on August 31 are not required to start school until 1 full year after the point at which they could have enrolled. In such cases, parents may request enrollment out of the normal age group (reception rather than Year 1), which requires the approval of school admission authority.	No change	Generally, promotion is automatic for Grades 1–8. Head teachers may decide to educate a student in a year group higher or lower than that indicated by their age based on sound educational reasons.

Exhibit 2: National Policies on Age of School Entry and Promotion

Reported by National Research Coordinators

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(Continued)

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Finland	Children begin school in August during the calendar year of their seventh birthday.	Parents may request to enroll children 1 year earlier or later than the official policy for psychological or medical reasons.	No change	For Grades 1–8, promotion is dependent on academic progress. A student may be retained due to failing marks or if retention is considered appropriate from the perspective of the student's general academic success.
France	Children must begin school in September of the calendar year of their sixth birthday.	In rare cases, parents and/or teachers may request early enrollment for academically advanced and mature children or request a 1-year delay in enrollment for immature children.	As of September 2019, children must begin school at age 3.	For Grades 1–5, promotion is dependent on academic progress. The board of teachers, including the head of school, makes a recommendation for each child, and parental input is considered. Students may repeat or skip only 1 grade in primary school.
Georgia	Children must be 6 years old by September 15 to begin school.	Follows policy	Starting in 2014, the age of entry is defined as 6 years old.	No policy
Germany	Children begin school on August 1 if they are 6 years old before a statutory qualifying date set by the state (June 30—September 30).	Exceptions to the policy vary by state—children may enter early if their sixth birthday is after the statutory date, or defer enrollment and attend kindergarten instead. Parents can apply to the local primary school for exceptions to the enrollment policy. Generally, the school administration makes the final decision based on parents' preferences and the results of the school entry test.	Policy changes vary by state. Common changes include flexible school entry, school deferment, and school choice.	Policies vary by state. In all states, students must be promoted from Grade 1 to Grade 2, either through strict promotion, restricted retention, or the possibility of restriction. For subsequent grades, promotion is dependent on students' grades. In some schools, students who are not promoted may be granted a probationary promotion or retake an examination. It is also possible for students with superior performance to skip a year.
Hong Kong SAR	Children may begin school when they are 5 years and 8 months old.	Some parents choose not to send their children to school according to policy. In these cases, the Education Bureau contacts the parents or makes home visits to confirm that the child's educational needs are being addressed. If there is no valid reason, the Education Bureau may require the parents to send the child to school.	No change	Policies on promotion and retention across Grades 1–8 are school-based. However, the Education Bureau has prescribed a maximum retention rate with which schools in the public sector must comply.
Hungary	Children typically begin school during the calendar year of their sixth birthday if their birthday is before August 31.	A committee of experts may decide that a child should stay in preschool for 1 more year. This committee also may allow a child early entry at the request of their parents.	Before 2013, children began school during the calendar year of their sixth birthday if their birthday was before May 31. Enrollment could be deferred until the year of the child's seventh birthday, or even the year of their eighth birthday if their birthday is after August 31.	Promotion is dependent on academic progress for all grades.

Exhibit 2: National Policies on Age of School Entry and Promotion

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Iran, Islamic Rep. of	Children must be 6 years old by September 21 to begin school.	Parents may decide whether they want their children to start school at age 7.	No change	For Grades 1–6, students complete a descriptive evaluation and are promoted if they perform satisfactorily in all subjects. Students who fail to meet the standard for 1 subject once or twice during their primary education can complete remedial classes or teacher-assigned tasks to be promoted. Otherwise, students repeat the grade. Students who perform unsatisfactorily in mathematics and Farsi are not promoted. For Grades 7 and 8, students must receive at least 10 out of 20 in all subjects by June, or retake the examinations in those subjects in September. Students who do not meet the standard in September repeat the grade.
Ireland	Children must begin school by age 6 and may begin at age 4. The first 2 years of primary school are "infants" classes, which have a shorter school day and are classified as ISCED 0, but are part of the same primary schools.	In recent years, the percentage of children beginning school at age 5 has increased (75%), while the percentage beginning at age 4 has decreased (23%). The expansion of the Early Childhood Care and Education (ECCE) program and school admission policies in over-subscribed schools have contributed to this change.	No change	For Grades 1–9, students can repeat a year only for educational reasons and in exceptional circumstances. The primary curriculum (Grades 1–6) is flexible and child-centered, and can be adapted to meet individual students' needs.
Israel	In general, children begin school during the calendar year of their sixth birthday.	Parents who feel their child is not ready to begin school may apply to the authorities for delayed enrollment. Requests are discussed by the kindergarten teacher, an educational psychologist, and the parents. Decisions should be made on common agreement, but parents have the final say.	No change	Automatic promotion for Grades 1–8, but retention is possible in exceptional circumstances.
Italy	Children must be 6 years old by December 31 to begin school in the fall of that year.	Parents may request early entry for children who are 6 years old by April 30 of the academic year of reference or that children who pass an examination skip the first year of school and start with the second year.	No change	Automatic promotion for Grades 1–5, with the exception of cases justified with special reasons and the unanimous agreement of all teachers. For Grades 6–8, promotion is dependent on academic progress.
Japan	Children must be 6 years old by April 1 to begin school.	Follows policy	No change	No policy
Jordan	Children must be 5 years and 8 months old by September 1 to begin school.	Follows policy	No change	For Grades 1–3, students who fail Arabic language or mathematics may repeat a grade with parental consent. For Grades 4–10, promotion is dependent on academic progress. Students cannot repeat more than 2 grades or the same grade twice. However, students who are absent for more than 20% of the school year without a legal reason will repeat the grade, irrespective of their total number of repetitions.
Kazakhstan	Children begin school during the calendar year of their sixth birthday.	Follows policy	No change	No policy

Exhibit 2: National Policies on Age of School Entry and Promotion

Reported by National Research Coordinators

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(Continued)

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Korea, Rep. of	Children must be 6 years old by December 31 to begin school the following March.	Parents or guardians may apply for early entry or for a 1-year delay in enrollment. However, this is rare.	No change	Promotion is dependent on minimum attendance. Students must attend at least two-thirds of the school days to be promoted.
Kosovo	Children begin school during the calendar year of their sixth birthday.	Follows policy	No change	No policy
Kuwait	For public schools, private Arabic schools, and private English schools, children must be 6 years old by March 15 to begin school the previous September. For private American schools, children must be 6 years old by September to begin school.	Follows policy	No change	Promotion is dependent on academic progress for Grades 1–8.
Latvia	Children begin school at age 6 or 7.	Many children begin primary school at age 7 because their parents feel they will benefit from being more mature and psychologically prepared.	Previously, children began school during the calendar year of their seventh birthday with some exceptions (health status and psychological preparedness). Since April 2018, amendments to the law provide for a commensurate, balanced, and flexible transition to basic education from age 6.	Promotion is dependent on academic progress for Grades 1–8. Students may repeat the same grade only once.
Lebanon	Children must be 6 years old by January 31 to begin school in October of that academic year.	Children typically participate in optional preprimary education-kindergarten programs beginning at age 3.	No change	Promotion is dependent on academic progress for Grades 1–8.
Lithuania	Children begin school during the calendar year of their seventh birthday. Children who attended a preprimary education program 1 year earlier begin school at age 6.	Parents or guardians can request early enrollment or a 1-year delay in enrollment.	Since 2017, policy recommends that children enter school at age 6 when educated under the preprimary education program 1 year earlier.	No policy, but decisions dependent on academic progress may be made at the school level.
Malaysia	Children who are 6 years old by January 1 begin school in January of that academic year. The Minister of Education may exempt any student or class of students from compulsory education, either absolutely or under specific conditions.	Follows policy	No change	No policy
Malta	Children begin school in the calendar year of their fifth birthday.	Follows policy	No change	Automatic promotion for all compulsory grades. In exceptional cases, students may be retained with consent from their parents or guardians.
Montenegro	Children begin school during the calendar year of their sixth birthday, following a medical examination.	Parents may request to enroll their child before age 6 or for a 1-year delay in enrollment. A commission comprising a pediatrician, a school psychologist, and an educator or a teacher, must approve all requests.	No change	Automatic promotion for Grades 1–5. Schools are required to organize remedial instruction for students that do not meet grade-level standards.
Morocco	Children begin school at age 5.5 to 6.	Follows policy	No change	For Grades 1–6, promotion is based on teachers' continuous assessment of academic progress. For Grades 6–7, promotion is based on teachers' continuous assessment, a unified school midterm examination, and a unified final examination designed by the local directorate of the Ministry of Education. For Grades 7–8, promotion is based on teachers' continuous assessment.

Exhibit 2: National Policies on Age of School Entry and Promotion

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(Continued)

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Netherlands	Children must begin kindergarten on the first school day of the month after their fifth birthday. Most children are 6 years old when they begin Grade 1.	Most children begin kindergarten at age 4 and are 6 years old when they begin Grade 1. Some children start Grade 1 later, if the school thinks that they would benefit from being more mature. Parents are involved in this decision, but the school has the final say.	No change	Automatic promotion for Grades 1–6. After Grade 6, schools decide the promotion and retention of students. Students are assigned to a track based on their previous academic progress, advice from teachers, and scores on a national assessment, and they may be assigned to a lower track or not be promoted to the next grade if they are not doing well.
New Zealand	Children may begin school following their fifth birthday and must begin school by their sixth birthday.	Nearly all children begin school on or soon after their fifth birthday. Parents may delay their child's entry until the beginning of a later term or until age 6.	Starting in 2020, schools, with consultation from their community, can opt to have new entrants start in groups at the beginning of each term after their fifth birthday. Only a small number of schools have indicated plans to use this option.	Promotion is typically automatic but can be subject to parent or principal discretion.
North Macedonia	Children begin school during the calendar year of their sixth birthday.	Follows policy	No change	Automatic promotion for Grades 1–5; promotion dependent on academic progress for Grades 6–9.
Northern Ireland	Children who are age 4 by July 1 begin school in September of that year. Children with fourth birthdays July 2–August 31 begin school in September of the next year, when they are 5 years old.	Follows policy	No change	Automatic promotion for all compulsory grades.
Norway	Children begin school during the calendar year of their sixth birthday.	Follows policy	No change	No policy
Oman	For public schools, children typically begin school when they are 6 years old (or at least 5 years and 8 months). For private schools, children begin school between 5 years and 2 months and 7 years and 2 months.	Children enrolling in public schools over age 7 and private schools over 7 years and 2 months are enrolled in the grade above, with special remedial plans implemented by the schools.	Before 2012, children began Grade 1 between ages 6 and 8.	Automatic promotion for Grades 1–4; promotion dependent on academic progress for Grades 5–8.
Pakistan	Children must be 6 years old by March 31 to begin school the following April.	Children can begin school up to age 7.	No change	Promotion is dependent on academic progress.
Philippines	Children are eligible to begin school when they have completed a kindergarten program (Department of Education accredited or another program) or have not attended kindergarten, but are at least 6 years old by August 31 of the school year they will enroll.	Follows policy	No change	Promotion dependent on academic progress for Grades 1–8. Students are promoted if they have a final grade of at least 75 in all learning areas or do not meet expectations in no more than 2 learning areas, but pass remedial classes for the learning areas with failing marks. Otherwise, students must repeat the grade.

Exhibit 2: National Policies on Age of School Entry and Promotion

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Poland	Children must begin school by age 7.	Parents may request early enrollment for 6-year-old children who have completed a 1-year preparatory preprimary program or hold a school readiness certificate from a counseling and guidance center. Parents may also request approval from the principal to defer enrollment for 1 year or more with a certificate recommending education for children with special needs.	In 2015, the age of entry was lowered to age 6. In 2016, it was raised back to age 7 with an option to enroll at age 6. Currently, 6-year-olds attend 1 year of preprimary education. With these changes, Polish schools now use a 2-level system consisting of primary and secondary schools.	Automatic promotion for Grades 1–3, with the exception of exceptional cases justified by the students' development, achievements, or health condition. For Grades 4–8, students must receive positive marks for all compulsory subjects by the end of the school year to be promoted to the next grade. Students with up to 2 unsatisfactory marks may retake examinations. In principle, students who fail a retake will not be promoted to the higher grade, but the school teaching council may conditionally promote students with an unsatisfactory mark in only 1 subject.
Portugal	Children must begin school during the calendar year of their sixth birthday—enrolled by June 15—and turn 6 years old by the beginning of the school year (mid-September).	Parents or legal guardians can request enrollment for children with sixth birthdays September 16–December 31.	No change	Automatic promotion for Grades 1–2; promotion dependent on academic progress for Grades 2–8.
Qatar	For public schools, children may begin at age 6 and must begin by age 8. For private schools, children may begin at age 5 and must begin by age 7.	Follows policy	No change	Promotion is dependent on academic progress. Students must achieve an average of 50% or higher across their first and second semester examinations to progress to the next grade.
Romania	Children begin school when they are 6 years old at the start of the school year.	Parents or guardians can submit a written request to enroll children with sixth birthdays before the end of the calendar year; the request may be accepted if the child's psychosomatic development is deemed appropriate.	Before 2012, children began school at age 7. Since 2012, children start school at age 6.	Automatic promotion for Grades 1–4; promotion dependent on academic progress for Grades 5–8.
Russian Federation	Children must be 6.5 years old by September 1 to begin school.	Parents and school administrators may decide that a child begins school between ages 6.3 and 6.9. Parents may also delay their child's enrollment until age 7 for maturity or health reasons.	No change	Automatic promotion for Grades 1–8, but conditional promotion for students with unsatisfactory academic performance. These students have to show improvement within a specified time frame, or the parents may ask for retention or enrollment in an adaptive or individual program.
Saudi Arabia	Children must be 6 years old by 90 days after the first day of school to begin school.	Follows policy	No change	Promotion dependent on academic progress for Grades 1–8.
Serbia	Children must begin school when they are 6.5–7.5 years old by the beginning of the school year.	In exceptional cases, enrollment may be postponed for 1 year.	No change	For Grades 4–7, students who have the lowest mark in 2 subjects at the end of the second semester and do not pass or take the remedial examination will repeat the grade. Talented students may progress through specially organized educational programs.

Exhibit 2: National Policies on Age of School Entry and Promotion

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Singapore	Children begin school if they are 6 years old by the day before the first day of school (e.g., January 2). Children who turn 6 years old on January 2 through January 1 the following year begin school the next academic year.	Parents may decide to delay their child's entry if the child has been medically assessed and deemed not ready at the legal age of admission or professionally diagnosed as having special educational needs or a developmental delay. Parents of children with birthdays on January 1 (who may therefore enter school 1 year earlier than peers born in the same year) may request to delay entry for 1 year if they feel the child will benefit from being more mature.	No change	In general, promotion is automatic for Grades 1–4. However, a principal has the discretion, in consultation with a student's parents, to retain the student for extenuating circumstances (e.g., prolonged absence due to illness). A Grade 5 student may also be considered for retention if in the professional judgment of the principal, the student's academic progress indicates that the student will likely benefit from repeating the grade. For Grades 6–8, promotion depends on meeting a set of academic standards on the national examinations and school-based examinations (for promotion to Grade 8 or 9).
Slovak Republic	Children who are 6 years old by August 31 must begin school on September 1, unless granted a delay.	Children may begin school early or after an approved delay based on psychological tests and professional recommendations. Delays must be approved by the headmaster of the school in which the child is supposed to enroll. When approved (approximately 10% of all children), parents decide whether the child returns to kindergarten or begins Grade 0; when denied, the child is obliged to begin school.	No change	Promotion is dependent on academic progress. If a student receives a final grade of 5 (insufficient) in 1–2 subjects, the student must pass a correction examination to progress to the next grade. Students who fail the correction examination or receive a final grade of 5 in more than 2 subjects must repeat the grade. Students with special educational needs do not receive a grade of 5 in subjects that are directly influenced by their handicap.
South Africa	Children must be 5 years old and turning 6 years old by June 30 of the next year to begin Grade 1 by mid-January.	Parents may delay enrollment to age 5 turning 6 for Grade 0 or age 6 turning 7 for Grade 1.	No change	Promotion is dependent on academic progress. Students must meet the minimum required level of achievement per subject in each grade and comply with the promotion requirements described in the National Policy Pertaining to the Programme and Promotion of the National Curriculum Statement Grades R–12. Students may be retained only once in each phase–foundation (Grades R–3), intermediate (Grades 4–6), and senior (Grades 7–9). Exceptions are made for immigrant students and students with disabilities (cognitive or physical impairment).
Spain	Children begin school during the calendar year of their sixth birthday.	Follows policy	No change	Promotion is based on academic progress. In Grades 1–6, students may repeat only 1 grade; in Grades 7–10, students may repeat 2 grades, but not the same grade twice.
Sweden	Children begin preschool class in the fall of the calendar year of their sixth birthday and primary school in the fall of the calendar year of their seventh birthday. It is mandatory for children to attend preschool class before primary school.	Parents may request to delay primary school entry to the year of a child's eighth birthday with special reasons or needs that must be approved by the municipality. Parents may also request that their child start primary school in the year of their sixth birthday.	In 2018, preschool class became mandatory. In practice, 95% of all 6-year-old children have attended preschool class for many years, so this policy has not substantially impacted practice.	Automatic promotion for Grades 1–9.

Exhibit 2: National Policies on Age of School Entry and Promotion

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Official Policy on Age of Entry to Primary School	Based on Parental Discretion, Usual Practice on Age of Entry to Primary School	Changes to Age of Entry Policy Within the Past 10 Years	Policy on Promotion and Retention in Grades 1–8
Turkey	Children must begin school if they are at least 5.75 years old by September 31.	Parents may request to enroll children with who will turn 5.75 by December 31. Parents may also request a delay in enrollment for children who are not developmentally ready.	In June 2019, the age of entry was increased from 5.5 years old to 5.75 years old.	In general, promotion is automatic throughout primary school. However, students who have not reached the desired level of competence, upon the written request of the parents, can repeat 1 grade. At the recommendation of a parent or teacher, students in Grades 1–3 that have demonstrated above grade-level competence may take an examination 1 month before the beginning of the school year to be promoted to a higher class.
United Arab Emirates	Children can begin school at age 6.	Follows policy	Before 2013, children could begin school at age 5.5. Since 2013, children must be 6 years old by December 31 of the year they enroll.	Automatic promotion for Grades 1–3; promotion dependent on academic progress for Grades 4–8. Students with low performance in more than 3 subjects will be retained in the same grade. Students can take a makeup exam if they do not pass 3 or fewer subjects.
United States	Varies by state, but each state requires children to begin school between set ages (typically 5–8).	Follows state policies	No change	Varies by state. Some states require examinations for grade promotion and/or graduation from high school. Many states have retention policies from Grade 3 to Grade 4 based on students' reading proficiency.
Benchmarking Participants				
Ontario, Canada	Children must begin school in September if they turn 6 years old on or before September 1. Children with sixth birthdays before December 31 also may begin school in September.	Parents may enroll their children in school before age 6.	No change	Promotion from Grade 8 to secondary school is dependent on academic progress. In cases where promotion is in question, the decision to promote or retain a student is typically made by the principal in accordance with school board policy. If promotion is denied, there is an appeal process.
Quebec, Canada	Children must be 6 years old by September to begin school in August of that year.	Follows policy	No change	Promotion is based on students' final report cards and rules of passage established by the school or the school board, according to their respective responsibilities. In primary and secondary education, the threshold for success is 60% for each subject.
Moscow City, Russian Fed.	Children must be at least 6.5 years old and no more than 8 years old by September 1 to begin school in September of that year, with the exception of children with medical conditions.	Children typically begin school at age 7 because their parents feel they will benefit from being more mature. Parents or legal guardians may ask the founder of the educational organization for early or delayed entry.	No change	Promotion dependent on academic progress. Students must pass an intermediate assessment at the end of the school year to progress to the next class. Students who do not pass are transferred to the next class conditionally and must complete remedial work within a certain period determined by the school. If they do not, they may repeat a grade or transfer to training on adapted educational programs and individual curricula.
Gauteng, South Africa	Same as South Africa			
Western Cape, South Africa	Same as South Africa			
Madrid, Spain	Same as Spain			
Abu Dhabi, UAE	Same as United Arab Emirates			
Dubai, UAE	Same as United Arab Emirates			

Exhibit 3: Official Languages and Languages of Instruction

Reported by National Research Coordinators

Country	Official Languages and Major Language Subgroups	Languages of Instruction for Mathematics and Science in the Fourth and Eighth Grades
Albania	Albanian is the official language.	Albanian is the language of instruction.
Armenia	Armenian is the official language.	Armenian is the language of instruction.
Australia	English is the official language. However, according to the 2016 Census, Australians speak over 200 languages, including over 50 actively spoken Australian Indigenous languages. About 21% of Australians speak a language other than English at home. The top 4 languages other than English are Mandarin (2.5%), Arabic (1.4%), Cantonese (1.2%), and Vietnamese (1.2%).	Most students receive mathematics and science instruction in English. Some schools provide bilingual instruction—in most cases, if the language of instruction is not English, it is a second or additional language, rather than a native language (although some schools deliver instruction in indigenous languages).
Austria	German is the official language. Hungarian, Croatian, and Slovenian are the official minority languages.	German is the language of instruction in almost all schools. Schools offering official minority languages as the language of instruction teach mathematics and science in the minority language. Bilingual schools or schools with a focus on a second language may offer instruction in both languages (e.g., English and German).
Azerbaijan	Azerbaijani is the official language. Azerbaijani and Russian are the major languages.	State schools provide instruction in either Azerbaijani or Russian. Parents choose a state school based on their preference and/or the language they speak at home. In Azerbaijani schools, students' native language is Azerbaijani. In Russian schools, students' native language may be a language other than Russian.
Bahrain	Arabic is the official language.	Arabic is the language of instruction in all government schools.
Belgium (Flemish)	Dutch is the official language in Flanders. French and German are the official languages in the other two language areas of Belgium.	Dutch is the language of instruction and the native language of the majority of children. In some Flemish municipalities near the regional language borders, primary instruction may be provided in French or German for students that speak French or German at home or whose parents are immigrants. Some secondary schools offer Content and Language Integrated Learning (CLIL) and teach mathematics and science in another language.
Bosnia and Herzegovina	Bosnian, Croatian, and Serbian are the official languages.	Generally, students receive mathematics and science instruction in their native language.
Bulgaria	Bulgarian is the official language.	Bulgarian is the only official language of instruction for all grades and subjects. However, in ISCED Level 3 language schools, the language of instruction in mathematics and science can be a different language (e.g. English, French, German, Russian, Spanish, or Italian).
Canada	English and French are the official languages.	In English language schools, students receive instruction in English. In francophone schools (i.e., schools in which students' first language is typically French), students receive instruction in French. In French Immersion schools, students may receive instruction in either English or French.
Chile	Spanish is the official language.	Spanish is the language of instruction. Spanish schools with a high percentage of indigenous students have special status and are expected to develop the necessary skills to preserve their language and knowledge of the history and culture of their people.
Chinese Taipei	No official language. Mandarin is often used at home and serves as the common language. Other native languages include Fukien, Hakka, and aboriginal languages.	Mandarin is the language of instruction for mathematics and science, with the exception of a few private schools that provide mathematics and science instruction in English.
Croatia	Croatian is the official language. Serbian, Italian, Hungarian, and Czech are minority language subgroups.	Croatian is the language of instruction in most schools (97%). National minorities can have their language, letter, and culture acknowledged within the school system in the form of 3 models for which each school can apply: (1) national minority school with a complete program in the language and letter of the minority; (2) school in which classes are presented in a dual way, with social science subjects in the minority language and all other subjects in Croatian; and (3) regular program presented in Croatian, with additional classes or activities each week to nurture the minority language and culture. Only students attending schools or classes under Model 1 receive mathematics and science instruction in the minority language.
Cyprus	Greek and Turkish are the official languages. English is spoken as a foreign language by the vast majority of the population.	Greek is the language of instruction in all public schools and some private schools. In many private schools, English is the language of instruction. Each school uses a particular language of instruction, regardless of whether the students in the school are native speakers. For example, all students in public primary or secondary schools are taught mathematics and science in Greek. In some private schools, mathematics and science instruction is presented in the language of schooling (i.e., English or French).

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Exhibit 3: Official Languages and Languages of Instruction

Reported by National Research Coordinators

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(Continued)

Country	Official Languages and Major Language Subgroups	Languages of Instruction for Mathematics and Science in the Fourth and Eighth Grades
Czech Republic	Czech is the official language.	Czech is the language of instruction.
Denmark	Danish is the official language.	Danish is the language of instruction for mathematics and science and technology in *Folkeskole* (primary and lower secondary education).
Egypt	Arabic is the official language. English, French, and German are second language subgroups.	Students receive mathematics and science instruction in their native language and in a second language.
England	English is the official language. In England's schools, over 25% of students are from an ethnic minority background and almost 1 in 5 students speak English as an Additional Language (EAL).	English is the language of instruction for mathematics and science. Through the National Curriculum, the Department for Education expects effective teaching and learning for EAL to take place within the curriculum: teachers are responsible for the needs of students whose first language is not English. Monitoring of progress should take account of the student's age, length of time in this country, previous educational experience, and ability in other languages. EAL students may take part in the national curriculum before developing communication skills in English. Teachers should plan teaching opportunities to help students with their English and should aim to provide the support students need to take part in all subjects.
Finland	Finnish (88%) and Swedish (5%) are the official languages.	Most schools are Finnish-speaking or Swedish-speaking and provide instruction in that language in all subjects.
France	French is the official language.	French is the language of instruction.
Georgia	Georgian is the official language of Georgia, and Abkhazian is the official language in the territory of Abkhazia (currently occupied by Russia).	Considering the multiethnic population of the country, comprising Azeri, Armenian, Russian, Abkhazian, and Ossetian communities, the law stipulates that students have the right to receive general education in their native language.
Germany	German is the official language.	In general, German is the language of instruction. Bilingual teaching is available in primary schools, secondary schools, schools with several education programs, and vocational schools. In recent years, bilingual teaching in primary schools and the use of foreign languages in MINT (mathematics, computer science, natural sciences, and technology) subjects have increased.
Hong Kong SAR	Chinese and English are the official languages. Cantonese and Putonghua are the major language subgroups.	Chinese is the language of instruction in most schools, but in some schools, instruction is provided in English.
Hungary	Hungarian is the official language. Minority language subgroups include German, Romanian, Slovene, Serb, and Croatian.	Hungarian is the official language of instruction, but there are a number of ethnic and national minority educational institutions that provide instruction in their own languages as a first or second language.
Iran, Islamic Rep. of	Farsi is the official language. Turkish and Arabic are the major language subgroups.	Farsi is the language of instruction.
Ireland	Irish and English are the official languages. According to the 2016 Census, 13% of the overall population is multilingual, speaking a language other than Irish or English at home. Polish is the most common additional language (2.8%), followed by French, Romanian, Lithuanian, and Spanish. On average, 3 children in every classroom speak a language other than English or Irish at home on a daily basis.	English is the language of instruction in the majority of primary schools (2,998). Irish is the language of instruction in 250 primary schools, including 150 *Gaelscoileanna*, where Irish is not a native language for the majority of the students, and 100 schools located in *Gaeltacht* areas, where varying percentages of the population speak Irish in the home (21.4%, according to the 2016 Census). At post-primary level, there are 672 wholly or predominantly English-medium schools and 50 schools in which Irish is the language of instruction for all students in all subjects.
Israel	Hebrew and Arabic are the official languages.	Hebrew is the language of instruction in the Hebrew-speaking sector's schools, and Arabic is the language of instruction in the Arabic-speaking sector's schools. Most students receive instruction in their native language, with the exception of newcomers or foreign students who enroll in regular schools (not designated for foreigners).
Italy	Italian is the official language. Recognized language minorities include Ladin and German (Province of Bolzano), Slovenian (Region of Friuli Venezia Giulia), and French (Region of Valle d'Aosta).	Italian is the language of instruction in most schools. Students of minority language groups can attend schools that provide instruction in Italian or in their minority language.
Japan	Japanese is the official language.	Japanese is the language of instruction.
Jordan	Arabic is the official language.	Arabic is the language of instruction.
Kazakhstan	Kazakh and Russian are the official languages.	Kazakh and Russian are the languages of instruction.
Korea, Rep. of	Korean is the official language.	Korean is the language of instruction.
Kosovo	Albanian and Serbian are the official languages. Bosnian and Turkish are major language subgroups.	Students receive instruction in their native language.
Kuwait	Arabic is the official language. English is a second major language.	Arabic is the language of instruction.

Exhibit 3: Official Languages and Languages of Instruction

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Official Languages and Major Language Subgroups	Languages of Instruction for Mathematics and Science in the Fourth and Eighth Grades
Latvia	Latvian is the official language. Russian is the major language subgroup.	Students have the opportunity to study in 7 minority education programs (Russian, Polish, Hebrew, Ukrainian, Estonian, Lithuanian, and Belarussian). Many schools offer bilingual instruction, presenting instruction to students in both their native language and a second language.
Lebanon	Arabic (Modern Standard Arabic) is the official language. Informal Arabic is the major language subgroup (N.B. Arabic native language).	Arabic, English, and French are the languages of instruction for Grade 4; English and French are the languages of instruction for Grade 8.
Lithuania	Lithuanian is the official language. Polish and Russian are the major language subgroups.	Students receive instruction in their native language.
Malaysia	Malay is the official language.	The medium of instruction in Malaysian public schools is Malay. However, in the Chinese National-Type Schools and Tamil National-Type Schools, instruction is delivered in Chinese and Tamil respectively. Since 2016, selected schools that have participated in the Dual Language Program (DLP) provide instruction in English for the teaching of science and mathematics.
Malta	Maltese and English are the official languages.	English is the language of instruction. Currently, efforts are being made to provide mathematics assessment in both Maltese and English.
Montenegro	Montenegrin is the official language. Serbian, Bosnian, Croatian, and Albanian are minority language subgroups.	Students receive instruction in their native language.
Morocco	Arabic and Tamazight are the official languages.	Arabic is the language of instruction. Students begin learning French as a second language in primary school, and starting in 2019, mathematics and science instruction in Grades 7–9 will progressively be provided in French.
Netherlands	Dutch is the first official language. Frisian, the second official language, is spoken by more than 350,000 people in the northern province of Friesland.	Students receive instruction in their native language (Dutch) or also in Frisian in some schools.
New Zealand	The Māori language and New Zealand Sign Language are the official languages. English is the predominant spoken language and a de facto official language. According to the 2018 Census, the largest language subgroups are Māori (4.0%), Samoan (2.2%), and Northern Chinese, including Mandarin (2.0%).	Students may receive instruction in English, Māori, or Pacific languages. In 2019, 2.6% of the total school population received more than half their instruction in the Māori language and 1.7% in a Pacific language (most often Samoan). There is no official information on the language of instruction for individual subjects.
North Macedonia	Macedonian is the official language. Albanian, Turkish, Serbian, and Bosnian are minority language subgroups.	Students receive instruction in their native language.
Northern Ireland	English is the language of custom and practice. Irish and Ulster Scots are officially recognized minority languages.	English is the language of instruction in the vast majority of schools. In Irish-medium schools (providing for 1.4% of students), instruction is provided in Irish, with English as a separate subject.
Norway	Norwegian and Sami are the official languages. The majority language, Norwegian, has 2 distinct written varieties: Bokmål (Book Language) and Nynorsk (New Norwegian), which are linguistically similar enough to be regarded as written dialects, mutually completely intelligible. Nynorsk is mostly used in Western Norway as a written language (by roughly 10% of the population, or about half a million people). Bokmål is dominant in the rest of the country, and is used by close to 90% of the population.	Norwegian is the language of instruction in the vast majority of schools. In Sami schools, the language of instruction is Sami.
Oman	Arabic is the official language.	Arabic is the language of instruction in public schools and some private schools. English is the language of instruction for private bilingual schools.
Pakistan	Urdu and English are the official languages. Sindhi is a language subgroup.	Urdu, English, and Sindhi are the languages of instruction.
Philippines	Filipino is the national language. Filipino and English are the official languages.	A salient feature of the K–12 program is the Mother-Tongue Based Multilingual Education (MTB-MLE). Currently, the Department uses 19 languages, taught as subject areas and used as languages of instruction. English and Filipino are taught as subjects starting in Grade 1 and gradually introduced as languages of instruction in Grades 4–6. English is the language of instruction for Grade 4.
Poland	Polish is the official language.	Polish is the language of instruction. Establishing international classes is rare but possible with approval from the Minister of National Education.
Portugal	Portuguese is the official language.	Portuguese is the language of instruction.
Qatar	Arabic is the official language.	Arabic is the language of instruction. However, numbers, symbols, equations, and scientific terms are presented in English.

Exhibit 3: Official Languages and Languages of Instruction

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Official Languages and Major Language Subgroups	Languages of Instruction for Mathematics and Science in the Fourth and Eighth Grades
Romania	Romanian is the official language. Hungarian is a language subgroup.	Romanian is the language of instruction in most schools. However, there are some schools that teach in another native language of the students (mostly Hungarian).
Russian Federation	Russian is the official language (80.9%). The other language subgroups are Tatar (3.87%), Bashkir (1.15%), Chuvash (1.05%), and Chechen (1.04%).	Russian is the language of instruction.
Saudi Arabia	Arabic is the official language. English is the major language subgroup.	Most students receive instruction in their native language, but some receive instruction in a second language.
Serbia	Serbian is the native language. There are 8 national minority languages: Albanian, Bosnian, Bulgarian, Hungarian, Romanian, Ruthenian, Slovak, and Croatian.	Serbian is the language of instruction for most children (94%). In some municipalities near the regional language borders, primary instruction may be provided in national minority languages. Minority language groups can have their language, letter, and culture acknowledged within the school system in either (1) mixed schools with classes taught in Serbian language and classes taught in the minority language exclusively, or (2) a national minority school with a complete program in the language and letter of the minority. Primary instruction is offered in the 8 national minority languages. Instruction for minority students can be organized in their native language if at least 15 students choose to enroll. According to data collected in 2017, most of students from national minority groups have received instruction in Hungarian (2.4%), Bosnian (2.4%), Albanian (0.9%), and Slovakian (0.5%).
Singapore	Malay, Chinese (Mandarin), Tamil, and English are the official languages. Malay is the national language of Singapore, as the Malays (13% of the resident population) are constitutionally recognized as the indigenous people of Singapore. Chinese (Mandarin) is recognized as the mother tongue language of the Chinese (74% of the resident population), while Tamil is spoken by the majority of Indians (9% of the resident population). English is the language of administration and education, and serves as a common language among the different racial and ethnic groups in Singapore. According to the Singapore 2015 General Household Survey, about 37% of the resident population ages 5 and older predominantly speak English.	English is the language of instruction, although about half of the students (45%) predominantly use a language other than the language of instruction at home. Singapore has a bilingual policy in school that encourages students to be proficient in both English and their own mother tongue language.
Slovak Republic	Slovak is the official language. Hungarian is the most prevalent national minority language, followed by Ukrainian and Ruthenian.	Slovak is the language of instruction, but instruction is also provided in minority languages or in English, German, French, or Bulgarian in bilingual primary schools. Generally, instruction in minority languages is provided at separate schools, although there are schools with joint administration that provide separate classes in the national language of instruction and minority languages of instruction.
South Africa	There are 11 official languages: isiZulu (home language for 24.6% of the population), isiXhosa (17%), Afrikaans (12.1%), Sepedi (9.5%), Setswana (8.8%), English (8.3%), Sesotho (8%), Xitsonga (4.2%), siSwati (2.6%), Tshivenda (2.4%), and isiNdebele (1.6%).	English and Afrikaans are the predominant languages of instruction. In Grades 1–3, children typically learn in their home language and then have the choice to switch in Grade 4, typically to either English or Afrikaans; a minority choose their home language.
Spain	Castilian Spanish is the official language. There are 4 additional co-official languages used in the different autonomous communities: Catalan, Galician, Valencian, and Basque.	Castilian is the language of instruction, except in regions with another official language. In these regions, schools use 2 official languages, in proportions determined by the regional educational authorities. Also, a growing number of schools have adopted a Content and Language Integrated Learning curriculum, in which some of the curriculum subjects are taught in a second language, usually English. In all schools, science may be provided in a second language, but mathematics must be taught in the students' native language.
Sweden	Swedish is the official language. Finnish, Yiddish, Menkieli, Romani, and Sami are official minority languages.	Swedish is the language of instruction. Some schools provide instruction in Sami, and some private schools provide instruction in English.
Turkey	Turkish is the official language.	Turkish is the language of instruction.
United Arab Emirates	Arabic is the official language.	English is the language of instruction in Abu Dhabi public schools, and Arabic is the language of instruction in Ministry of Education (MOE) public schools. In Elite MOE schools, English is only the language of instruction for Grade 8.

Exhibit 3: Official Languages and Languages of Instruction

Reported by National Research Coordinators

(Continued)

Country	Official Languages and Major Language Subgroups	Languages of Instruction for Mathematics and Science in the Fourth and Eighth Grades
United States	There is no official national language in the United States, but English is the primary language in the country. In Fall 2016, about 90% of public elementary and secondary students spoke English as their first language. The most common home language for English Language Learner (ELL) students was Spanish/Castilian, followed by Arabic and Chinese. Spanish/Castilian was the home language for 7.7% of the public K–12 population.	English is generally the language of instruction. ELL students receive language support in a variety of program formats.
Benchmarking Participants		
Ontario, Canada	English and French are the official languages.	English and French are the languages of instruction. American Sign Language (ASL) and Quebec Sign Language (QSL) may also be used as languages of instruction.
Quebec, Canada	French is the official language. English is the major language subgroup.	French and English are languages of instruction. A large proportion of students have neither French nor English as their mother tongue.
Moscow City, Russian Fed.	Russian is the official language.	Russian is the language of instruction.
Gauteng, South Africa	Same as South Africa	
Western Cape, South Africa	Same as South Africa	
Madrid, Spain	Same as Spain	
Abu Dhabi, UAE	Same as United Arab Emirates	
Dubai, UAE	Same as United Arab Emirates	

Exhibit 4: Universal and Targeted Early Childhood Education Programs

Reported by National Research Coordinators

Early Childhood Educational Development (ECED) programs are for children under age 3, and Preprimary Education (PPE) programs are for children age 3 or older. Universal programs are accessible and available to all children (but all children do not necessarily attend these programs), while targeted programs are designed to support certain subgroups.

Country	Universal Programs			Targeted Programs		
	ECED	PPE	Number of Years Students May Attend Programs	ECED	PPE	Description of Programs or Initiatives
Albania	○	●	3	●	●	Targeted PPE programs are developed by the Agency of Quality Assurance in Pre-university Education. They are described in the Curriculum Framework of Pre-school education (https://ascap.edu.al/wp-content/uploads/2018/03/Korniza-Kurrikulare-e-arsimit-parashkollorit-IZHA-Dhjetor-2016.pdf).
Armenia	●	●	3	○	○	n/a
Australia	○	●	2	●	●	Targeted ECED and PPE program coverage varies by state but entails either specific funding to attend the programs or provision of special programs for children from low socioeconomic status backgrounds, indigenous children, children from refugee families, multiple birth children, and/or children under child protection programs.
Austria	●	●	4 or more	○	○	n/a
Azerbaijan	○	●	1	○	○	n/a
Bahrain	○	●	3	○	○	n/a
Belgium (Flemish)	○	●	3	●	●	For ECED programs, priority access is given to families who need childcare to enable parents to work, single-parent families, families with low incomes, families with foster children, and vulnerable families. For PPE programs, additional resources are provided to schools with a high population of children from families with low socioeconomic status to ensure full access to preprimary education for all. There are separate PPE classes for children that will be directed toward special education because of severe intellectual or physical disabilities.
Bosnia and Herzegovina	○	○	4 or more	○	○	n/a
Bulgaria	●	●	4 or more	○	○	n/a
Canada	●	●	4 or more	○	○	n/a
Chile	○	○	4 or more	●	●	Under the Chile Grows With You law (2009), children from low-income families are guaranteed access to half-day nursery school or kindergarten programs. Children whose parents are working, studying, or looking for work are guaranteed access to extended-hours nursery school or kindergarten programs.
Chinese Taipei	●	●	4 or more	○	○	According to legislation, public preschools give priority enrollment to children on offshore islands or in remote areas and those who need assistance economically, physically or mentally, culturally, or ethnically.
Croatia	●	●	4 or more	○	○	ECED and PPE programs are organized for all groups of children including certain subgroups, such as children from low-income families and children from minority groups.
Cyprus	○	●	4 or more	○	○	n/a
Czech Republic	○	●	4 or more	○	●	The targeted PPE programs are guaranteed by the School Act and used for the education of children with special needs, such as health, and children from different cultural environments and living conditions. Preschool education is compulsory for a child who reaches the age of 5 by the beginning of the school year. This requirement was introduced as of the 2017-2018 school year. The last year of preprimary class is free of charge.
Denmark	●	●	4 or more	●	○	Targeted ECED programs are compulsory for 1-year-old children who live in a socially vulnerable area and do not participate in a universal ECED program.
Egypt	○	○	4 or more	○	○	n/a

● Yes
○ No

Exhibit 4: Universal and Targeted Early Childhood Education Programs

Reported by National Research Coordinators

(Continued)

Early Childhood Educational Development (ECED) programs are for children under age 3, and Preprimary Education (PPE) programs are for children age 3 or older. Universal programs are accessible and available to all children (but all children do not necessarily attend these programs), while targeted programs are designed to support certain subgroups.

Country	Universal Programs			Targeted Programs		
	ECED	PPE	Number of Years Students May Attend Programs	ECED	PPE	Description of Programs or Initiatives
England	○	●	4 or more	●	●	Children are eligible for free ECED provisions from the school term after their second birthday if their parents meet prescribed means-tested criteria or if the child has special education needs, has a disability, or is in public care. Local authorities are required to secure sufficient places offering 570 hours per year, over 38–52 weeks. Children age 3 and older are entitled to additional free hours if a parent has a current positive determination of eligibility from Her Majesty's Revenue and Customs (HMRC).
Finland	●	●	4 or more	○	○	n/a
France	○	●	4 or more	○	○	Children can be enrolled in preprimary education (*école maternelle*) starting at age 2. In 2017, 12% of 2-year-olds, 97% of 3-year-olds, 99% of 4-year-olds, and 100% of 5-year-olds were enrolled.
Georgia	●	●	4 or more	○	○	n/a
Germany	●	●	4 or more	●	●	Under Social Security Code VIII (*Achtes Buch Sozialgesetzbuch Kinder-und Jugendhilfe* (R60)), the provision of education and care in daycare centers and child-minding services is adjusted to the individual child's age and developmental stage, linguistic capabilities, and life situation and interests, taking into account the child's ethnic origin in heterogeneous groups. The range of services offered is based on the needs of the children and their families. For children whose development is significantly impaired and for children with disabilities, the necessary help should be offered in an integrative form in a daycare facility for the purpose of joint care that includes all children. The daycare staff combines common education of all children with individual support, which equalizes personal and social disadvantages and contributes to more equal opportunities for children regardless of gender, or social or ethnic origin.
Hong Kong SAR	○	●	3	○	○	n/a
Hungary	○	●	4 or more	○	○	n/a
Iran, Islamic Rep. of	○	●	2	○	●	There is a 1-month PPE program before beginning Grade 1 for children of low-income families and for those who speak a language other than Farsi at home.
Ireland	○	●	4 or more	○	●	The Early Start Programme is a 1-year PPE preventative intervention scheme offered in selected DEIS institutions (Delivering Equality of Opportunity in Schools, under the Department of Education and Skills (DES) Action Plan for Educational Inclusion). This preschool program is managed, funded, and evaluated by DES; its primary objective is to tackle educational disadvantage by targeting children who are at risk of not reaching their potential within the school system. Children must be between 3 years and 2 months and 4 years and 7 months on September 1 of the year in which they are enrolled in either Early Start or the Early Childhood Care and Education scheme. DES also funds 134 Early Intervention preschool classes for children between the ages of 3 and 6 with autism spectrum disorder that are attached to recognized primary schools. Early Intervention classes have a small student-to-teacher ratio (6:1) and multiple Special Needs Assistants.
Israel	●	●	4 or more	○	○	PPE is universally provided and accessible to all 3-year-olds, regardless of socioeconomic, cultural, or ethnic background. About 25% of children under age 3 attend supervised kindergartens (ECED) that follow universal programs.
Italy	○	●	3	○	○	Targeted programs are not provided, but there are a small number of PPE schools for children with disabilities (e.g., blind or deaf).

● Yes
○ No

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Exhibit 4: Universal and Targeted Early Childhood Education Programs

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Early Childhood Educational Development (ECED) programs are for children under age 3, and Preprimary Education (PPE) programs are for children age 3 or older. Universal programs are accessible and available to all children (but all children do not necessarily attend these programs), while targeted programs are designed to support certain subgroups.

Country	Universal Programs			Targeted Programs		
	ECED	PPE	Number of Years Students May Attend Programs	ECED	PPE	Description of Programs or Initiatives
Japan	●	●	3	○	○	Children ages 3–5 attend PPE programs offered at kindergarten and daycare centers for free. ECED programs are also available for children below age 3, with tuition, but tuition is waived for low-income families. There are PPE programs for children with disabilities.
Jordan	○	●	2	○	●	The Ministry of Education provides targeted PPE programs for Kindergarten 2 (KG2) in remote and economically disadvantaged areas.
Kazakhstan	●	●	3	●	●	The aim of the ECED program is the positive socialization of children from birth to 3 years old; familiarizing them with sociocultural norms, traditions of the family, society and the state; and developing their social skills and self-study skills. The goal of PPE is the formation of spiritual and moral values, knowledge, skills and abilities in children in accordance with their age and individual capabilities, the upbringing of universal values, patriotism and tolerance, based on the national idea of "Mangilik El", as well as socio-psychological, personal, strong-willed, physical and intellectual preparation of children for school.
Korea, Rep. of	●	●	4 or more	○	○	Early childhood education and care programs are provided to all children ages 0–5, and daycare centers established by the government, local authorities, and other nonprofit corporations give priority enrollment to disadvantaged children.
Kosovo	●	●	4 or more	○	○	n/a
Kuwait	○	●	3	○	○	n/a
Latvia	●	●	4 or more	○	○	n/a
Lebanon	○	●	3	○	○	PPE is available for students in public and private schools and is highly recommended for all learners. Parents may choose between private or public school.
Lithuania	●	●	4 or more	○	○	n/a
Malaysia	●	●	4 or more	●	●	Targeted PPE programs are offered by Early Childhood Care and Education (public and private sectors) for children ages 4–6 from low-income families. Parents can choose to enroll their child in public (government) preschool or private preschool. The GENIUS Negara Program under the Ministry of Education, targets children from low-income families.
Malta	●	●	4 or more	○	○	n/a
Montenegro	●	●	4 or more	●	●	There is a specialized program that defines the form and content of educational work for children with disabilities and developmental difficulties, children without parental care, children whose parents receive social benefits, and children from the most vulnerable groups (including children facing difficulties due to social, linguistic, and cultural obstacles). Preschool education is free for all children from vulnerable groups.
Morocco	○	●	2	○	●	The Ministry of Education used to establish special classes in a limited number of schools for students with special needs. The focus of the syllabus was on educational games incorporating letters, numbers, shapes, colors, etc. A shift to integrate students with special needs in regular classes is being developed now. The syllabus is an introduction to literacy and numeracy using techniques involving play and games.

● Yes
○ No

Exhibit 4: Universal and Targeted Early Childhood Education Programs

Reported by National Research Coordinators

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(Continued)

Early Childhood Educational Development (ECED) programs are for children under age 3, and Preprimary Education (PPE) programs are for children age 3 or older. Universal programs are accessible and available to all children (but all children do not necessarily attend these programs), while targeted programs are designed to support certain subgroups.

Country	Universal Programs			Targeted Programs		
	ECED	PPE	Number of Years Students May Attend Programs	ECED	PPE	Description of Programs or Initiatives
Netherlands	○	○	2	●	●	*Voor-en Vroegschoolse Educatie* (VVE) is meant for children ages 2–5 who have a deficiency in language or general development; these programs are not compulsory but enable children to learn in a playful manner before they begin primary school. Children typically attend 2 times per week but may attend more often if their development is behind that of their peers. The municipality is responsible for VVE and is responsible for implementing the national ECED and PPE programs. VVE pays particular attention to language development (e.g., vocabulary), basic mathematics (e.g., counting, measuring and orientation in space and time), development of fine and gross motor skills, and social-emotional development, including independence, self-confidence, and playing with peers.
New Zealand	○	●	3	○	○	Free hours are available to all universal PPE programs, regardless of family income, or the family or child's immigration status. Targeted funding is provided to early childhood education (ECE) services and *ngā kōhanga reo* with high proportions (20% or above) of children (*tamariki*) from disadvantaged backgrounds.
North Macedonia	●	●	4 or more	●	●	There is a specialized program that defines the form and content of education for children with disabilities and developmental difficulties. Preschool education is free for all children from vulnerable groups.
Northern Ireland	○	●	1	●	●	Sure Start is a government program that provides a range of support services for parents and children under age 4 who live in disadvantaged areas. It aims to give children the best start in life by supporting parents from pregnancy to early childhood. Sure Start complements the work of existing local services and provides young families with advice on addressing specialized needs or difficulties.
Norway	●	●	4 or more	○	○	By law, all children have the right to preprimary education, but it is not mandatory. The municipalities are responsible for providing preprimary education, either by running public kindergartens or by supporting private kindergartens.
Oman	○	○	3	○	●	Targeted PPE programs are provided in private schools.
Pakistan	○	●	2	○	○	n/a
Philippines	●	●	4 or more	○	○	n/a
Poland	○	●	4 or more	○	○	n/a
Portugal	○	●	3	○	○	n/a
Qatar	●	●	2	○	○	n/a
Romania	●	●	4 or more	○	○	n/a
Russian Federation	○	●	4 or more	○	●	Targeted PPE programs are provided for children ages 3 or older with impaired hearing, vision, physical health, or mental development.
Saudi Arabia	○	●	2	○	○	n/a

● Yes
○ No

Exhibit 4: Universal and Targeted Early Childhood Education Programs

Reported by National Research Coordinators

(Continued)

Early Childhood Educational Development (ECED) programs are for children under age 3, and Preprimary Education (PPE) programs are for children age 3 or older. Universal programs are accessible and available to all children (but all children do not necessarily attend these programs), while targeted programs are designed to support certain subgroups.

Country	Universal Programs			Targeted Programs		
	ECED	PPE	Number of Years Students May Attend Programs	ECED	PPE	Description of Programs or Initiatives
Serbia	●	●	4 or more	●	●	Legislation provides for 3 types of targeted programs: special, specialized, and other. They are intended for children from the most vulnerable social groups, including children with special needs, Roma children, and children from rural and economically deprived communities and families. Special programs are comprehensive educational programs aimed at the overall development of the child and include additional support for families. Specialized programs are narrower educational programs with an emphasis on the individual preferences of the child or that relate to different areas of educational work with children. The education institution may, to adapt to the specific needs of children and families, organize other programs (e.g. for socialization, cultivating creative expression, etc.), as well as multiday programs at the institution. Public preschools give priority enrollment to children who need economic, physical, mental, or cultural support.
Singapore	○	○	4 or more	●	●	The Early Childhood Development Agency (ECDA) runs the Preschool Outreach Programme targeting low-income families with children age 3 or older who are not already enrolled in a PPE program. The program works with outreach agencies to visit these families and assist them with placement in a PPE program by aiding in the registration process, preparing supporting documents needed for subsidy applications, addressing other needs the families may have with regard to enrollment, and then continuing to follow up with the families until the child has achieved regular attendance. ECDA introduced KidSTART in 2016, a pilot program to provide an ecosystem of support for low-income children and their families in areas ranging from child development to health and parenting skills. Preschools also provide programs for children with learning and other developmental needs. Additionally, a variety of methods are used to offset the cost of ECED and PPE programs, including grant subsidies and fee caps.
Slovak Republic	○	●	3	○	○	n/a
South Africa	○	●	1	○	○	n/a
Spain	○	●	4 or more	●	○	The first cycle of ECED programs is not free, but since 2006, there has been a gradual increase in the number of publicly funded schools in collaboration with regional education authorities. Public school authorities establish the fees and typically regulate the maximum public cost after taking into account the following criteria: having multiple children attending the same school, family income, extended school hours, and use of the canteen service. The second cycle of this noncompulsory educational stage (PPE) is free, leading to an enrollment rate close to 100%.
Sweden	●	●	4 or more	○	○	In 2018, preschool class (for children ages 6 and 7) was made mandatory. Preschool has its own curriculum that is closely linked to that of primary school, and preschool classes are often located in the same building as primary school.
Turkey	○	●	4 or more	○	○	n/a
United Arab Emirates	○	●	2	○	○	The government provides PPE programs that include kindergarten for all Emirati children from age 3 years and 8 months, regardless of families' socioeconomic status.

● Yes
○ No

Exhibit 4: Universal and Targeted Early Childhood Education Programs

Reported by National Research Coordinators

(Continued)

Early Childhood Educational Development (ECED) programs are for children under age 3, and Preprimary Education (PPE) programs are for children age 3 or older. Universal programs are accessible and available to all children (but all children do not necessarily attend these programs), while targeted programs are designed to support certain subgroups.

Country	Universal Programs			Targeted Programs		
	ECED	PPE	Number of Years Students May Attend Programs	ECED	PPE	Description of Programs or Initiatives
United States	Varies by state	Varies by state	4 or more	●	●	The Head Start or Early Head Start programs offer targeted federal entitlement programs for low-income families who meet specific requirements. There are also targeted entitlement programs for children with disabilities. The specifics of the services delivered by the Head Start or Early Head Start programs differ across states and are shaped by the needs of the local communities being targeted. There are 17 states that require districts to offer full-day kindergarten programs, and 28 states that require half-day programs. The majority of states require that the kindergarten entrance age be 5 years old.
Benchmarking Participants						
Ontario, Canada	○	●	4 or more	○	○	In the province of Ontario, all students may attend full-day kindergarten. Attendance is not compulsory in Ontario public schools until age 6.
Quebec, Canada	●	●	4 or more	○	○	n/a
Moscow City, Russian Fed.	●	●	4 or more	●	●	There are targeted ECED and PPE programs that prioritize development (e.g., physical development, aesthetic development, etc.) as well as correctional programs for children with disabilities.
Gauteng, South Africa	Same as South Africa					
Western Cape, South Africa	Same as South Africa					
Madrid, Spain	Same as Spain					
Abu Dhabi, UAE	Same as United Arab Emirates					
Dubai, UAE	Same as United Arab Emirates					

● Yes
○ No

Exhibit 5: Topics Covered by Early Childhood Education Curriculum Guidance Documents*

Reported by National Research Coordinators

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Country	Has National Early Childhood Education Curriculum Guidance Documents		Topics Covered in Curriculum Guidance Documents											
			Socio-Emotional Development		Physical Development and Health Education		Oral Language Development and Communication Skills		Reading and Literacy Skills		Mathematics		Science	
	ECED	PPE	ECED	PPE	ECED	PPE	ECED	PPE	ECED	PPE	ECED	PPE	ECED	PPE
Albania	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Armenia	○	○	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Australia	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Austria	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Azerbaijan	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Bahrain	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	○
Belgium (Flemish)	●	●	●	●	●	●	●	●	○	●	○	●	○	●
Bosnia and Herzegovina	●	●	●	●	●	●	●	●	●	●	●	●	●	–
Bulgaria	●	●	●	●	●	●	○	●	○	●	○	●	○	●
Canada	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Chile	●	●	●	●	●	●	●	●	●	●	●	●	●	○
Chinese Taipei	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Croatia	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Cyprus	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Czech Republic	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Denmark	●	●	●	●	●	●	●	○	○	○	○	●	●	●
Egypt	○	○	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
England	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Finland	●	●	●	●	●	●	●	●	○	●	○	●	○	●
France	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Georgia	○	○	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Germany	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hong Kong SAR	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	n/a
Hungary	○	●	n/a	●	n/a	●	n/a	○	n/a	●	n/a	●	n/a	○
Iran, Islamic Rep. of	○	●	n/a	●	n/a	●	n/a	○	n/a	●	n/a	●	n/a	●
Ireland	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Israel	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Italy	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Japan	○	●	n/a	●	n/a	●	n/a	●	n/a	○	n/a	○	n/a	●
Jordan	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	○
Kazakhstan	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Korea, Rep. of	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Kosovo	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Kuwait	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	○
Latvia	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Lebanon	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Lithuania	●	●	●	●	●	●	●	●	○	●	○	●	○	●
Malaysia	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Malta	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	○
Montenegro	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Morocco	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Netherlands	○	○	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

● Yes
○ No

* ECED (Early Childhood Education Development) programs are for children under age 3 and PPE (Preprimary Education) programs include Kindergarten for children age 3 or older.

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Exhibit 5: Topics Covered by Early Childhood Education Curriculum Guidance Documents*

Reported by National Research Coordinators

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(Continued)

Country	Has National Early Childhood Education Curriculum Guidance Documents		Topics Covered in Curriculum Guidance Documents											
			Socio-Emotional Development		Physical Development and Health Education		Oral Language Development and Communication Skills		Reading and Literacy Skills		Mathematics		Science	
	ECED	PPE	ECED	PPE	ECED	PPE	ECED	PPE	ECED	PPE	ECED	PPE	ECED	PPE
New Zealand	●	●	●	●	●	●	●	●	●	●	●	●	●	●
North Macedonia	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Northern Ireland	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Norway	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Oman	○	○	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pakistan	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	○
Philippines	●	●	●	●	●	●	●	●	●	●	○	○	○	○
Poland	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	○
Portugal	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Qatar	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Romania	●	●	●	●	●	●	●	●	●	●	●	●	●	○
Russian Federation	○	●	n/a	●	n/a	●	n/a	○	n/a	○	n/a	○	n/a	●
Saudi Arabia	○	○	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Serbia	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Singapore	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Slovak Republic	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
South Africa	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Spain	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Sweden	●	●	●	●	●	●	●	●	●	●	●	●	●	○
Turkey	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	○
United Arab Emirates	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
United States	○	○	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Benchmarking Participants														
Ontario, Canada	○	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●	n/a	●
Quebec, Canada	●	●	●	●	●	●	●	●	●	●	●	●	●	○
Moscow City, Russian Fed.	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Gauteng, South Africa	Same as South Africa													
Western Cape, South Africa	Same as South Africa													
Madrid, Spain	Same as Spain													
Abu Dhabi, UAE	Same as United Arab Emirates													
Dubai, UAE	Same as United Arab Emirates													

● Yes
○ No

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Exhibit 6: Status of Fourth Grade Mathematics and Science Curricula

Reported by National Research Coordinators

Country	Mathematics			Science		
	National Curriculum	Year Introduced	Being Revised	National Curriculum	Year Introduced	Being Revised
Albania	●	Introduced in 2014; implemented in 2018	○	●	Introduced in 2014; implemented in 2018	○
Armenia	●	2014	○	●	2012	○
Australia	●	Introduced in 2012; revised in 2015	○	●	Introduced in 2012; revised in 2015	○
Austria	●	2003	●	●	2011	●
Azerbaijan	●	2008	○	●	2008	○
Bahrain	●	2017	○	●	2017	○
Belgium (Flemish)	Varies by school network organization	1998	●	Varies by school network organization	1998	●
Bosnia and Herzegovina	○	Varies by entity/canton/ *Brčko* District	Varies by entity/canton/ *Brčko* District	Varies by entity/canton/ *Brčko* District	Varies by entity/canton/ *Brčko* District	Varies by entity/canton/ *Brčko* District
Bulgaria	●	2003	●	●	2003	●
Canada	Varies by province	2001–2015 (varies by province)	● (varies by province)	Varies by province	1996–2019 (varies by province)	● (varies by province)
Chile	●	2012	○	●	2012	○
Chinese Taipei	●	Introduced in 2004; minor revision in 2008	●	●	Introduced in 2004; minor revision in 2008	●
Croatia	●	2006	●	●	2006	●
Cyprus	●	2014	●	●	2011	●
Czech Republic	●	Introduced in 2007; minor revisions in 2013 and 2016	○	●	Introduced in 2007; minor revisions in 2016	○
Denmark	●	2015	●	●	2015	●
England	●	2014	○	●	2014	○
Finland	●	Introduced in 2014; implemented in 2016	○	●	Introduced in 2014; implemented in 2016	○
France	●	Introduced in 2015; revised in 2018	○	●	Introduced in 2015; revised in 2018	○
Georgia	●	Introduced in 2011; fully implemented in 2016	○	●	Introduced in 2011; fully implemented in 2016	○
Germany	Varies by state	2008 (varies by state)	○ (varies by state)	Varies by state	2012 (varies by state)	○ (varies by state)
Hong Kong SAR	●	2002	●	●	2017	○
Hungary	●	2013	●	●	2013	●
Iran, Islamic Rep. of	●	2014	●	●	Introduced in 2010; implemented in 2012	●
Ireland	●	2001	●	●	2003	○
Italy	●	2012	○	●	2012	○
Japan	●	Introduced in 2009; implemented in 2011	●	●	Introduced in 2009; implemented in 2011	●
Kazakhstan	●	2018	○	●	2018	○
Korea, Rep. of	●	Introduced in 2015; implemented in 2018	○	●	Introduced in 2015; implemented in 2018	○
Kosovo	●	Introduced in 2016; will be fully implemented by the 2020–2021 school year	○	●	Introduced in 2016; will be fully implemented by the 2020–2021 school year	○
Kuwait	●	Introduced in 2016; implemented in 2018	●	●	Introduced in 2016; implemented in 2018	●
Latvia	●	2014	●	●	2014	●

● Yes
○ No

SOURCE: IEA's Trends in International Mathematics and Science Study - TIMSS 2019

IEA TIMSS & PIRLS International Study Center
Lynch School of Education
BOSTON COLLEGE

Exhibit 6: Status of Fourth Grade Mathematics and Science Curricula

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Mathematics			Science		
	National Curriculum	Year Introduced	Being Revised	National Curriculum	Year Introduced	Being Revised
Lithuania	●	2008	●	●	2008	●
Malta	●	2014	●	●	1999	●
Montenegro	●	2017	○	●	2017	○
Morocco	●	2004	●	●	2004	●
Netherlands	●	2009	●	Noncompulsory curriculum structure	2009	●
New Zealand	●	Introduced in 2008; fully implemented in 2010	○	●	Introduced in 2008; fully implemented in 2010	○
North Macedonia	●	2015	○	●	2015	○
Northern Ireland	●	2007	○	●	2007	○
Norway	●	2006	●	●	2006	●
Oman	●	2017	●	●	2017	●
Pakistan	●	2006	●	●	2006	●
Philippines	●	2016	○	●	2016	○
Poland	●	2017	○	●	2017	○
Portugal	●	Introduced in 2007; minor revision in 2014	○	●	Introduced in 2001; minor revision in 2006	○
Qatar	●	2018	●	●	2018	●
Russian Federation	●	2011	●	●	2011	●
Saudi Arabia	●	2011	●	●	2011	●
Serbia	●	2006	●	●	2006	●
Singapore	●	2013	●	●	2014	●
Slovak Republic	●	2015	○	●	2015	○
South Africa	●	2012	○	●	2012	○
Spain	●	Introduced in 2014; implemented in 2015	○	●	Introduced in 2014; implemented in 2015	○
Sweden	●	Introduced in 2011; revised in 2018	○	●	Introduced in 2011; revised in 2018	○
Turkey	●	2018	○	●	Introduced in 2017; implemented in 2018	○
United Arab Emirates	●	2016	●	●	2016	●
United States	Varies by state	2007–2017 (varies by state)	● (varies by state)	Varies by state	2002–2018 (varies by state)	● (varies by state)
Benchmarking Participants						
Ontario, Canada	●	2005	●	●	Introduced in 2007; implemented in 2008	○
Quebec, Canada	●	2001	○	●	2001	○
Moscow City, Russian Fed.	●	2011	●	●	2011	●
Madrid, Spain	Same as Spain					
Abu Dhabi, UAE	Same as United Arab Emirates					
Dubai, UAE	Same as United Arab Emirates					

● Yes
○ No

Exhibit 7: Status of Eighth Grade Mathematics and Science Curricula

Reported by National Research Coordinators

Country	Mathematics			Science		
	National Curriculum	Year Introduced	Being Revised	National Curriculum	Year Introduced	Being Revised
Australia	●	Introduced in 2012; revised in 2015	○	●	Introduced in 2012; revised in 2015	○
Bahrain	●	2017	○	●	2017	○
Chile	●	Approved in 2013; implemented in 2016	○	●	Approved in 2013; implemented in 2016	○
Chinese Taipei	●	Introduced in 2004; minor revision in 2008	●	●	Introduced in 2004; minor revision in 2008	●
Cyprus	●	2012	●	●	2015	●
Egypt	●	2003	●	●	2008	●
England	●	2014	○	●	2014	○
Finland	●	Introduced in 2014; implemented in 2018	○	●	Introduced in 2014; implemented in 2018	○
France	●	Introduced in 2015; minor revision in 2018	○	●	2015	●
Georgia	●	Introduced in 2011; fully implemented in 2016	●	●	Introduced in 2011; fully implemented in 2016	●
Hong Kong SAR	●	2001	●	●	1998	○
Hungary	●	2013	●	●	2013	●
Iran, Islamic Rep. of	●	2014	●	●	Introduced in 2010; implemented in 2013	●
Ireland	●	Introduced in 2010; implemented in 2013	●	●	2016	●
Israel	●	Introduced in 2009; officially approved in 2014	○	●	2011	●
Italy	●	2012	○	●	2012	○
Japan	●	Introduced in 2009; implemented in 2012	●	●	Introduced in 2009; implemented in 2012	●
Jordan	●	2003	○	●	2003	○
Kazakhstan	●	2018	○	●	2018	○
Korea, Rep. of	●	2014	○	●	2014	○
Kuwait	●	2018	●	●	2018	●
Lebanon	●	1997	○	●	1997	○
Lithuania	●	2008	●	●	2008	●
Malaysia	●	2017	○	●	2017	●
Morocco	●	2004	○	●	2004	○
New Zealand	●	Introduced in 2008; fully implemented in 2010	○	●	Introduced in 2008; fully implemented in 2010	○
Norway	●	2006	●	●	2006	●
Oman	●	2002	●	●	2005	●
Portugal	●	Introduced in 2007; minor revision in 2014	○	●	2001	○
Qatar	●	2018	●	●	2018	●
Romania	●	2017	○	●	2017	○
Russian Federation	●	2015	●	●	2015	●
Saudi Arabia	●	2011	●	●	2011	●
Singapore	●	2013	○	●	2013	●
South Africa	●	2012	○	●	2012	○

● Yes
○ No

Exhibit 7: Status of Eighth Grade Mathematics and Science Curricula

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Mathematics			Science		
	National Curriculum	Year Introduced	Being Revised	National Curriculum	Year Introduced	Being Revised
Sweden	●	Introduced in 2011; revised in 2018	○	●	Introduced in 2011; revised in 2018	○
Turkey	●	2018	○	●	Introduced in 2017; implemented in 2018	○
United Arab Emirates	●	2016	●	●	2016	●
United States	Varies by state	2007–2017 (varies by state)	● (varies by state)	Varies by state	2008–2018 (varies by state)	● (varies by state)
Benchmarking Participants						
Ontario, Canada	●	2005	●	●	Introduced in 2007; implemented in 2008	○
Quebec, Canada	●	2005	○	●	2006	○
Moscow City, Russian Fed.	●	2015	●	●	2015	●
Gauteng, South Africa	Same as South Africa					
Western Cape, South Africa	Same as South Africa					
Abu Dhabi, UAE	Same as United Arab Emirates					
Dubai, UAE	Same as United Arab Emirates					

● Yes
○ No

Exhibit 8: Instructional Time Devoted to Mathematics and Science Curricula at the Fourth Grade

Reported by National Research Coordinators

Country	Percentage of Total Instructional Time	
	Mathematics	Science
Albania	16%	8%
Armenia	14%	7%
Australia	Varies by state (approximately 18%)	Varies by state (approximately 7%)
Austria	Approximately 18%	Approximately 14%
Azerbaijan	16%	8%
Bahrain	20%	13%
Belgium (Flemish)	Not specified in curriculum	Not specified in curriculum
Bosnia and Herzegovina	20%	10%
Bulgaria	18%	7%
Canada	15–20% (varies by province)	5–15% (varies by province)
Chile	12–20% (recommended)	7–10% (recommended)
Chinese Taipei	10–15%	8–11%
Croatia	22%	17%
Cyprus	20%	6%
Czech Republic	20%	7%
Denmark	17%	10%
England	Not specified in curriculum	Not specified in curriculum
Finland	14%	10%
France	21%	8%
Georgia	20%	8%
Germany	Varies by state (approximately 20%)	Varies by state (approximately 15%)
Hong Kong SAR	12–15%	12–15% (recommended)
Hungary	13–20%	4–8%
Iran, Islamic Rep. of	16%	12%
Ireland	19%	4% (recommended)
Italy	Not specified in curriculum	Not specified in curriculum
Japan	18%	11%
Kazakhstan	18%	7%
Korea, Rep. of	14%	10%
Kosovo	21%	8%
Kuwait	14%	6%
Latvia	19%	8%
Lithuania	18%	8%
Malta	15%	15%
Montenegro	19%	10%
Morocco	16%	5%
Netherlands	Not specified in curriculum	Not specified in curriculum
New Zealand	Not specified in curriculum	Not specified in curriculum
North Macedonia	21%	9%
Northern Ireland	Not specified in curriculum	Not specified in curriculum
Norway	12–17%	2–7%
Oman	15%	13%
Pakistan	20%	20%
Philippines	14%	14%
Poland	16%	8%
Portugal	28%	12%
Qatar	Not specified in curriculum	9%
Russian Federation	16%	8%
Saudi Arabia	16%	9%

Exhibit 8: Instructional Time Devoted to Mathematics and Science Curricula at the Fourth Grade

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Percentage of Total Instructional Time	
	Mathematics	Science
Serbia	21%	8–13%
Singapore	20%	8%
Slovak Republic	15%	11%
South Africa	22%	13%
Spain	Varies by region (approximately 15–18%)	Varies by region (approximately 6–10%)
Sweden	15%	12%
Turkey	Not specified in curriculum, but approximately 20%	Not specified in curriculum, but approximately 11%
United Arab Emirates	20%	12%
United States	Varies by school district	Varies by school district
Benchmarking Participants		
Ontario, Canada	20%	Not specified in curriculum
Quebec, Canada	Not specified in curriculum	Not specified in curriculum
Moscow City, Russian Fed.	16%	8%
Madrid, Spain	Same as Spain	
Abu Dhabi, UAE	Same as United Arab Emirates	
Dubai, UAE	Same as United Arab Emirates	

Exhibit 9: Instructional Time Devoted to Mathematics and Science Curricula at the Eighth Grade

Reported by National Research Coordinators

Country	Percentage of Total Instructional Time	
	Mathematics	Science
Australia	Varies by state (approximately 12%)	Varies by state (approximately 10%)
Bahrain	20%	13%
Chile	16–18% (recommended)	10–12% (recommended)
Chinese Taipei	10–15%	8–11%
Cyprus	11%	14%
Egypt	Approximately 15–20%	Approximately 10–15%
England	Not specified in curriculum	Not specified in curriculum
Finland	14%	19%
France	14%	12%
Georgia	16%	25%
Hong Kong SAR	12–15%	10–15%
Hungary	10–15% (recommended)	15–20% (recommended)
Iran, Islamic Rep. of	13%	10%
Ireland	Not specified in curriculum	Not specified in curriculum
Israel	14%	14%
Italy	13%	7%
Japan	10%	14%
Jordan	15%	13%
Kazakhstan	14%	6%
Korea, Rep. of	11%	12%
Kuwait	14%	11%
Lebanon	14%	17%
Lithuania	13%	20%
Malaysia	12%	12%
Morocco	13%	13%
New Zealand	Not specified in curriculum	Not specified in curriculum
Norway	12%	10%
Oman	17.5%	15%
Portugal	13%	20%
Qatar	Not specified in curriculum	12%
Romania	Not specified in curriculum	Not specified in curriculum
Russian Federation	16%	19%
Saudi Arabia	14%	11%
Singapore	13–18%	9–14%
South Africa	16%	11%
Sweden	15%	12%
Turkey	Not specified in curriculum, but approximately 20%	Not specified in curriculum, but approximately 11%
United Arab Emirates	20%	15%
United States	Varies by school district	Varies by school district
Benchmarking Participants		
Ontario, Canada	20%	Not specified in curriculum
Quebec, Canada	17%	11%
Moscow City, Russian Fed.	16%	19%
Gauteng, South Africa	Same as South Africa	
Western Cape, South Africa	Same as South Africa	
Abu Dhabi, UAE	Same as United Arab Emirates	
Dubai, UAE	Same as United Arab Emirates	

Exhibit 10: Grades Mathematics and Science First Taught by Specialist Teachers

Reported by National Research Coordinators

Country	Grades Mathematics and Science First Taught by Specialist Teachers	
	Mathematics	Science
Albania	Grade 5	Grade 5
Armenia	Grade 1	Grade 2
Australia	Typically Year 7 (Year 8 in South Australia), but varies by school	Typically Year 7 (Year 8 in South Australia), but varies by school
Austria	Grade 5	Grade 5
Azerbaijan	Grade 5	Grade 6, 7, or 8
Bahrain	Grade 4	Grade 4
Belgium (Flemish)	Grade 7	Grade 7
Bosnia and Herzegovina	Grade 5 or 6 (varies by school)	Grade 5 or 6 (varies by school)
Bulgaria	Typically Grade 5, but sometimes earlier	Typically Grade 5, but sometimes earlier
Canada	Typically Grade 7 (varies by province and by school)	Typically Grade 7 (varies by province and by school)
Chile	Typically Grade 7 or 8; all students must be taught by subject specialists beginning in Grade 9	Typically Grade 7 or 8; all students must be taught by subject specialists beginning in Grade 9
Chinese Taipei	Grade 7	Grade 7
Croatia	Grade 5	Grade 5
Cyprus	Grade 7	Grade 7
Czech Republic	Typically Grade 6, but sometimes Grade 3 or 4 (varies by school)	Typically Grade 6, but sometimes Grade 3 or 4 (varies by school)
Denmark	Grade 1; teachers hold grade-specific subject specializations	Grade 1; teachers hold grade-specific subject specializations
Egypt	Grade 4	Grade 4
England	Typically Year 7 (Grade 6), but sometimes earlier or later	Typically Year 7
Finland	Typically Grade 7	Typically Grade 7
France	Grade 6	Grade 6
Georgia	Grade 5	Grade 5
Germany	Grade 5	Grade 5
Hong Kong SAR	Typically the beginning of secondary education (varies by school)	Grade 7
Hungary	Grade 5	Grade 5
Iran, Islamic Rep. of	Grade 7	Grade 7
Ireland	Grade 7	Grade 7
Israel	Grade 3 (recommended)	Grade 4
Italy	Grade 6	Grade 6
Japan	Grade 7	Grade 7
Jordan	Grade 4	Grade 4
Kazakhstan	Grade 5	Grade 5
Korea, Rep. of	Typically Grade 7	Grade 7
Kosovo	Grade 6	Grade 6
Kuwait	Grade 1	Grade 1
Latvia	Typically Grade 5, but may be in Grades 1–7 (varies by school)	Typically Grade 5, sometimes earlier (varies by school)
Lebanon	Grade 7	Grade 7
Lithuania	Grade 5	Grade 5
Malaysia	Typically Primary 1 (Grade 1)	Typically Primary 1 (Grade 1)
Malta	Year 7	Year 3
Montenegro	Grade 6	Grade 6
Morocco	Grade 7	Grade 7
Netherlands	Grade 7	Grade 7
New Zealand	Year 9 (Grade 8)	Year 9 (Grade 8)

Exhibit 10: Grades Mathematics and Science First Taught by Specialist Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Grades Mathematics and Science First Taught by Specialist Teachers	
	Mathematics	Science
North Macedonia	Grade 6	Grade 5
Northern Ireland	Typically Year 8 (Grade 6)	Typically Year 8 (Grade 6)
Norway	Varies by teachers' education	Varies by teachers' education
Oman	Grade 5	Grade 5
Pakistan	Beginning of secondary school	Beginning of secondary school
Philippines	Typically Grade 7 (varies by teachers' education)	Typically Grade 7 (varies by teachers' education)
Poland	Grade 4	Grade 4
Portugal	Grade 5	Grade 5 for natural sciences; Grade 7 for physical sciences, including physics and chemistry
Qatar	Grade 3	Typically Grade 3
Romania	Grade 5	Grade 5
Russian Federation	Grade 5	Grade 5 for biology and geography; Grade 7 for physics; Grade 8 for chemistry
Saudi Arabia	Grade 7	Grade 7
Serbia	Grade 5	Grade 5
Singapore	Secondary 1 (Grade 7)	Secondary 1 (Grade 7)
Slovak Republic	Typically Grade 5 (varies by school)	Typically Grade 5 (varies by school)
South Africa	Typically Grade 7	Typically Grade 7
Spain	Grade 7	Grade 7
Sweden	Typically Grade 4	Typically Grade 4
Turkey	Grade 5	Grade 5
United Arab Emirates	Grade 4	Grade 4
United States	Typically Grade 6 (varies across states, districts, and schools)	Typically Grade 6 (varies across states, districts, and schools)
Benchmarking Participants		
Ontario, Canada	Grade 9	Grade 11
Quebec, Canada	Secondary 1 (Grade 7)	Secondary 1 (Grade 7)
Moscow City, Russian Fed.	Grade 5	Grade 5 for biology and geography; Grade 7 for physics; Grade 8 for chemistry
Gauteng, South Africa	Same as South Africa	
Western Cape, South Africa	Same as South Africa	
Madrid, Spain	Same as Spain	
Abu Dhabi, UAE	Same as United Arab Emirates	
Dubai, UAE	Same as United Arab Emirates	

Exhibit 11: Number of TIMSS Mathematics Topics Intended to Be Taught by the End of Fourth Grade

Reported by National Research Coordinators

Country	All Mathematics (17 Topics)			Number (7 Topics)			Measurement and Geometry (7 Topics)			Data (3 Topics)		
	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4
Albania	10	0	7	7	0	0	3	0	4	0	0	3
Armenia	16	0	1	6	0	1	7	0	0	3	0	0
Australia	14	2	1	6	1	0	5	1	1	3	0	0
Austria	15	0	2	6	0	1	6	0	1	3	0	0
Azerbaijan	12	0	5	5	0	2	4	0	3	3	0	0
Bahrain	17	0	0	7	0	0	7	0	0	3	0	0
Belgium (Flemish)	17	0	0	7	0	0	7	0	0	3	0	0
Bosnia and Herzegovina	10	0	7	3	0	4	7	0	0	0	0	3
Bulgaria	13	0	4	5	0	2	5	0	2	3	0	0
Canada	15	0	2	7	0	0	5	0	2	3	0	0
Chile	17	0	0	7	0	0	7	0	0	3	0	0
Chinese Taipei	11	1	5	6	0	1	2	1	4	3	0	0
Croatia	9	1	7	3	0	4	6	1	0	0	0	3
Cyprus	7	10	0	3	4	0	3	4	0	1	2	0
Czech Republic	10	4	3	5	0	2	4	2	1	1	2	0
Denmark	17	0	0	7	0	0	7	0	0	3	0	0
England	14	0	3	7	0	0	4	0	3	3	0	0
Finland	15	1	1	6	1	0	6	0	1	3	0	0
France	11	4	2	3	3	1	5	1	1	3	0	0
Georgia	10	0	7	4	0	3	3	0	4	3	0	0
Germany	13	1	3	5	0	2	5	1	1	3	0	0
Hong Kong SAR	14	0	3	5	0	2	6	0	1	3	0	0
Hungary	14	0	3	5	0	2	6	0	1	3	0	0
Iran, Islamic Rep. of	17	0	0	7	0	0	7	0	0	3	0	0
Ireland	17	0	0	7	0	0	7	0	0	3	0	0
Italy	14	0	3	7	0	0	4	0	3	3	0	0
Japan	16	0	1	6	0	1	7	0	0	3	0	0
Kazakhstan	17	0	0	7	0	0	7	0	0	3	0	0
Korea, Rep. of	14	0	3	6	0	1	6	0	1	2	0	1
Kosovo	13	0	4	6	0	1	6	0	1	1	0	2
Kuwait	17	0	0	7	0	0	7	0	0	3	0	0
Latvia	14	0	3	6	0	1	5	0	2	3	0	0
Lithuania	16	0	1	6	0	1	7	0	0	3	0	0
Malta	16	0	1	7	0	0	6	0	1	3	0	0
Montenegro	15	0	2	5	0	2	7	0	0	3	0	0
Morocco	14	0	3	7	0	0	7	0	0	0	0	3
Netherlands	8	3	6	3	0	4	4	1	2	1	2	0
New Zealand	11	6	0	6	1	0	3	4	0	2	1	0
North Macedonia	4	8	5	2	5	0	1	2	4	1	1	1
Northern Ireland	13	1	3	5	0	2	5	1	1	3	0	0
Norway	9	0	8	6	0	1	2	0	5	1	0	2
Oman	10	0	7	7	0	0	2	0	5	1	0	2
Pakistan	14	0	3	7	0	0	5	0	2	2	0	1
Philippines	17	0	0	7	0	0	7	0	0	3	0	0
Poland	15	1	1	5	1	1	7	0	0	3	0	0

Because of rounding, some results may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study - TIMSS 2019
Downloaded from http://timss2019.org/encyclopedia/download

TIMSS & PIRLS International Study Center
Lynch School of Education
BOSTON COLLEGE

Exhibit 11: Number of TIMSS Mathematics Topics Intended to Be Taught by the End of Fourth Grade

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	All Mathematics (17 Topics)			Number (7 Topics)			Measurement and Geometry (7 Topics)			Data (3 Topics)		
	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4
Portugal	17	0	0	7	0	0	7	0	0	3	0	0
Qatar	16	0	1	7	0	0	7	0	0	2	0	1
Russian Federation	12	0	5	5	0	2	5	0	2	2	0	1
Saudi Arabia	17	0	0	7	0	0	7	0	0	3	0	0
Serbia	12	0	5	5	0	2	7	0	0	0	0	3
Singapore	15	0	2	6	0	1	6	0	1	3	0	0
Slovak Republic	12	0	5	5	0	2	4	0	3	3	0	0
South Africa	14	0	3	6	0	1	5	0	2	3	0	0
Spain	13	0	4	5	0	2	6	0	1	2	0	1
Sweden	12	0	5	5	0	2	5	0	2	2	0	1
Turkey	11	0	6	6	0	1	4	0	3	1	0	2
United Arab Emirates	17	0	0	7	0	0	7	0	0	3	0	0
United States	17	0	0	7	0	0	7	0	0	3	0	0
International Average	**14**	**1**	**3**	**6**	**0**	**1**	**5**	**0**	**1**	**2**	**0**	**1**
Benchmarking Participants												
Ontario, Canada	17	0	0	7	0	0	7	0	0	3	0	0
Quebec, Canada	16	0	1	7	0	0	6	0	1	3	0	0
Moscow City, Russian Fed.	12	0	5	5	0	2	5	0	2	2	0	1
Madrid, Spain	Same as Spain											
Abu Dhabi, UAE	Same as United Arab Emirates											
Dubai, UAE	Same as United Arab Emirates											

Exhibit 12: Number of TIMSS Science Topics Intended to Be Taught by the End of Fourth Grade

Reported by National Research Coordinators

Country	All Science (26 Topics)			Life Science (7 Topics)			Physical Science (12 Topics)			Earth Science (7 Topics)		
	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4
Albania	18	0	8	3	0	4	12	0	0	3	0	4
Armenia	19	0	7	6	0	1	7	0	5	6	0	1
Australia	16	6	4	6	1	0	4	4	4	6	1	0
Austria	24	0	2	7	0	0	12	0	0	5	0	2
Azerbaijan	12	0	14	5	0	2	2	0	10	5	0	2
Bahrain	26	0	0	7	0	0	12	0	0	7	0	0
Belgium (Flemish)	12	0	14	6	0	1	3	0	9	3	0	4
Bosnia and Herzegovina	14	0	12	5	0	2	4	0	8	5	0	2
Bulgaria	22	0	4	6	0	1	11	0	1	5	0	2
Canada	26	0	0	7	0	0	12	0	0	7	0	0
Chile	19	0	7	6	0	1	8	0	4	5	0	2
Chinese Taipei	11	0	15	4	0	3	7	0	5	0	0	7
Croatia	16	0	10	6	0	1	6	0	6	4	0	3
Cyprus	21	0	5	6	0	1	9	0	3	6	0	1
Czech Republic	11	2	13	7	0	0	1	0	11	3	2	2
Denmark	19	0	7	6	0	1	6	0	6	7	0	0
England	21	0	5	7	0	0	11	0	1	3	0	4
Finland	9	0	17	5	0	2	3	0	9	1	0	6
France	5	12	9	2	4	1	2	5	5	1	3	3
Georgia	19	0	7	6	0	1	9	0	3	4	0	3
Germany	26	0	0	7	0	0	12	0	0	7	0	0
Hong Kong SAR	9	2	15	2	1	4	5	1	6	2	0	5
Hungary	17	0	9	5	0	2	8	0	4	4	0	3
Iran, Islamic Rep. of	22	0	4	6	0	1	11	0	1	5	0	2
Ireland	19	2	5	6	0	1	11	1	0	2	1	4
Italy	22	0	4	7	0	0	11	0	1	4	0	3
Japan	18	1	7	4	0	3	9	1	2	5	0	2
Kazakhstan	26	0	0	7	0	0	12	0	0	7	0	0
Korea, Rep. of	12	2	12	4	0	3	5	1	6	3	1	3
Kosovo	26	0	0	7	0	0	12	0	0	7	0	0
Kuwait	26	0	0	7	0	0	12	0	0	7	0	0
Latvia	23	0	3	7	0	0	10	0	2	6	0	1
Lithuania	20	0	6	6	0	1	8	0	4	6	0	1
Malta	18	0	8	5	0	2	9	0	3	4	0	3
Montenegro	26	0	0	7	0	0	12	0	0	7	0	0
Morocco	16	0	10	6	0	1	8	0	4	2	0	5
Netherlands	–	–	–	–	–	–	–	–	–	–	–	–
New Zealand	20	5	1	5	1	1	9	3	0	6	1	0
North Macedonia	16	3	7	5	1	1	7	0	5	4	2	1
Northern Ireland	23	0	3	6	0	1	11	0	1	6	0	1
Norway	9	0	17	4	0	3	2	0	10	3	0	4
Oman	21	0	5	7	0	0	10	0	2	4	0	3
Pakistan	26	0	0	7	0	0	12	0	0	7	0	0
Philippines	26	0	0	7	0	0	12	0	0	7	0	0

A dash (–) indicates data not provided.
Because of rounding some results may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study - TIMSS 2019
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Exhibit 12: Number of TIMSS Science Topics Intended to Be Taught by the End of Fourth Grade

Reported by National Research Coordinators

(Continued)

Country	All Science (26 Topics)			Life Science (7 Topics)			Physical Science (12 Topics)			Earth Science (7 Topics)		
	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 4
Poland	7	0	19	5	0	2	2	0	10	0	0	7
Portugal	26	0	0	7	0	0	12	0	0	7	0	0
Qatar	12	6	8	4	2	1	6	2	4	2	2	3
Russian Federation	13	0	13	6	0	1	1	0	11	6	0	1
Saudi Arabia	26	0	0	7	0	0	12	0	0	7	0	0
Serbia	21	0	5	7	0	0	12	0	0	2	0	5
Singapore	9	0	17	3	0	4	6	0	6	0	0	7
Slovak Republic	21	0	5	6	0	1	11	0	1	4	0	3
South Africa	19	0	7	5	0	2	9	0	3	5	0	2
Spain	22	0	4	7	0	0	9	0	3	6	0	1
Sweden	25	0	1	7	0	0	12	0	0	6	0	1
Turkey	14	1	11	3	0	4	8	0	4	3	1	3
United Arab Emirates	26	0	0	7	0	0	12	0	0	7	0	0
United States	24	0	2	7	0	0	10	0	2	7	0	0
International Average	**18**	**1**	**7**	**6**	**0**	**1**	**8**	**0**	**3**	**4**	**0**	**2**
Benchmarking Participants												
Ontario, Canada	19	0	7	5	0	2	9	0	3	5	0	2
Quebec, Canada	16	0	10	4	0	3	10	0	2	2	0	5
Moscow City, Russian Fed.	13	0	13	6	0	1	1	0	11	6	0	1
Madrid, Spain	Same as Spain											
Abu Dhabi, UAE	Same as United Arab Emirates											
Dubai, UAE	Same as United Arab Emirates											

Exhibit 13: Number of TIMSS Mathematics Topics Intended to Be Taught by the End of Eighth Grade

Reported by National Research Coordinators

Country	All Mathematics (22 Topics)			Number (3 Topics)			Algebra (7 Topics)		
	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8
Australia	16	3	3	3	0	0	4	1	2
Bahrain	22	0	0	3	0	0	7	0	0
Chile	20	0	2	3	0	0	6	0	1
Chinese Taipei	14	0	8	3	0	0	5	0	2
Cyprus	17	0	5	3	0	0	6	0	1
Egypt	20	1	1	3	0	0	5	1	1
England	22	0	0	3	0	0	7	0	0
Finland	17	3	2	3	0	0	5	2	0
France	15	0	7	3	0	0	3	0	4
Georgia	16	0	6	3	0	0	7	0	0
Hong Kong SAR	17	0	5	3	0	0	5	0	2
Hungary	19	0	3	3	0	0	6	0	1
Iran, Islamic Rep. of	17	0	5	3	0	0	3	0	4
Ireland	18	3	1	3	0	0	7	0	0
Israel	22	0	0	3	0	0	7	0	0
Italy	16	2	4	3	0	0	4	0	3
Japan	20	0	2	3	0	0	6	0	1
Jordan	22	0	0	3	0	0	7	0	0
Kazakhstan	22	0	0	3	0	0	7	0	0
Korea, Rep. of	19	0	3	3	0	0	6	0	1
Kuwait	22	0	0	3	0	0	7	0	0
Lebanon	14	0	8	3	0	0	4	0	3
Lithuania	16	0	6	3	0	0	4	0	3
Malaysia	22	0	0	3	0	0	7	0	0
Morocco	22	0	0	3	0	0	7	0	0
New Zealand	17	3	2	3	0	0	4	2	1
Norway	21	0	1	3	0	0	7	0	0
Oman	21	0	1	3	0	0	6	0	1
Portugal	21	0	1	3	0	0	7	0	0
Qatar	21	0	1	3	0	0	6	0	1
Romania	12	9	1	3	0	0	4	3	0
Russian Federation	18	2	2	3	0	0	7	0	0
Saudi Arabia	22	0	0	3	0	0	7	0	0
Singapore	17	3	2	3	0	0	5	2	0
South Africa	20	0	2	3	0	0	5	0	2
Sweden	16	0	6	3	0	0	5	0	2
Turkey	18	0	4	3	0	0	6	0	1
United Arab Emirates	22	0	0	3	0	0	7	0	0
United States	22	0	0	3	0	0	7	0	0
International Average	**19**	**1**	**2**	**3**	**0**	**0**	**6**	**0**	**1**
Benchmarking Participants									
Ontario, Canada	18	0	4	3	0	0	4	0	3
Quebec, Canada	15	0	7	3	0	0	2	0	5
Moscow City, Russian Fed.	18	2	2	3	0	0	7	0	0
Gauteng, South Africa	Same as South Africa								
Western Cape, South Africa	Same as South Africa								
Abu Dhabi, UAE	Same as United Arab Emirates								
Dubai, UAE	Same as United Arab Emirates								

Because of rounding some results may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study - TIMSS 2019
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Exhibit 13: Number of TIMSS Mathematics Topics Intended to Be Taught by the End of Eighth Grade

Reported by National Research Coordinators

(Continued)

Country	Geometry (6 Topics)			Data and Probability (6 Topics)		
	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8
Australia	3	2	1	6	0	0
Bahrain	6	0	0	6	0	0
Chile	5	0	1	6	0	0
Chinese Taipei	3	0	3	3	0	3
Cyprus	3	0	3	5	0	1
Egypt	6	0	0	6	0	0
England	6	0	0	6	0	0
Finland	5	1	0	4	0	2
France	4	0	2	5	0	1
Georgia	3	0	3	3	0	3
Hong Kong SAR	6	0	0	3	0	3
Hungary	6	0	0	4	0	2
Iran, Islamic Rep. of	6	0	0	5	0	1
Ireland	4	2	0	4	1	1
Israel	6	0	0	6	0	0
Italy	5	1	0	4	1	1
Japan	6	0	0	5	0	1
Jordan	6	0	0	6	0	0
Kazakhstan	6	0	0	6	0	0
Korea, Rep. of	5	0	1	5	0	1
Kuwait	6	0	0	6	0	0
Lebanon	5	0	1	2	0	4
Lithuania	5	0	1	4	0	2
Malaysia	6	0	0	6	0	0
Morocco	6	0	0	6	0	0
New Zealand	5	0	1	5	1	0
Norway	6	0	0	5	0	1
Oman	6	0	0	6	0	0
Portugal	6	0	0	5	0	1
Qatar	6	0	0	6	0	0
Romania	5	1	0	0	5	1
Russian Federation	4	1	1	4	1	1
Saudi Arabia	6	0	0	6	0	0
Singapore	5	0	1	4	1	1
South Africa	6	0	0	6	0	0
Sweden	3	0	3	5	0	1
Turkey	5	0	1	4	0	2
United Arab Emirates	6	0	0	6	0	0
United States	6	0	0	6	0	0
International Average	**5**	**0**	**1**	**5**	**0**	**1**
Benchmarking Participants						
Ontario, Canada	6	0	0	5	0	1
Quebec, Canada	4	0	2	6	0	0
Moscow City, Russian Fed.	4	1	1	4	1	1
Gauteng, South Africa	Same as South Africa					
Western Cape, South Africa	Same as South Africa					
Abu Dhabi, UAE	Same as United Arab Emirates					
Dubai, UAE	Same as United Arab Emirates					

Exhibit 14: Number of TIMSS Science Topics Intended to Be Taught by the End of Eighth Grade

Reported by National Research Coordinators

Country	All Science (26 Topics)			Biology (7 Topics)			Chemistry (8 Topics)		
	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8
Australia	16	4	6	5	1	1	4	1	3
Bahrain	26	0	0	7	0	0	8	0	0
Chile	26	0	0	7	0	0	8	0	0
Chinese Taipei	17	1	8	7	0	0	7	0	1
Cyprus	17	0	9	5	0	2	7	0	1
Egypt	25	0	1	6	0	1	8	0	0
England	25	0	1	7	0	0	7	0	1
Finland	26	0	0	7	0	0	8	0	0
France	23	0	3	7	0	0	6	0	2
Georgia	19	0	7	3	0	4	7	0	1
Hong Kong SAR	19	1	6	6	0	1	3	1	4
Hungary	23	0	3	5	0	2	8	0	0
Iran, Islamic Rep. of	25	0	1	7	0	0	7	0	1
Ireland	–	–	–	–	–	–	–	–	–
Israel	26	0	0	7	0	0	8	0	0
Italy	21	1	4	7	0	0	4	1	3
Japan	24	0	2	6	0	1	7	0	1
Jordan	26	0	0	7	0	0	8	0	0
Kazakhstan	26	0	0	7	0	0	8	0	0
Korea, Rep. of	20	1	5	5	0	2	4	1	3
Kuwait	26	0	0	7	0	0	8	0	0
Lebanon	8	7	11	3	3	1	1	2	5
Lithuania	24	0	2	7	0	0	6	0	2
Malaysia	26	0	0	7	0	0	8	0	0
Morocco	24	0	2	7	0	0	7	0	1
New Zealand	19	6	1	5	2	0	6	1	1
Norway	20	0	6	7	0	0	7	0	1
Oman	25	0	1	7	0	0	7	0	1
Portugal	25	0	1	7	0	0	8	0	0
Qatar	21	0	5	5	0	2	6	0	2
Romania	25	1	0	6	1	0	8	0	0
Russian Federation	24	0	2	7	0	0	7	0	1
Saudi Arabia	26	0	0	7	0	0	8	0	0
Singapore	14	7	5	6	0	1	3	4	1
South Africa	24	0	2	7	0	0	7	0	1
Sweden	26	0	0	7	0	0	8	0	0
Turkey	18	0	8	4	0	3	7	0	1
United Arab Emirates	26	0	0	7	0	0	8	0	0
United States	22	0	4	7	0	0	4	0	4
International Average	22	1	3	6	0	1	7	0	1
Benchmarking Participants									
Ontario, Canada	21	0	5	7	0	0	4	0	4
Quebec, Canada	22	0	4	7	0	0	5	0	3
Moscow City, Russian Fed.	24	0	2	7	0	0	7	0	1
Gauteng, South Africa	Same as South Africa								
Western Cape, South Africa	Same as South Africa								
Abu Dhabi, UAE	Same as United Arab Emirates								
Dubai, UAE	Same as United Arab Emirates								

Because of rounding some results may appear inconsistent.
A dash (–) indicates data not provided.

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Exhibit 14: Number of TIMSS Science Topics Intended to Be Taught by the End of Eighth Grade

Reported by National Research Coordinators

(Continued)

Country	Physics (7 Topics)			Earth Science (4 Topics)		
	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8	Topics Taught to All or Almost All Students	Topics Taught to Only the More Able Students (Top Track)	Not Included in the Curriculum Through Grade 8
Australia	4	2	1	3	0	1
Bahrain	7	0	0	4	0	0
Chile	7	0	0	4	0	0
Chinese Taipei	3	1	3	0	0	4
Cyprus	1	0	6	4	0	0
Egypt	7	0	0	4	0	0
England	7	0	0	4	0	0
Finland	7	0	0	4	0	0
France	6	0	1	4	0	0
Georgia	5	0	2	4	0	0
Hong Kong SAR	6	0	1	4	0	0
Hungary	6	0	1	4	0	0
Iran, Islamic Rep. of	7	0	0	4	0	0
Ireland	–	–	–	–	–	–
Israel	7	0	0	4	0	0
Italy	6	0	1	4	0	0
Japan	7	0	0	4	0	0
Jordan	7	0	0	4	0	0
Kazakhstan	7	0	0	4	0	0
Korea, Rep. of	7	0	0	4	0	0
Kuwait	7	0	0	4	0	0
Lebanon	3	1	3	1	1	2
Lithuania	7	0	0	4	0	0
Malaysia	7	0	0	4	0	0
Morocco	7	0	0	3	0	1
New Zealand	4	3	0	4	0	0
Norway	3	0	4	3	0	1
Oman	7	0	0	4	0	0
Portugal	6	0	1	4	0	0
Qatar	7	0	0	3	0	1
Romania	7	0	0	4	0	0
Russian Federation	6	0	1	4	0	0
Saudi Arabia	7	0	0	4	0	0
Singapore	4	3	0	1	0	3
South Africa	6	0	1	4	0	0
Sweden	7	0	0	4	0	0
Turkey	3	0	4	4	0	0
United Arab Emirates	7	0	0	4	0	0
United States	7	0	0	4	0	0
International Average	**6**	**0**	**1**	**4**	**0**	**0**
Benchmarking Participants						
Ontario, Canada	7	0	0	3	0	1
Quebec, Canada	6	0	1	4	0	0
Moscow City, Russian Fed.	6	0	1	4	0	0
Gauteng, South Africa	Same as South Africa					
Western Cape, South Africa	Same as South Africa					
Abu Dhabi, UAE	Same as United Arab Emirates					
Dubai, UAE	Same as United Arab Emirates					

Exhibit 15: Methods Used to Evaluate the Implementation of Mathematics and Science Curricula at the Fourth Grade

Reported by National Research Coordinators

Country	Visits by Inspectors		School Self-Evaluation		Research Programs		National or Regional Examinations	
	Mathematics	Science	Mathematics	Science	Mathematics	Science	Mathematics	Science
Albania	●	●	●	●	○	○	●	●
Armenia	●	●	●	●	○	○	●	○
Australia	○	○	●	●	○	○	●	●
Austria	●	○	○	○	○	○	●	○
Azerbaijan	●	●	●	●	●	●	●	●
Bahrain	●	●	●	●	○	●	●	●
Belgium (Flemish)	●	●	○	○	○	○	●	●
Bosnia and Herzegovina	●	●	●	●	○	○	●	○
Bulgaria	●	●	○	○	○	○	●	●
Canada	○	○	●	●	●	○	●	●
Chile	●	●	●	●	○	○	●	●
Chinese Taipei	●	●	●	●	○	○	○	○
Croatia	●	●	●	●	○	○	●	●
Cyprus	●	●	○	○	○	○	○	○
Czech Republic	●	●	●	●	○	○	○	○
Denmark	○	○	●	●	●	●	●	○
England	●	●	●	●	○	○	●	○
Finland	○	○	●	●	●	●	●	●
France	●	●	○	○	○	○	●	●
Georgia	●	●	●	●	●	●	○	○
Germany	●	●	●	●	○	○	●	○
Hong Kong SAR	●	●	●	●	●	●	●	○
Hungary	●	●	●	●	○	○	○	○
Iran, Islamic Rep. of	○	○	○	○	●	●	○	●
Ireland	●	●	●	●	●	●	○	○
Italy	○	○	●	●	○	○	○	○
Japan	●	●	●	●	●	●	●	●
Kazakhstan	●	●	●	●	●	●	●	●
Korea, Rep. of	●	●	●	●	●	●	○	○
Kosovo	●	●	●	●	●	●	●	●
Kuwait	●	●	●	●	●	●	●	●
Latvia	●	●	●	●	●	●	●	●
Lithuania	●	●	●	●	○	○	○	○
Malta	●	●	●	●	○	○	●	●
Montenegro	●	●	●	●	○	○	●	●
Morocco	●	●	●	●	●	○	●	●
Netherlands	●	●	●	○	○	○	○	○
New Zealand	●	●	●	●	●	●	○	○
North Macedonia	●	●	●	●	○	○	○	○
Northern Ireland	●	●	●	●	●	●	○	○
Norway	○	○	○	○	○	○	○	○
Oman	●	●	●	●	●	●	●	●
Pakistan	●	●	●	●	○	○	○	○
Philippines	●	●	●	●	●	●	●	●
Poland	●	●	●	●	○	○	●	○
Portugal	○	○	●	●	○	○	●	○

● Yes
○ No

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Exhibit 15: Methods Used to Evaluate the Implementation of Mathematics and Science Curricula at the Fourth Grade

Reported by National Research Coordinators

(Continued)

Country	Visits by Inspectors		School Self-Evaluation		Research Programs		National or Regional Examinations	
	Mathematics	Science	Mathematics	Science	Mathematics	Science	Mathematics	Science
Qatar	●	●	●	●	○	○	●	●
Russian Federation	○	○	●	●	●	●	○	○
Saudi Arabia	●	●	●	●	○	○	●	●
Serbia	●	●	●	●	○	○	○	○
Singapore	○	○	●	●	○	○	●	●
Slovak Republic	●	●	●	●	○	○	●	○
South Africa	○	○	●	●	○	○	○	○
Spain	○	○	●	●	○	○	●	●
Sweden	●	●	●	●	●	●	●	●
Turkey	○	○	●	●	●	●	●	●
United Arab Emirates	●	●	●	●	●	●	●	●
United States	●	●	●	●	●	●	●	●
Benchmarking Participants								
Ontario, Canada	○	○	●	●	●	○	●	○
Quebec, Canada	○	○	●	●	○	○	●	○
Moscow City, Russian Fed.	○	○	●	●	●	●	○	○
Madrid, Spain	Same as Spain							
Abu Dhabi, UAE	Same as United Arab Emirates							
Dubai, UAE	Same as United Arab Emirates							

● Yes
○ No

Exhibit 16: Methods Used to Evaluate the Implementation of Mathematics and Science Curricula at the Eighth Grade

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Country	Visits by Inspectors		School Self-Evaluation		Research Programs		National or Regional Examinations	
	Mathematics	Science	Mathematics	Science	Mathematics	Science	Mathematics	Science
Australia	○	○	●	●	○	○	●	●
Bahrain	●	●	●	●	○	●	●	●
Chile	●	●	●	●	○	○	●	●
Chinese Taipei	●	●	●	●	○	○	○	○
Cyprus	●	●	●	○	○	○	○	○
Egypt	●	●	●	●	○	●	●	●
England	●	●	●	●	○	○	●	●
Finland	○	○	●	●	●	●	●	●
France	●	●	○	○	●	●	●	●
Georgia	●	●	●	●	●	●	○	○
Hong Kong SAR	●	●	●	●	●	●	●	○
Hungary	●	●	●	●	○	○	○	○
Iran, Islamic Rep. of	●	○	○	○	●	●	○	●
Ireland	●	●	●	●	●	●	○	○
Israel	●	●	●	●	○	○	●	●
Italy	○	○	●	●	○	○	●	●
Japan	●	●	●	●	●	●	●	●
Jordan	●	●	●	●	●	●	●	●
Kazakhstan	●	●	●	●	●	●	●	●
Korea, Rep. of	●	●	●	●	●	●	●	●
Kuwait	●	●	●	●	●	●	●	●
Lebanon	○	○	●	●	○	○	●	○
Lithuania	●	●	●	●	○	○	○	○
Malaysia	●	●	●	●	●	●	●	●
Morocco	●	●	○	●	○	○	●	●
New Zealand	●	●	●	●	●	●	○	○
Norway	○	○	○	○	○	○	●	●
Oman	●	●	●	●	●	●	●	●
Portugal	○	○	●	●	○	○	●	○
Qatar	●	●	●	●	○	●	●	●
Romania	●	●	●	●	●	●	●	●
Russian Federation	○	○	●	●	●	○	○	○
Saudi Arabia	●	●	●	●	○	○	●	●
Singapore	○	○	●	●	○	○	●	●
South Africa	○	○	●	●	○	○	○	○
Sweden	●	●	●	●	●	●	●	●
Turkey	○	○	●	●	●	●	○	○
United Arab Emirates	●	●	●	●	●	●	●	●
United States	●	●	●	●	●	●	●	●

● Yes
○ No

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Exhibit 16: Methods Used to Evaluate the Implementation of Mathematics and Science Curricula at the Eighth Grade

Reported by National Research Coordinators

(Continued)

Country	Visits by Inspectors		School Self-Evaluation		Research Programs		National or Regional Examinations	
	Mathematics	Science	Mathematics	Science	Mathematics	Science	Mathematics	Science
Benchmarking Participants								
Ontario, Canada	○	○	●	●	●	○	●	○
Quebec, Canada	○	○	●	●	○	○	●	●
Moscow City, Russian Fed.	○	○	●	●	●	○	○	○
Gauteng, South Africa	Same as South Africa							
Western Cape, South Africa	Same as South Africa							
Abu Dhabi, UAE	Same as United Arab Emirates							
Dubai, UAE	Same as United Arab Emirates							

● Yes
○ No

Exhibit 17: National Policies Regarding Examinations with Consequences for Students

Reported by National Research Coordinators

Country	Examinations with Consequences for Individual Students	Grades at which Examinations are Given	Purpose of Examinations
Albania	●	Grades 5, 9 and 12	The Grade 5 Assessment of Primary Education Pupils' Achievements (VANAF) in Albanian language, mathematics, and science is used to monitor student progress at the system level. The Grade 9 National Basic Education Examination certifies the completion of basic education. The Grade 12 State *Matura* Examination certifies the completion of secondary education. A State *Matura* Diploma is required for entry to a higher education institution.
Armenia	●	Grades 4, 9, and 12	Grade 4 examinations in mathematics and Armenian language are used for primary school graduation. Grade 9 examinations in Armenian language, mathematics, foreign language, Armenian history, and 1 science subject are used for secondary school graduation. Grade 12 examinations in Armenian language, mathematics, and Armenian history are used for high school graduation.
Australia	●	Varies by state and territory, but all students take an examination in Year 12	In Year 12, a system of accreditation is used to determine students' final grades and graduation from secondary school, as well as an overall score that is used in entrance to tertiary school. Most states and territories use a system of assessment that combines school-based coursework and external examinations.
Austria	●	End of upper secondary school (some schools)	Some upper secondary schools offer *Matura* examinations. Universities also may mandate entry examinations.
Azerbaijan	●	Grades 9 and 11	Grade 9 examinations in mathematics, native language, and foreign language are used for entrance to upper secondary school. Grade 11 examinations are required for graduation from upper secondary school and used for higher education admissions.
Bahrain	●	Grades 6, 9, and 12	Grades 6 and 9 examinations in all subjects are used for promotion to the next grade. Grade 12 examinations are used for university admissions.
Belgium (Flemish)	○	n/a	There are no central qualification exams in Flanders. Each school decides how it assesses students' performance—for example, through tests and examinations.
Bosnia and Herzegovina	●	Grade 9 and, in some cases, Grade 12	In Canton Sarajevo, Grade 9 examinations in mathematics, language, and foreign language are used for entry to and placement in secondary school. In Canton Tuzla, Grade 12 *Matura* examinations in 2 subjects (selected from language, mathematics and physics, biology-chemistry, history and geography, or philosophy-sociology) are required for graduation from secondary school.
Bulgaria	●	Grade 7 and final year of secondary school	Grade 7 examinations in mathematics and Bulgarian language are used for admission to specialized upper secondary schools. National *Matura* examinations in Bulgarian language and literature and at least 1 other subject (mathematics, geography, physics, chemistry, biology, history, philosophy, or foreign language) are required to receive a secondary school diploma. Scores from these examinations are also used for university admissions.
Canada	●	Grade 10 or 12 (varies by province)	Grade 10 or 12 examinations are used for graduation from secondary school. In most provinces, the examinations assess numeracy and literacy. In some provinces (e.g., Alberta, Quebec, and Newfoundland and Labrador), the examinations also assess science (i.e. biology, chemistry, and physics) and social studies (i.e. geography and history). In Newfoundland and Labrador, these examinations are required for entry to postsecondary school.
Chile	●	Grade 12	National university selection examinations are used for higher education admissions. The standardized group of examinations includes 2 mandatory tests (mathematics and language and communication) and 2 optional tests (natural science and social science). In addition to students' performance on the examinations, scores are based on students' grade point averages for Grades 8–12. Universities define the weight of each examination in program admissions.
Chinese Taipei	●	Grades 9 and 12	Grade 9 examinations in Mandarin, English, mathematics, science, and social science are used for entry to and placement in secondary school. In Grade 12, an examination at the end of the first semester is used for university applications, and an examination at the end of the year is used for university admission and placement.
Croatia	●	End of secondary school (Grades 11, 12, or 13)	State *Matura* examinations are used for higher education admissions. All students who have attended *gymnasium* and any students who have attended vocational or art programs and who plan to enroll in higher education are required to take compulsory examinations (mathematics, Croatian language, and 1 foreign language) at the level of their choice (higher/extended or lower/basic). Optional examinations are offered in sociology, geography, ethics, biology, politics, music art, visual art, physics, logic, philosophy, chemistry, religion, informatics, psychology, and history; ancient Latin and Greek languages; and other foreign languages. Any of the examinations can be translated to a national minority group language, as needed.
Cyprus	●	Grade 12	Grade 12 examinations in modern Greek language and 4–5 other subjects are required to obtain a school leaving certificate and used for placement in public universities.

● Yes
○ No

Exhibit 17: National Policies Regarding Examinations with Consequences for Students

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(Continued)

Country	Examinations with Consequences for Individual Students	Grades at which Examinations are Given	Purpose of Examinations
Czech Republic	●	End of secondary school	Compulsory examinations in Czech language and world literature and in either mathematics or a foreign language are required for graduation from secondary school and used for admission to tertiary education. Examinations in Czech language and world literature and mathematics are required to enter upper secondary school (when study programs end with a *Maturita* examination)
Denmark	●	Grade 9	Grade 9 examinations in language, mathematics, and science are used for placement in general secondary education or vocational education and training (VET).
Egypt	●	End of primary and preparatory (lower secondary) school	Examinations in all subjects at the end of primary and preparatory (lower secondary) school are used for entry to and placement in secondary school.
England	●	Years 11 and 13	Year 11 examinations in core subjects (English, mathematics, and science) and foundation subjects are used by schools and colleges to determine placement in higher level courses. Year 13 examinations are used to determine access to higher education and employment. Students may also take other examinations designed and delivered by organizations other than the Department for Education (e.g., International Baccalaureate, Pre-U, BTecs, Cambridge Technicals, and OCR Nationals).
Finland	●	End of upper secondary school	The Matriculation Examination is used to determine entry to university. It comprises 4 tests, including native language and 3 other subjects (the second national language or a foreign language, mathematics, sciences, and humanities).
France	●	Grades 9 and 12	Grade 9 examination is used to issue a diploma (*Le Diplôme National du Brevet*) attesting the acquisition of general knowledge at the end of the first cycle of secondary school. Grade 12 *Baccalauréat* examination is required for admission to higher education. There are 3 versions of this examination. The general examination (completed by 50% of students) includes the dominant disciplines in the general education framework—economic and social series, literary, and scientific. The technical examination (completed by 20% of students) combines general and technological topics. The vocational examination (completed by 30% of students) covers a variety of vocational specialties and enables students to enter the workforce or pursue higher education.
Georgia	●	End of secondary school	Examinations in Georgian language and literature, foreign language, either mathematics or history, and, for students pursuing medical education, biology, are required for higher education admission.
Germany	●	Varies by state	In some states, Grade 9 examinations are required for graduation from lower secondary school or to obtain a certificate of general education qualification. In all states, Grade 10 final examinations are used to obtain a *Mittlerer Schulabschluss* certificate. In some states, the *Arbitur* examination is required to obtain a school leaving certificate.
Hong Kong SAR	●	Grade 12	Secondary 6 (Grade 12) examinations are used to distribute the Hong Kong Diploma of Education and to determine admission to local universities.
Hungary	●	End of secondary school	The *Matura* examination, consisting of mathematics, Hungarian language and literature, foreign language, history, and another chosen subject, is required to obtain a school finishing certificate and is a prerequisite for admission to higher education.
Iran, Islamic Rep. of	●	Grades 1 and 12	A school readiness assessment is used to screen and diagnose students with special needs. In Grade 12, a national examination is required for a secondary school certificate of completion. University entrance examinations are used for university admission.
Ireland	●	Grade 9 and final year of post-primary education	Grade 9 school-based and final examinations in English, mathematics, and science are used to issue Junior Cycle Profile of Achievement (JCPA) certificates. In the final year of post-primary education, students take high-stakes examinations to obtain a Leaving Certificate; examinations are also used for higher education admissions.
Israel	●	End of secondary school	Matriculation examinations in both compulsory and elective subjects contribute to students' final grades in secondary school and are considered in university or college admissions. Examinations in mathematics, English as a foreign language, and students' native language are compulsory, while examinations in the sciences are not mandatory.
Italy	●	Grades 8 and 13	Grade 8 examinations in mathematics and language are used to determine entry to secondary school. Grade 13 examinations in language and 1 specific subject are required for completion of secondary school.
Japan	●	Grades 9 and 12	Grade 9 examinations in several subjects including mathematics, science, Japanese language, English language, and social studies are used to determine admission to public upper secondary schools. Grade 12 examinations designed by the National Center for University Entrance are used in university admissions.
Jordan	●	Grade 12	Grade 12 examinations in language, mathematics, and science are used in university or community college admissions.

● Yes
○ No

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Exhibit 17: National Policies Regarding Examinations with Consequences for Students

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(Continued)

Country	Examinations with Consequences for Individual Students	Grades at which Examinations are Given	Purpose of Examinations
Kazakhstan	●	Grade 8	Grade 8 examinations in language and mathematics are used for entry to and placement in secondary school.
Korea, Rep. of	●	Grade 12	The Grade 12 College Scholastic Ability Test (CSAT) is used in college or university admissions. Students can choose from 48 subjects in 5 areas (Korean language, mathematics, foreign language (English), social studies/sciences/vocational education, and second foreign languages/Chinese characters and classics) according to their future plans (e.g., the department or major they are applying for).
Kosovo	●	Grade 9 and end of secondary school	The Grade 9 Orientation Test in native language, English language, mathematics, natural science, social science, and Technology Information and Communication (TIK) is used for entry to and placement in secondary school. At the end of secondary school, students can take *Matura* examinations in native language, English language, mathematics, and elective subjects.
Kuwait	●	Grades 5–12	Students in Grades 1–4 are assessed continuously. Students must pass examinations in Grade 5 of primary school and Grades 6–9 of intermediate school in Islamic education, Arabic language, English language, mathematics, science, and social studies for promotion to the next grade. In high school (Grades 10–12), end-of-semester examinations are used in college admission. In addition, there is a placement test for admission to Kuwait University and private universities.
Latvia	●	Grades 9 and 12	Grade 9 examinations in the language of instruction, mathematics, a chosen foreign language, and Latvian history are required for a certificate of primary education and entrance to secondary school. Grade 12 examinations in Latvian, a chosen foreign language, mathematics, and 1 other subject of choice are required for graduation from secondary school and for university admissions.
Lebanon	●	Grades 9 and 12	Grade 9 examinations in language, mathematics, science, humanities, and social science are used for entry to and placement in secondary school. Grade 12 examinations are used for entry to and placement in university.
Lithuania	●	Grades 10 and 12	Grade 10 examinations in Lithuanian language, mathematics, and native language (optional) are required for graduation from lower secondary school. Passing scores on Grade 12 examinations in Lithuanian language and 1 optional subject are required for graduation from upper secondary school and to receive a *Matura* Certificate. Students must pass at least 3 *Matura* examinations to enter a higher education institution.
Malaysia	●	Grades 6, 9, and 11	Grade 6 (Primary School Achievement) examinations in Malay language, English, science, mathematics, and other languages of instruction (Chinese or Tamil) are used as a checkpoint for literacy, numeracy, and reasoning skills. Grade 9 (Form Three Assessment) examinations in Malay language, English, mathematics, science, history, geography, living skills, and Islamic study for Muslim students are compulsory and serve as a second checkpoint. Grade 11 examinations in Malay language, English, mathematics, science, history, and Islamic study/moral education are required to obtain a Malaysia Certificate of Education.
Malta	●	Years 4–11	The Ministry for Education and Employment administers national end-of-year assessments in Years 4–11 that are used to evaluate students' achievement and determine their track for the next school year. The assessments contribute to students' secondary school certificate and profile, awarded at the end of compulsory education. The Year 6 examination serves as a benchmark for the end of primary school, and the Year 11 examination is used for further general and tertiary education admissions.
Montenegro	●	Grades 9 and 13	Grade 9 examinations in native language, mathematics, and 1 elective subject are required for a certificate of primary education and entry to secondary school. At the end of secondary school, students take a *Matura* Examination or a vocational examination for completion of secondary school and admission to upper secondary schools and universities.
Morocco	●	Grades 9, 11, and 12	In Grades 9 and 11, examinations designed by the Regional Ministry of Education are considered in conjunction with school examinations in decisions regarding promotion to the next grade. At the end of Grade 12, national Baccalaureate examinations in a variety of subjects are used to determine high school graduation.
Netherlands	●	Grade 6 and Grade 10, 11, or 12	Schools are required to administer a national examination in Grade 6 that must include mathematics and language and may include other optional subjects. Schools may choose from a number of national tests, all of which include anchor items to enable comparisons across schools. Students' scores are considered in determining their track in secondary school. End of secondary school examinations administered in Grades 10, 11, or 12 (depending on the track) are required for entrance to tertiary education.
New Zealand	●	Years 11, 12, and 13	The National Certificate of Educational Achievement (NCEA) is offered in a variety of subjects including mathematics, science, chemistry, biology, physics, and Earth and space science; students complete the NCEA in Years 11–13. Students must achieve minimum levels in literacy, numeracy, and 3 approved subjects for university admission.

● Yes
○ No

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Exhibit 17: National Policies Regarding Examinations with Consequences for Students

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(Continued)

Country	Examinations with Consequences for Individual Students	Grades at which Examinations are Given	Purpose of Examinations
North Macedonia	●	End of secondary school	The *Matura* Examination is required for completion of secondary school and is used for entry to and placement in university. Students in *gymnasium* must complete examinations in their native language and 3 other subjects. Students in vocational education and training (VET) school may complete examinations in their native language and 1 other subject to graduate.
Northern Ireland	●	Typically Year 12	There are numerous providers for examinations of general and professional technical qualifications, but no compulsory, state-provided examinations. The General Certificate of Secondary Education (GCSE) examinations, which assess students' knowledge, understanding, and skills at the end of compulsory education, are the most common and used to determine progression to further study at school or in college, or to training and employment. Students taking GCSEs are required to take examinations in a minimum of 5 subjects, including English, mathematics, and science.
Norway	●	Grade 10 and each grade in upper secondary school	Grade 10 examinations in Norwegian, mathematics, and English, combined with school marks, are the basis for entry to and placement in upper secondary school. In upper secondary school, students take examinations in their chosen subjects at the end of each year that are considered in university admissions.
Oman	●	Grades 10 and 12	Grade 10 examinations are used in assigning students' final grades at the end of basic education and to determine promotion to post-basic education. Grade 12 examinations are used for higher education admissions to colleges, universities, and institutes.
Pakistan	●	Beginning of secondary school, Grade 10, and end of upper secondary school	Examinations are required to enter secondary school, continue from lower to upper secondary school, and enter university.
Philippines	●	Grades 4, 7, and 11	National examinations in Grades 4, 7, and 11 are used to determine whether students are meeting learning standards and to evaluate and improve instruction. Key Stage 1 (Grade 4) examinations assess early language, literacy, and numeracy. Key Stages 2 and 3 (Grades 7 and 11) examinations assess twenty-first century skills across learning content areas, including English, science, mathematics, Filipino, and social studies.
Poland	●	Primary Grade 8 and Secondary Grade 3	Grade 8 examinations in Polish, mathematics, and a modern foreign language are used to assess the extent to which students have met the requirements of the national core curriculum. The scores do not impact the completion of primary education but are considered in admission to secondary school. In Secondary Grade 3, students may take a *Matura* examination in a variety of subjects, some compulsory and some selected by the student. The results are used for higher education admissions.
Portugal	●	Grades 9, 11, and 12	Grade 9 examinations (language and mathematics) and Grade 11 examinations (specific areas such as physics and chemistry, geography, history, biology, and geology) are used to determine whether students have passed the subjects and contribute to their final grades. Grade 12 examinations are required for completion of secondary school and entry to university.
Qatar	●	Grades 3, 6, and 9	Grade 3 examinations in English, mathematics, and Arabic are used to determine placement for Grades 4–6. Grade 6 examinations in English, Arabic, mathematics, and science are used for entry to and placement in prep school. Grade 9 examinations in English, Arabic, mathematics, and science are used for entry to and placement in secondary school.
Romania	●	Grade 8	Grade 8 examinations in language and mathematics are used for entry to and placement in high school.
Russian Federation	●	Grades 9 and 11	Grades 9 and 11 examinations in mathematics and Russian are required to pass the State Summative Attestation and receive basic and secondary school certificates. Students may also choose examinations in other subjects that may be used for admission to the next level of education.
Saudi Arabia	●	End of secondary school	Students take 2 standardized tests at the end of secondary school that are used for university admissions. The General Aptitude Test (GAT) measures analytical and deductive skills, and general ability for learning. The Scholastic Achievement Admission Test (SAAT) measures academic achievement in science and arts.
Serbia	●	Grade 8	Grade 8 examinations in language and mathematics, as well as other subjects such as science and history, are used for entry to and placement in secondary school.
Singapore	●	Grades 6, 10, and 12	Primary School Leaving Examinations (Grade 6) are used to determine merit in the centralized secondary school admission system, which is both merit- and choice-based. In Grade 10, students take the General Certificate of Education (GCE) O-Level or GCE N-Level examinations in a range of compulsory (English language, native language, mathematics) and elective subjects, including science. These exams are used as a measure of merit in the post-secondary admission system, which is both merit- and choice-based. In Grade 12, students may take the GCE A-Level examination or the International Baccalaureate (IB) Diploma Programme, which can be used for local university admission.

● Yes
○ No

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Exhibit 17: National Policies Regarding Examinations with Consequences for Students

Reported by National Research Coordinators

Country	Examinations with Consequences for Individual Students	Grades at which Examinations are Given	Purpose of Examinations
Slovak Republic	●	Grades 5, 9, and 13	Examinations in Grades 5 and 9 assess mathematics and Slovak language (or Hungarian or Ukrainian). In Grade 9, the results are used for entry to secondary school. In Grade 13, students take a compulsory external school-leaving examination in language, literature, and 1 foreign language and may take an optional examination in mathematics. The results of these tests contribute to a final school-leaving examination and can influence entrance to tertiary education.
South Africa	●	Grade 12	The National Senior Certificate examination is a high stakes examination that covers all subjects in the curriculum. It is used to determine access to different types of tertiary institutions (universities, technical and vocational colleges) and disciplinary fields.
Spain	●	Grade 12	Grade 12 examinations are used for university admissions. Examinations in Grades 3, 6, and 10 are used for diagnostic purposes and do not have consequences for individual students.
Sweden	○	n/a	No policy
Turkey	●	End of primary school and end of secondary school	The Central Examination for Entry to High School, including a numerical section (mathematics and science) and a verbal section (Turkish, culture and of ethics, history, and foreign language), is used for admission and placement in high schools that accept entrance examinations. Students applying to fine arts or sports high schools must take an ability examination. The Higher Education Institutions Examination, administered by the Assessment, Selection, and Placement Center at the end of high school, consists of a basic proficiency test, a field proficiency test, and a foreign language test. All students must take the basic proficiency test, which includes mathematics, Turkish, science, and social sciences. Students also may take the field proficiency test, which measures achievement in specific fields (mathematics, Turkish language and literature, science, and social sciences). The foreign language test is offered in German, Arabic, French, English, and Russian.
United Arab Emirates	●	Grade 12	Grade 12 examinations in Arabic and English languages, mathematics, physics, and chemistry are used for university admission and placement.
United States	○	Varies by state, but commonly at the end of secondary school	There are no nationally mandated examinations that have consequences for individual students, although some states do require examinations for high school graduation or promotion in earlier grades. In the 2017–2018 school year, 25 states had state-mandated end-of-course assessments, several of which served as “exit exams” that required a passing grade for high school graduation and some of which were components of a student’s final course grade. It also is common for states to require upper secondary students to take one or more of the nationally available standardized tests used in the admission process for postsecondary education—the SAT (originally called the Scholastic Aptitude Test) and the ACT (originally called American College Testing). In addition to these test scores, postsecondary institutions’ admissions offices look at several factors, including students’ class rank, grade point average (GPA), and extracurricular activities. Some postsecondary institutions, including most two-year community colleges, do not require these test scores for admission.
Benchmarking Participants			
Ontario, Canada	●	Grade 10	The Ontario Secondary School Literacy Test, provided by the Ministry of Education in the province of Ontario, is required for high school graduation.
Quebec, Canada	●	Primary Grades 4 and 6; Secondary Grades 4 and 5	Primary Grades 4 and 6 examinations assess French language, reading, writing, and mathematics. Secondary Grades 4 and 5 examinations assess mathematics, science and technology, French language, and English language.
Moscow City, Russian Fed.	●	Grades 9 and 11	Grades 9 and 11 examinations in mathematics and Russian are required to pass the State Summative Attestation and receive basic and secondary school certificates.
Gauteng, South Africa	Same as South Africa		
Western Cape, South Africa	Same as South Africa		
Madrid, Spain	Same as Spain		
Abu Dhabi, UAE	Same as United Arab Emirates		
Dubai, UAE	Same as United Arab Emirates		

● Yes
○ No

Exhibit 18: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Fourth Grade

Reported by National Research Coordinators

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	Science Instruction
Albania	The national curriculum contains statements about the use of digital devices organized around developing digital competencies in mathematics, such as collecting, organizing, and displaying data..	A document provided by the Agency of Quality Assurance describes the policies. Students are expected to develop digital competencies, such as communication, collaboration, and using technologies to collect, organize, analyze, and display data.
Armenia	No policy	No policy
Australia	The use of digital devices is encouraged but not mandated. The F–10 Australian Curriculum includes general capabilities, including ICT capability, that are expected to be addressed through the learning areas, including mathematics. The mathematics curriculum content descriptions refer to "using appropriate digital technologies."	Same as for mathematics
Austria	Computers should be used for learning and creative working in all subjects. There are no subject-specific policies, but digital education is an important aspect of the new curriculum.	Same as for mathematics
Azerbaijan	No policy	No policy
Bahrain	The Ministry of Education implements 2 major projects related to e-learning: the King Hamad Project for Future Schools and the Digital Empowerment in Education project. Both projects entail the use of digital devices and include e-lessons and digital enrichments that students can access in class and at home through the Ministry's portal. Classes are also equipped with smart/interactive boards.	Same as for mathematics
Belgium (Flemish)	Policies vary by schools' curricula. Typically, students begin using 4-function calculators in Grade 4. They are also expected to use media to explore software, develop technical skills, find information through search strategies, store information, create PowerPoint presentations, and present information to others. Students should be able to choose appropriate devices for their needs and explain their reasoning.	Policies vary by schools' curricula. Although there are no explicit policies for science, students are expected to develop basic ICT skills starting at Grade 4 (same as mathematics).
Bosnia and Herzegovina	No policy	No policy
Bulgaria	Currently, there is only a statement about practical skills for using a calculator. However, a new act coming into effect with the new curriculum for 2019 includes policies for twenty-first century skill development as well as the use of ICT and other technologies.	Same as for mathematics
Canada	Calculators, spreadsheets, databases, and hypertext technology are used to solve problems that require sorting, organizing, classifying, and extending data.	Same as for mathematics
Chile	Digital tools such as computers and calculators support the learning environment by enabling students to explore patterns and relationships in geometrical settings and simple equations, to test hypotheses, present data, and support calculations. ICT can be used to enhance the learning process in Grades 1–4, although it is expected that students understand and apply the relevant concepts before using these tools.	ICT is considered a relevant skill to register and communicate information, and to promote scientific ideas. It is expected that students become more familiar with ICT in the development of scientific knowledge.
Chinese Taipei	Once students have learned basic computational skills, teachers can introduce technology aids for solving mathematics problems. Calculators should not interfere with teaching concepts and are typically used only in junior and senior high school.	Teachers should teach with various media and resources, including computers and the internet, to engage students in searching for information.
Croatia	In the current Teaching Plan and Program, there are no recommendations for using calculators, tablets, and computers in Grade 4 mathematics classes. However, beginning in 2021, the new curriculum will emphasize the use of digital technology in teaching and learning.	Same as for mathematics
Cyprus	Technology should be used when it will add value to the conceptual development of mathematical ideas.	The national curriculum includes a provision for fostering multiple key competences, including the fluent, valid, and considerate use of ICT.
Czech Republic	No policy	No policy
Denmark	According to the national curriculum, students can use digital devices and applications in teaching activities, but the use of computers is not mandatory.	Same policy as for mathematics

Exhibit 18: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Fourth Grade

Reported by National Research Coordinators

(Continued)

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	**Science Instruction**
England	According to the national curriculum, ICT, including calculators, should not be used as a substitute for good written and mental arithmetic. It should be introduced near the end of Key Stage 2 (Grades 2—5) to support students' conceptual understanding and exploration of more complex number problems if written and mental arithmetic are secure. Teachers should use their judgment about when ICT tools should be used.	No policy
Finland	Programming is integrated into mathematics instruction. One of the objectives of instruction is to inspire students to design algorithms in the form of computer programs in graphic programming environments. ICT and calculators are used in teaching and learning. Education providers and teachers can decide what types of digital devices to use.	ICT is integrated into science instruction. One of the objectives of instruction is to direct students to use ICT responsibly and ergonomically as a means of interaction, and for acquiring, processing, and presenting information.
France	According to the mathematics curriculum, calculators should be used to implement and check arithmetic. Computers should be used to help better organize work and create digital models.	According to the science curriculum, computers should be used to model reality.
Georgia	In compliance with the national curriculum, a student should use different means of communication during class, including ICT.	Same as for mathematics
Germany	Policies vary by state. In North Rhine-Westphalia, ICT, and traditional media (e.g. books, TV, radio), are learning aids and instructional topics. In primary school, students are introduced to important sources of information and how to make meaningful use of ICT. Media is also taught as its own subject, in which students learn about the nature of a reality shaped by current technologies. Media literacy is developed through systematically working with media.	Same as for mathematics
Hong Kong SAR	Calculators are used to facilitate learning mathematics, rather than to replace mental arithmetic and written calculation. Students can use calculators to analyze number patterns and constructs, as well as check different methods and results of problem solving. Students may also be taught to use appropriate computer software to explore number patterns and characteristics of shapes, draw figures and statistical graphs, and analyze data and compile reports. Students are guided in using the internet to collect relevant mathematical information, enrich what they are currently learning, and explore real-world applications.	No policy
Hungary	Electronic devices, such as calculators, computers, and graphical calculators, along with the internet and courseware, are used to develop students' digital competence.	No policy
Iran, Islamic Rep. of	Students may use calculators in class, with the exception of when they are learning to compute. Calculator-based activities are also provided in mathematics textbooks.	No explicit policy, but there are activities in the science curriculum that require calculators or computers.
Ireland	The primary mathematics teacher guidelines provide guidance on the use of technology within the primary mathematics curriculum, specifically in support of using calculators and ICT in the classroom. The Digital Strategy for Schools 2015–2020, published by the Department of Education and Skills, outlines the government's action plan for integrating ICT into teaching, learning, and assessment practices in schools.	There is no explicit policy for the use of digital devices in Grade 4 science instruction. However, strong links are made between science and technology, and the role of technology in exploring science.
Italy	The objectives for digital education are primarily established in the National Plan for Digital Education (*Piano Nazionale Scuola Digitale*; PNSD). It is organized into 35 broad actions, covering all of the areas connected to the development of ICT in public education. ICT and its use in education is viewed as a transversal objective, necessary to fulfill the requirements of each subject.	Same as for mathematics
Japan	When necessary, computers and other digital devices should be used to enrich students' sense of numbers, quantities, and geometric figures, and to improve their ability to represent data by using tables and graphs.	Appropriate digital devices, such as computers and audiovisual aids, should be used for instruction on observations, experiments, cultivation, raising animals, and making learning materials.
Kazakhstan	No policy	No policy

Exhibit 18: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Fourth Grade

Reported by National Research Coordinators

(Continued)

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	Science Instruction
Korea, Rep. of	The Guidelines for Teaching and Learning and Assessment state that learning with media and tools arouses students' interest and promotes effectiveness and diversity of learning. Audiovisual material, multimedia and internet, teaching aids, calculators, and educational software can be used. Teachers should make use of these tools to help students perform complicated computations, gain a deeper understanding of mathematical concepts, and develop problem-solving skills in situations that do not pertain directly to computation. Assessments of learning in mathematics provide students with opportunities to use different technological tools depending on the learning content and the methods of assessment.	The scientific communication skills included in the curriculum relate to the comprehension and expression of scientific and technical information through a variety of media such as models, audiovisual materials, software, computers, smart devices, and the internet. In addition, teachers should instruct students on mathematical thinking and computer use as it relates to learning different topics.
Kosovo	The curriculum guidance documents describe the methodology for the use of digital devices and provide resources for teachers.	Same as for mathematics
Kuwait	No policy	No policy
Latvia	In addition to acquiring the skills to perform operations with rational numbers in their heads and in writing, students are expected to learn to use calculators and computers to perform operations. Students also must learn to use computers to find information.	No policy
Lithuania	No explicit policy, but students take a compulsory ICT course beginning in Grade 5. Teachers may also use computers or tablets at their discretion, but the use of calculators in primary school is not recommended.	No policy
Malta	The National Curriculum Framework emphasizes digital literacy as a cross-curricular theme. In the primary mathematics syllabus, the use of digital devices is encouraged as a learning and teaching tool.	Same as for mathematics
Montenegro	The State Education Program's goals include acquiring ICT skills, such as finding, processing, and saving information. In mathematics, it is recommended that students use calculators to check calculations and other ICT to research new ideas.	Students are encouraged to become familiar with using calculators, tablets, and computers in all subjects. Teachers may use computers in the classroom to demonstrate experiments or to enable students to practice ICT skills.
Morocco	The Ministry of Education provides digital resources for schools. More and more teachers now use computers to introduce and practice the target elements of their courses. Many schools are equipped with a multimedia room (GENIE program) where teachers can bring their students to have ICT based lessons.	Same as for mathematics
Netherlands	No policy	No policy
New Zealand	No policy. The use of technology is discussed in general terms, but not specifically within mathematics.	No policy. The use of technology is discussed in general terms, but not specifically within science.
North Macedonia	The national curriculum contains statements about the use of digital devices.	Same as for mathematics
Northern Ireland	Students should use ICT to investigate, analyze, present, and interpret information; discover patterns and relationships; and solve problems. A range of ICT, including databases and programmable devices, should be used to support and enhance students' mathematical abilities. Students should also be provided with opportunities to use Logo and spreadsheets to help develop critical thinking and problem-solving skills.	Science is described as Science and Technology. The curriculum provides levels of progression for the use of ICT. When planning topics, teachers should ensure that students are provided with opportunities to develop their skills in communication, using mathematics and ICT, and enhance their thinking skills and personal capabilities.
Norway	Using digital tools in mathematics is 1 of the 5 basic skills implemented for each subject in the curriculum. Students should be able to use digital tools for games, exploration, visualization, and publication. The skill also involves being aware of, using, and evaluating the role of digital tools for problem-solving, simulation, and modeling.	Using digital tools in science is 1 of the 5 basic skills implemented for each subject in the curriculum. Students should be able to use digital tools for exploration, measurement, visualization, simulation, registration, documentation, and publication when performing experiments and fieldwork. Digital animations, simulations, and games are aids for stimulating creativity as well as demonstrating and visualizing natural science problems and research questions. A critical assessment of internet-based information reinforces work in science.
Oman	ICT resources are suggested for teachers.	Same as for mathematics
Pakistan	No policy	No policy
Philippines	To respond to the demands of the times and to prepare and equip learners with digital literacy skills, the Department of Education has envisioned an online learning platform and the use of Open Educational Resources (OERs).	Same as for mathematics

Exhibit 18: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Fourth Grade

Reported by National Research Coordinators

(Continued)

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	Science Instruction
Poland	Creative problem solving with ICT is one of the main goals in the primary school curriculum. With regard to mathematics instruction, there is a statement about using calculators for more difficult calculation examples.	Although specific policies are not directly included in the core curriculum, there is an additional document that provides advice for teachers about the use of digital devices. It states that the core curriculum objectives can be achieved through activities involving computers, educational software, internet resources, interactive whiteboards, films, and games.
Portugal	The use of digital technology such as Scratch, Excel, and numerical applets, is encouraged for teaching problem solving and other learning tasks. The use of calculators is recommended only for specific situations, such as computing with large numbers and completing multistep calculations.	No policy
Qatar	The mathematics curriculum includes suggestions for teachers on the use of ICT tools and digital devices. Students should use technology to play a variety of number games to gain fluency and flexibility in reading and rounding numbers, and expressing mixed numbers as improper fractions. Students should also use ICT to work in groups to complete symmetric shapes on square grid paper, give a line of symmetry, and construct line graphs with a scale using spreadsheets.	Students should use the internet to research different topics, use data loggers to measure the temperature, and make presentations to show their results.
Russian Federation	The general recommendations for all subjects are to use ICT tools and resources to search and reproduce the necessary information and solve educational problems with simple information objects (e.g., text, drawings, available ICT resources). The program provides for the use of calculators in the study of some mathematics topics.	There are no explicit policies for science beyond the general recommendations for all subjects. These recommendations address the use of various search methods in accordance with communicative and cognitive tasks—including the ability to enter text using the keyboard, record measured values digitally, analyze images and sounds, and prepare presentations with audio, video, and graphic accompaniment—and comply with the rules of information selectivity, ethics, and etiquette.
Saudi Arabia	No policy	No policy
Serbia	The national curriculum recommends the use of ICT in instruction but does not mandate it. Students are guided in using the internet to collect relevant subject information, enrich what they are currently learning, and explore real world application.	Same as for mathematics
Singapore	Schools are guided by the Ministry of Education's Masterplan for ICT in Education in their use of digital devices to support teaching and learning in all subjects. The most recent plan aims to broaden the use of ICT for quality learning to support the curriculum. For mathematics, the curriculum framework states that for students to develop a deep understanding of mathematical concepts and make sense of their applications, they should be exposed to technological aids that help them relate abstract mathematical concepts to concrete experiences. In today's classrooms, mathematical skills also include the ability to use spreadsheets and other software to learn and do mathematics. The role of ICT in the teaching and learning of mathematics is further articulated under the Principles of Teaching in the mathematics syllabus: Teaching should connect learning to the real world, harness ICT tools, and emphasize twenty-first century competencies. Teachers should consider the affordances of ICT to help students learn. ICT tools can help students understand mathematical concepts through visualizations, simulations, and representations, as well as work collaboratively and think critically about solutions. They can also support exploration and experimentation and extend the range of problems accessible to students.	Schools are guided by the Ministry of Education's Masterplan for ICT in Education in their use of digital devices to support teaching and learning in all subjects. The most recent plan aims to broaden the use of ICT for quality learning to support the curriculum. For science, it translates into staying up to date with the changing education landscape and developments in education technology, and helping students develop twenty-first century competencies, a broad and deep foundation of learning in science, and life-long learning skills. ICT supports the inquiry process and facilitates student collaboration and self-directed learning; online collaborative tools enable students to discuss their ideas or findings and consult field experts. Internet-enabled devices can be used to facilitate data collection and analysis in situated learning. Students can also explore and visualize abstract concepts using simulations tools.
Slovak Republic	According to the State Education Program, calculators are used to perform addition and subtraction of numbers up to 10,000,000. Schools and teachers have discretion over the use of calculators in other mathematics topics. The State Education Program aims to educate students in using ICT to acquire skills in finding, processing, and saving information.	No policy
South Africa	The use of calculators is permitted for specific calculations.	No policy
Spain	The national curriculum includes the use of technology in the search for knowledge or to make calculations, solve problems, and deliver results. Students are expected to become familiar with calculators and their operating rules when solving basic problems and checking their results.	The national guidelines refer to the importance of developing digital competence (based on European key competencies) across all school subjects. For science, ICT should be used to search for and select information or to offer conclusions. There is no express reference to the use of any particular digital device.

Exhibit 18: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Fourth Grade

Reported by National Research Coordinators

(Continued)

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	**Science Instruction**
Sweden	The national curriculum states that schools are responsible for ensuring that each student can use modern technology as a tool in the search for knowledge, communication, creativity, and learning. In mathematics, students should be given opportunities to develop knowledge in using digital tools and programming to explore problems and mathematical concepts, make calculations, and present and interpret data. Students may use mental arithmetic, written methods, or digital tools to approximate natural numbers and simple numbers in decimal form. Students are also taught how to program using unambiguous, step-by-step instructions, algorithms, and visual programming environments. Construction of simple tables, diagrams, and geometric shapes should be taught with and without digital tools. The relationship between the binary number system and digital technology should also be taught.	In science, students should be given opportunities to develop different skills within various topics with the use of both digital tools and other equipment, and to look for answers by using different types of sources.
Turkey	According to the curriculum, students should learn digital competence—the safe and critical use of ICT for business, daily life, and communication. Interactive activities with appropriate ICT may be used in instruction.	Same as for mathematics
United Arab Emirates	No policy	No policy
United States	Most states do not have policies regarding computer use. However, many states have standards for technology literacy requiring computer use in mathematics instruction. Both the Common Core State Standards and Every Student Succeeds Act (ESSA; 2015) emphasize the importance of using technology in the classroom as a part of student enrichment. States are increasingly providing or enabling digital devices and digital content for students and faculty to use in school and at home. Some states have standards for the use of calculators in instruction as well as the introduction of 4-function calculators. Individual districts may give guidelines regarding calculator usage during instructional time, but there is no commonly agreed-upon policy related to calculator usage in elementary mathematics courses. Calculator usage is typically low in Grade 4; data from the 2017 National Assessment of Educational Progress (NAEP) showed that for the majority of Grade 4 students, calculators were not permitted during their mathematics lessons.	Most states do not have policies regarding computer and calculator use in science instruction. However, many states and national science standards documents include statements related to the use of technology such as computers, calculators, and other digital tools. The Next Generation Science Standards (NGSS) emphasize science practices that benefit from the use of technology, such as analyzing and interpreting data, using mathematical and computational thinking, as well as developing and using models to describe or predict science phenomena. ESSA (2015) emphasizes the importance of using technology in the classroom as a part of student enrichment, and many schools have chosen to integrate technology with their science instruction. States are increasingly providing or enabling digital devices and digital content for students and faculty to use in school and at home.
Benchmarking Participants		
Ontario, Canada	According to the Ontario Curriculum Guide, calculators and computers can be used to perform operations, make graphs, and organize and display data. Students may use digital devices to investigate number and graphing patterns, geometric relationships, and different representations to simulate situations and to extend problem solving. It is important that students learn when it is appropriate to apply mental computation, reasoning, and estimation skills to predict and check answers. Teachers can use ICT both for whole class instruction and to design programs that meet diverse student needs. ICT can be used to reduce the time spent on routine mathematical tasks; promote thinking and concept development; introduce simulations, multimedia resources, databases, and computer-assisted learning modules; and connect students to other schools, at home and abroad.	According to the Ontario Curriculum Guide, ICT provides a range of tools that can significantly extend and enrich teachers' instructional strategies and support students learning in science and technology. Computer programs can be used to help students collect, organize, and sort the data and to write, edit, and present reports on their findings. ICT also can be used to simulate investigations when field studies on a particular topic are not feasible and to connect students to other schools, at home and abroad.
Quebec, Canada	No explicit policy. The use of technological tools such as calculators or software is suggested but not mandatory.	The Science and Technology Program proposes the use of ICT in teaching science.
Moscow City, Russian Fed.	The exemplary basic educational program of general primary education is based on the use of ICT tools and resources to solve a variety of educational, cognitive, and practical problems, across all subjects. The program also provides for the use of calculators for teaching and learning some topics in mathematics.	Same as for mathematics
Madrid, Spain	Same as Spain	
Abu Dhabi, UAE	Same as United Arab Emirates	
Dubai, UAE	Same as United Arab Emirates	

Exhibit 19: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Eighth Grade

Reported by National Research Coordinators

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	Science Instruction
Australia	The use of digital devices is encouraged but not mandated. The F–10 Australian Curriculum includes general capabilities, including ICT capability, that are expected to be addressed through the learning areas, including mathematics. The mathematics curriculum content descriptions refer to "using appropriate digital technologies."	Same as for mathematics
Bahrain	The Ministry of Education implements 2 major projects related to e-learning: the King Hamad Project for Future Schools and the Digital Empowerment in Education project. Both projects entail the use of digital devices and include e-lessons and digital enrichments that students can access in class and at home through the Ministry's portal. Classes are also equipped with smart/interactive boards.	Same as for mathematics
Chile	According to the national curriculum, ICT should be used to support the understanding of mathematical concepts, to model and represent functions and geometrical objects, and to organize and communicate results. In calculations, ICT should only be used to check work, implement a large number of single operations, or implement operations with very large numbers.	According to the national curriculum, ICT should be used to collect, process, and communicate information in science. ICT is an essential part of scientific literacy and should be used for measurement, registering and modeling data, and communicating results.
Chinese Taipei	Once students have learned basic computational skills, teachers can introduce technology aids for solving mathematics problems. Calculators should not interfere with teaching concepts and are typically only used in junior and senior high school.	Teachers should teach with various media and resources, including computers and the internet, to engage students in searching for information.
Cyprus	No policy	Physics teachers can use digital devices to support implementation of the curriculum, such as the use of data loggers, computers, and sensors. Teachers may also use smartphones for formative evaluation and for video analysis.
Egypt	Students can use calculators from Grade 5.	For teaching and learning science, students and teachers may use digital devices such as computers in schools' multimedia centers. In the last 3 years, the Ministry of Education has produced computer labs and some digital curricula.
England	According to the national curriculum, ICT, including calculators, should not be used as a substitute for good written and mental arithmetic. In secondary schools, teachers should use their judgment about when ICT tools should be used.	Same as for mathematics
Finland	Programming is integrated into mathematics instruction. An objective of instruction is to inspire students to design algorithms in the form of computer programs in graphic programming environments. ICT and calculators are used in teaching and learning. Education providers and teachers can decide what kinds of digital devices to use.	ICT is integrated into science instruction in a variety of ways. The use of technology promotes equality and equity among students in their learning. For example, an objective of instruction in physics is to guide students to use ICT for acquiring, processing, and presenting information and measurement results, and to support the students' learning by using illustrative simulations.
France	Students use digital tools such as spreadsheets, calculators, dynamic geometry, and programming software to manage real or experimental data, make representations and simulations, and to program technical objects.	According to the science curriculum, students are taught to search for information on the internet to answer scientific questions or problems (i.e., choose relevant keywords and assess the reliability of sources and the validity of results); use data acquisition and processing tools, database software, simulations, and digital models; and use digital tools to share information on a scientific subject and produce scientific documents.
Georgia	No policy	No policy
Hong Kong SAR	The use of graphing calculators and the availability of computers and other information technology aids in the classrooms impacts content and strategies for teaching and learning mathematics. ICT may be used in a variety of ways in mathematics classes, including for data analysis, simulations, graphical presentations, symbolic manipulation, and observing patterns. The appropriate use of ICT in the teaching and learning of mathematics is emphasized in the mathematics curriculum.	ICT is 1 of the 4 key tasks to promote learning to learn. These tasks can be adopted and adapted in the Science Education Key Learning Areas (KLAs) to enliven instruction, and to help learners progress toward the vision of whole-person development.
Hungary	Calculators and computers are used alongside books, such as encyclopedias, informative books, and exercise books, on mathematics development tasks.	Students engage in computer-supported learning, such as searching for information, using the library, internet, databases, and simulations and applications for measuring.
Iran, Islamic Rep. of	Students may use calculators in class, with the exception of when they are learning to compute. Calculator-based activities are also provided in mathematics textbooks. The use of calculators and computers is permitted but not mandated; usage is based on teachers' decisions.	No explicit policy, but there are activities in the science curriculum that require calculators or computers.

Exhibit 19: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Eighth Grade

Reported by National Research Coordinators

(Continued)

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	**Science Instruction**
Ireland	The Junior Certificate Mathematics Curriculum highlights the importance of using technology to support mathematics applications, such as enabling children to think and communicate quantitatively and spatially, solve problems, and recognize situations in which mathematics can be applied. Students should be able to generate data or acquire data from other sources, including the internet. Students should also summarize data (e.g., in spreadsheets) and engage with dynamic geometry software. The mathematics curriculum provides for the introduction and use of calculators from Grade 4 onward; by Grade 8, students are expected to be able to use calculators to help develop their problem-solving skills by enabling them to focus on the structure of a problem and explore different solutions.	Students should have opportunities to develop a range of key skills and use digital media and technology to communicate; stimulate creativity; develop numeracy skills; and understand, access, manage, and share content. Students should also be taught how to be safe, responsible, and ethical when using digital technology.
Israel	There are only general statements advocating the use of computers in the different processes of learning, both in algebra and geometry. Calculators are allowed in instruction and testing.	There are only general statements about integrating computers into science learning activities. The science curriculum includes references to computerized activities for each grade.
Italy	The objectives for digital education are primarily established in the National Plan for Digital Education (*Piano Nazionale Scuola Digitale*; PNSD). It is organized into 35 broad actions, covering all of the areas connected to the development of ICT in public education. ICT and its use in education is viewed as a transversal objective, necessary to fulfill the requirements on each subject.	Same as for mathematics
Japan	In teaching each subject, consideration should be given to proper use of tools such as a *soroban* (Japanese abacus), calculators, computers, and ICT to improve learning results. In particular, technology should be considered for teaching content related to numerical calculations, as well as for activities such as observation, manipulation, and experimentation.	For the instruction in each field, consideration should be given to ensure the proactive and appropriate use of tools, such as computers and ICT, when searching for information in the course of observations and experiments, conducting experiments, data processing, and experimental measurements.
Jordan	The Education Strategy Plan emphasizes the use of ICT in teaching and learning mathematics.	The Education Strategy Plan emphasizes the use of ICT in the teaching and learning process. Digital content for the science curriculum is available for students and teachers to use.
Kazakhstan	No policy	No policy
Korea, Rep. of	Teachers should use a diverse and appropriate set of educational equipment and materials to promote the effective learning of mathematics. They should also make use of a variety of tools such as calculators, computers, and software to help students perform complex computations (when not learning computation); help them develop a deeper understanding of mathematical concepts, principles, and laws; and enhance their problem-solving skills.	Students should have the ability to understand and express scientific and technical information through a variety of media, such as computers and audiovisual equipment. Teachers should use the latest ICT and devices, such as models, audiovisual materials, software, computers, smart devices, and the internet. Science teachers should also teach mathematical thinking and computer use functions related to learning science topics.
Kuwait	No explicit policy, but schools typically allow students to use calculators for simple mathematics problems and validation of an answer or a scientific rule during class. Calculators are not allowed during examinations.	Same as for mathematics
Lebanon	No policy	No policy
Lithuania	The curriculum contains guidelines for incorporating ICT into instruction. Computer programs can be used during lessons to introduce new material. In Grades 7–8, integrated lessons include ICT together with various other subjects.	Same as for mathematics
Malaysia	ICT should be used for exploratory activities involving various methods such as the use of concrete materials (e.g., origami) or dynamic geometric software.	Teachers are encouraged to use digital devices in the classroom, such as searching for information, and preparing and making presentations. E-learning is also implemented such that students and teachers can use social media platforms to communicate about lessons. The use of digital devices is recommended in data handling, especially in project-based learning.
Morocco	The Ministry of Education provides digital resources for schools. Most schools received CDs and DVDs that contain the target lessons and subjects in digital formats to be used in the multimedia room. The Ministry of Education website also includes digital lessons, most of which were contributed by classroom teachers.	Same as for mathematics
New Zealand	No policy. The use of technology is discussed in general terms, but not specifically within mathematics.	No policy. The use of technology is discussed in general terms, but not specifically within science.

Exhibit 19: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Eighth Grade

Reported by National Research Coordinators

(Continued)

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	Science Instruction
Norway	Digital tools are used in mathematics for games, exploration, visualization, and presentation. The curriculum for digital skills involves being aware of, using, and evaluating the role of digital tools for estimation, problem-solving, simulation, and modeling. It is also important that students learn to find information, analyze, process, and present data with appropriate tools, and be critical of sources, analyses, and results.	Digital tools are used in science for exploration, measurement, visualization, simulation, registration, documentation, and publication when performing experiments and fieldwork. Digital animations, simulations, and games are good aids for stimulating creativity, and demonstrating and visualizing natural science problems and research questions. Critical assessment of internet-based information reinforces the work in this subject. Digital communication systems make it possible to discuss natural science problems and research questions.
Oman	No policy	No policy
Portugal	The use of digital technology, such as Scratch, Excel, and numerical applications, is encouraged for teaching problem solving and other learning tasks. The use of calculators is recommended only for specific situations, such as computing with large numbers, square roots, and completing multistep calculations.	No policy
Qatar	The mathematics curriculum includes suggestions for teachers on the use of ICT tools and digital devices. Students should use the square root and cubic root keys on scientific calculators, interpret scientific notation generated and displayed on scientific calculators, and use graphing calculators, graphing software, and spreadsheets to explore line graphs. Students are also expected to explore relationships using geometry software.	Students should use the internet to research different topics, use data loggers to measure the temperature, and make presentations to show their results.
Romania	No policy	No policy
Russian Federation	According to the Federal State Educational Standard of Basic General Education, students learning mathematics and computer science must develop basic skills and abilities to use computers, be able to formalize and structure information, draw typical flat shapes and 3-dimensional bodies using simple computer tools, and choose how to represent data in accordance with the task (through tables, diagrams, graphs, charts) using appropriate software for data processing. Students are also expected to exercise safe and appropriate behavior when working with computer programs and on the internet, as well as comply with information ethics and laws.	In accordance with the basic educational curriculum, students use ICT to search and apply the information resources necessary to solve educational and practical problems, and use computer technology (including the choice of adequate task tool hardware, software and services) to solve ICT learning tasks, such as calculation, writing letters, essays, reports, and abstracts; and creating presentations. Students will also create information resources of different types and for different audiences, and observe information ethics and information security rules.
Saudi Arabia	No policy	No policy
Singapore	Schools are guided by the Ministry of Education's Masterplan for ICT in Education in their use of digital devices to support teaching and learning in all subjects. The most recent plan aims to broaden the use of ICT for quality learning to support the curriculum. For mathematics, the curriculum framework states that for students to develop a deep understanding of mathematical concepts and make sense of their applications, they should be exposed to technological aids that help them relate abstract mathematical concepts to concrete experiences. In today's classrooms, mathematical skills also include the abilities to use spreadsheets and other software to learn and do mathematics. The role of ICT in the teaching and learning of mathematics is further articulated under the Principles of Teaching in the mathematics syllabus: Teaching should connect learning to the real world, harness ICT tools, and emphasize twenty-first century competencies. Teachers should consider the affordances of ICT to help students learn. ICT tools can help students understand mathematical concepts through visualizations, simulations, and representations, as well as work collaboratively and think critically about solutions. They can also support exploration and experimentation, and extend the range of problems accessible to students.	Schools are guided by the Ministry of Education's Masterplan for ICT in Education in their use of digital devices to support teaching and learning in all subjects. The most recent plan aims to broaden the use of ICT for quality learning to support the curriculum. For science, it translates into staying up to date with the changing education landscape and developments in education technology, and helping students develop twenty-first century competencies, a broad and deep foundation of learning in science, and lifelong learning skills. ICT supports the inquiry process and also facilitates student collaboration and self-directed learning; online collaborative tools enable students to discuss their ideas or findings and consult field experts. Internet-enabled devices can be used to facilitate data collection and analysis in situated learning. Students can also explore and visualize abstract concepts using simulation tools.
South Africa	Teachers provide direction to students regarding when they are permitted to use calculators. Calculators should be used for computations involving large numbers and when students' knowledge of number facts or concepts are not being explicitly assessed. Students should not become dependent on calculators; calculators remain a useful tool for checking solutions.	No policy

Exhibit 19: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Eighth Grade

Reported by National Research Coordinators

(Continued)

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	**Science Instruction**
Sweden	The national curriculum states that schools are responsible for ensuring that each student can use modern technology as a tool in the search for knowledge, communication, creativity, and learning. In mathematics, students should be given opportunities to develop knowledge in using digital tools and programming to explore problems and mathematical concepts, make calculations, and present and interpret data. Students may use mental arithmetic, written methods, or digital tools to approximate natural numbers and simple numbers in decimal form. Students are also taught how to program in different programming environments using algorithms, specifically focusing on how algorithms can be created, tested, and improved when programming for mathematical problem solving. Depiction and construction of geometrical objects should be taught both with and without digital tools, as should designing and interpreting tables, diagrams, and graphs. Students are also expected to produce scales for reducing and increasing 2- and 3-dimensional objects, assess risk and chance based on computer simulations and statistical material, and understand how functions can be used, both with and without digital tools, to examine change, rate of change, and relationships.	In science, students should be given opportunities to develop different skills within different topics with the use of both digital tools and other equipment, and to look for answers by using different types of sources.
Turkey	According to the curriculum, students should learn digital competence—the safe and critical use of ICT for business, daily life, and communication. Interactive activities with appropriate ICT may be used in instruction.	Same as for mathematics
United Arab Emirates	Students may use graphing calculators, simple calculators, and tablets.	No policy
United States	Most states do not have policies regarding computer use. However, many states have standards for technology literacy requiring computer use in mathematics instruction. Some Common Core State Standards in mathematics require the use of technology in the middle to upper grades. Many school districts and schools have chosen to integrate technology, such as computers, tablets, and interactive whiteboards, with their mathematics instruction. States are increasingly providing or enabling digital devices and digital content for students and faculty to use in school and at home. Some states also have standards for use of calculators in instruction as well as the progression from 4-function to graphing calculators. Individual districts may give guidelines regarding calculator usage during instructional time. Calculator usage is common in Grade 8 mathematics courses; data from the 2017 National Assessment of Educational Progress (NAEP) showed that for the majority of Grade 8 students, teachers reported unrestricted use of calculators during their mathematics lessons.	Most states do not have policies regarding computer and calculator use in science instruction. However, many states and national science standards documents include statements related to the use of technology such as computers, calculators, and other digital tools. The Next Generation Science Standards (NGSS) emphasize science practices that benefit from the use of technology, such as analyzing and interpreting data, using mathematical and computational thinking, as well as developing and using models to describe or predict science phenomena. The Every Student Succeeds Act (ESSA; 2015) emphasizes the importance of using technology in the classroom as a part of student enrichment, and many schools have chosen to integrate technology with their science instruction. States are increasingly providing or enabling digital devices and digital content for students and faculty to use in school and at home.
Benchmarking Participants		
Ontario, Canada	According to the Ontario Curriculum Guide, calculators and computers can be used to perform operations, make graphs, and organize and display data. Students may use digital devices to investigate number and graphing patterns, geometric relationships, and different representations to simulate situations and to extend problem solving. It is important that students learn when it is appropriate to apply mental computation, reasoning, and estimation skills to predict and check answers. Teachers can use ICT both for whole class instruction and to design programs that meet diverse student needs. ICT can be used to reduce the time spent on routine mathematical tasks; promote thinking and concept development; introduce simulations, multimedia resources, databases, and computer-assisted learning modules; and connect students to other schools, at home and abroad.	According to the Ontario Curriculum Guide, ICT provides a range of tools that can significantly extend and enrich teachers' instructional strategies and support students learning in science and technology. Computer programs can be used to help students collect, organize, and sort the data and to write, edit, and present reports on their findings. ICT also can be used to simulate investigations when field studies on a particular topic are not feasible and to connect students to other schools, at home and abroad.
Quebec, Canada	No policy	The Science and Technology Program proposes the use of a number of information and communication technologies in the teaching of this discipline.

Exhibit 19: National Policies Regarding Use of Information and Communications Technology (ICT) and Digital Devices in Mathematics and Science Instruction at the Eighth Grade

Reported by National Research Coordinators

(Continued)

Country	Description of the National Policies for Use of Information and Communications Technology (ICT) and Digital Devices	
	Mathematics Instruction	**Science Instruction**
Moscow City, Russian Fed.	According to the Federal State Educational Standard of Basic General Education, students learning mathematics and informatics will develop basic skills and abilities to use computers, be able to formalize and structure information, draw typical flat shapes and 3-dimensional bodies using simple computer tools, and choose how to represent data in accordance with the task (through tables, diagrams, graphs, charts) using appropriate software for data processing. Students are also expected to exercise safe and appropriate behavior when working with computer programs and on the internet, as well as comply with information ethics and laws.	In accordance with the General Educational Program, students will utilize ICT to search and apply the information resources necessary to solve educational and practical problems and use computer technology (including the choice of adequate task tool hardware and software and services) to solve information and communication learning tasks, such as calculation; writing letters, essays, reports, and abstracts; and creating presentations. Students will also create information resources of different types and for different audiences, and observe information ethics and information security rules.
Gauteng, South Africa	Same as South Africa	
Western Cape, South Africa	Same as South Africa	
Abu Dhabi, UAE	Same as United Arab Emirates	
Dubai, UAE	Same as United Arab Emirates	

Exhibit 20: National Policies Regarding Use of Digital Devices in Mathematics Examinations

Reported by National Research Coordinators

Country	National Policies Regarding Use of Digital Devices in Mathematics Examinations	
	Grade 4	Grade 8
Albania	No policy	–
Armenia	No policy	–
Australia	No explicit policy. However, the National Assessment Program—Literacy and Numeracy (NAPLAN) has a policy that calculators are not allowed in the national assessments in Years 3 and 5 (national assessment does not take place in Year 4).	No explicit policy, however NAPLAN has a policy that calculators are allowed for certain sections of the assessments in Years 7 and 9 (national assessment does not take place in Year 8).
Austria	No explicit policy	–
Azerbaijan	No policy	–
Bahrain	No policy	No policy
Belgium (Flemish)	No explicit policy. Certain students that need special accommodations may use computers and calculators during lessons and examinations.	–
Bosnia and Herzegovina	No policy	–
Bulgaria	No policy	–
Canada	No policy	–
Chile	No explicit policy. The national curriculum includes ICT learning goals, and the Ministry of Education provides teachers with guidance on using ICT in the classroom and digital resources.	Same as for Grade 4
Chinese Taipei	No explicit policy. Calculators and computers are not allowed in high-stakes assessments. Therefore, students are prohibited from using them in formal tests in school. However, some teachers may allow students to use technology for quizzes.	Same as for Grade 4
Croatia	No policy	No policy
Cyprus	No policy	Calculators are allowed during examinations.
Czech Republic	No policy	–
Denmark	The national mathematics test is a computer-based adaptive test. It is mandatory in Grade 3 and optional in Grade 4.	–
Egypt	–	Only calculators are allowed during examinations.
England	No explicit policy, as there are no prescribed tests or examinations for Year 5. For the standard assessment tests in Grade 1 and Year 2, calculators are not permitted.	No explicit policy, as there are no prescribed tests or examinations for Year 9. Scientific calculators are allowed for parts of the General Certificate of Secondary Education (GCSE) examinations taken at the end of Grade 10; GCSE examinations are paper-based assessments.
Finland	No policy	No policy
France	No policy	No policy
Georgia	Computer-based national assessments (census-based) are administered in Grades 4, 6, and 10.	No policy
Germany	No policy	–
Hong Kong SAR	In general, primary students are not allowed to use calculators during tests and examinations.	Scientific calculators with specified models are allowed in public examinations for Secondary 3 (Grade 9). There are no public examinations for Secondary 2 (Grade 8). Schools have their own policies regarding the use of digital devices. In general, scientific calculators are allowed during school tests and examinations of mathematics for all secondary levels (Grade 7–12).
Hungary	No policy	No policy
Iran, Islamic Rep. of	Calculators are not allowed during tests and examinations.	The use of calculators and computers is permitted but not mandated and is based on the teachers' discretion.
Ireland	No policy. There are references to the use of digital devices in general but not specific to Grade 4 mathematics tests or examinations.	Students are permitted to use calculators during state examinations.
Israel	–	Calculators are allowed during testing.
Italy	No policy	No policy
Japan	No policy	No policy
Jordan	–	Students are allowed to use calculators during mathematics lessons and examinations.
Kazakhstan	No policy	No policy

A dash (–) indicates data not provided.

SOURCE: IEA's Trends in International Mathematics and Science Study - TIMSS 2019

Exhibit 20: National Policies Regarding Use of Digital Devices in Mathematics Examinations

Reported by National Research Coordinators

(Continued)

Country	National Policies Regarding Use of Digital Devices in Mathematics Examinations	
	Grade 4	Grade 8
Korea, Rep. of	Assessment of learning in mathematics can provide students with opportunities to use technological tools including calculators, computers, and educational software, depending on the learning content and the methods of assessment.	Same as for Grade 4
Kosovo	No policy	–
Kuwait	No policy	No policy
Latvia	No policy	–
Lebanon	–	No policy
Lithuania	No explicit policy, but primary school teachers can use computers (or tablets) in the learning process at their discretion. Use of calculators in primary schools is not recommended.	No explicit policy, but students begin compulsory IT courses in Grade 5. Teachers can use computers (or tablets) in the learning process at their discretion.
Malaysia	–	A special circular on the use of scientific calculators in the school and public examination has been distributed to all schools. Students are only allowed to use nonprogrammable scientific calculators during examinations.
Malta	No policy	–
Montenegro	No policy	–
Morocco	Students are not allowed to use any digital device during tests or examinations.	The use of nonprogrammable calculators during examinations is sometimes allowed.
Netherlands	No policy	–
New Zealand	No policy. The use of technology is discussed generally, but not specifically within the mathematics area of the curriculum.	Same as for Grade 4
North Macedonia	No policy	–
Northern Ireland	No policy, as there are no national tests or examinations in Grade 4.	–
Norway	No policy	No policy
Oman	No policy	No policy
Pakistan	No policy	–
Philippines	No policy, although students are barred from using technology to capture test items during national examinations.	–
Poland	No policy	–
Portugal	No policy	No policy
Qatar	No policy	No policy
Romania	–	Students are not allowed to use any digital device during tests and examinations.
Russian Federation	No policy	No policy
Saudi Arabia	Digital devices are not allowed during tests.	Same as for Grade 4
Serbia	No policy, as there are no national tests or examinations in Grade 4. Students are not allowed to use any digital device during tests or oral examination, with the exception of students with individual educational plans.	–
Singapore	No policy. Calculators are introduced only after Grade 4.	No policy
Slovak Republic	No policy. Teachers and schools have discretion over decisions about calculator use.	–
South Africa	No policy	No policy
Spain	No policy	–
Sweden	No policy, but there are some statements about digital tools in the core content of the syllabus that are supposed to be assessed.	Same as for Grade 4
Turkey	No policy	No policy
United Arab Emirates	No policy	The multiple-choice items on end of term assessments (40–50% of the assessment) are administered via computers.

Exhibit 20: National Policies Regarding Use of Digital Devices in Mathematics Examinations

Reported by National Research Coordinators

(Continued)

Country	National Policies Regarding Use of Digital Devices in Mathematics Examinations	
	Grade 4	**Grade 8**
United States	Most states have standards for calculator use on state-level assessments as well as the type of calculator. In the majority of states, calculators are not permitted on Grade 4 mathematics assessments. Most states give their mathematics assessments via computers or tablets and specify whether a physical or a virtual calculator (e.g., an app on a tablet) may be used.	Most states have standards for calculator use on state-level assessments as well as the type of calculator. In the majority of states, calculators are permitted on Grade 8 mathematics assessments. Most states give their mathematics assessments via computers or tablets and specify whether a physical or a virtual calculator (e.g., an app on a tablet) may be used.
Benchmarking Participants		
Ontario, Canada	No policy. According to the Education Quality and Accountability Office Guide for Accommodations, Special Provisions and Exemptions, students may receive accommodations involving technology for large-scale assessments.	Same as for Grade 4
Quebec, Canada	No policy	There are no guidelines or policies regarding the use of technology. The government suggests the use of some tools, such as scientific calculators and software, but it is not mandatory. There are no guidelines or policies regarding the use of technologies for secondary mathematics examinations.
Moscow City, Russian Fed.	In accordance with the basic program of primary general education, ICT can and should be widely used in assessing the formation of universal educational actions, which are also formed in the process of studying mathematics.	No policy
Gauteng, South Africa	Same as South Africa	
Western Cape, South Africa	Same as South Africa	
Madrid, Spain	Same as Spain	
Abu Dhabi, UAE	Same as United Arab Emirates	
Dubai, UAE	Same as United Arab Emirates	

Exhibit 21: Main Preparation Routes and Current Requirements for Fourth Grade Teachers

Reported by National Research Coordinators

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Albania	Most teachers receive their education through a university degree program in the field of education.	● (1 year)	●	● (3 months)	●	In 2010, a law was introduced to regulate the profession. Now, teachers must hold a license.
Armenia	Most teachers receive their education through a university degree program. Some have attended a teacher college program, but that is becoming less common.	● (1 year)	●	○	○	Beginning in 2023, teachers will be required to hold a bachelor's degree.
Australia	Most teachers receive a 4-year university degree in education, or complete a 2-year postgraduate qualification program following a 3- or 4-year noneducation degree.	● (varies by course, but at least 60 days)	●	● (varies by state, but usually around 1 year)	○	In 2011, all Ministers of Education endorsed a nationally consistent approach to teacher registration that includes requiring the same standards and consistent processes across states and territories. Since 2016, all initial teacher education candidates take the Literacy and Numeracy Test for Initial Teacher Education Students to demonstrate that they are in the top 30% of the adult population for personal literacy and numeracy.
Austria	Since 2015, all teachers are required to hold a bachelor's degree from a university. Teachers also are encouraged to complete a master's degree.	● (at least 65 days)	●	○	●	In 2013, a law requiring teacher education programs to be housed in university colleges of teacher education was introduced. Teachers also were offered the option to specialize in a subject or pedagogical topic. Since 2015, all teachers must complete a bachelor's degree (240 ECTS credits). As of 2019, all teachers also must complete courses adding up to a minimum of 60 (or up to 120) ECTS credits, and their first year of teaching is considered an induction phase, during which they are supported by mentors. Teachers may begin the induction phase while completing their master's degree, or after.
Azerbaijan	Primary teachers must have a university or college degree and should major in Pedagogy of Primary Education.	● (14 weeks)	●	○	○	No change in policy
Bahrain	Teachers are required to hold a subject-specific bachelor's degree (e.g., mathematics or science) and attend in-service training. Teachers that did not complete their degree at an educational institution must obtain a post-graduate diploma (PgD) in education.	● (1 year)	○	○	○	Since 2012, teachers graduating from Bahrain Teachers College can teach all subjects and are exempt from the PgD requirement.
Belgium (Flemish)	Teachers receive their education through a bachelor's degree program at a university college (equivalent to 180 ECTS credits). Older teachers completed a 2-year program.	● (3 years)	●	○	○	No change in policy
Bosnia and Herzegovina	All teachers receive their education through a university degree program.	● (1–2 years)	●	● (1–2 years)	○	No change in policy
Bulgaria	Primary teachers must have at least a bachelor's degree (4 years) in primary pedagogy.	● (150–240 hours)	●	○	○	No change in policy

● Yes
○ No

Note: 60 European Credit Transfer and Accumulation System (ECTS) credits are equivalent to one full year of study or work.

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Exhibit 21: Main Preparation Routes and Current Requirements for Fourth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Canada	Teachers are trained by faculties of education at universities. Teachers must hold a teaching degree (e.g. Bachelor's of Education, Master's of Teaching, etc.) to teach in public schools.	● (2 weeks–4 months)	●	● (900 hours–2 years)	●	Since 2015, initial teacher education programs doubled in length (from 2 to 4 academic semesters), and the minimum practicum requirements doubled (from 40 to 80 days). The Ontario College of Teachers Act was amended to include a provision requiring teachers to pass a mathematics proficiency test to teach in public schools.
Chile	Teachers receive their education through a university degree program. The most common degree is "basic education pedagogy" (*pedagoga en educacin basica*), which includes Grades 1–8.	● (6 months–1 year)	●	○	○	In 2016, the Teacher Professional Development System Law was passed, changing the way teachers are selected into initial training programs, their preparation, their working conditions and salaries, and their professional development. Now, all teacher preparation programs are housed at universities, and additional admission requirements are being gradually introduced. Pedagogy students must take 2 diagnostic evaluations—1 administered by universities at the beginning of the program and 1 by the Ministry of Education during the 12 months leading up to graduation.
Chinese Taipei	Most teachers attend a teacher education program while they receive their education in universities.	● (6 months)	●	○	●	No change in policy
Croatia	Teachers receive their initial training and education necessary for teaching through university degree programs. All homeroom teachers are educated in Teacher Faculties within the main Croatian universities and may have majored in a variety of fields.	● (2 years)	●	● (1 year)	○	In 2010, the Bologna Process for tertiary education was fully implemented.
Cyprus	Grade 4 teachers must hold a university degree in education/pedagogy.	● (varies, typically 6 months)	○	● (varies, 4–6 years)	○	No change in policy
Czech Republic	Most teachers receive their education through a university degree program (master's degree).	● (typically 6–7 weeks)	●	○	○	No change in policy
Denmark	Teachers must complete a 4-year professional bachelor program in education (equivalent to 240 ECTS credits).	● (18 weeks)	●	○	○	In 2013, a new school reform set a goal for all teachers to have education experience and/or majored in all subjects they teach by 2020. The requirement to hold a degree from a 4-year professional bachelor's program was introduced in 2017.
England	Teachers in Local Authority maintained schools must have a degree to obtain Qualified Teacher status and meet threshold General Certification of Secondary Education (GCSE) standards in English, mathematics, and science. Teachers in academy schools (state-funded but independent of the Local Authority) do not need to be qualified.	● (24 weeks)	○	● (1 school year)	●	As of 2012, all independent schools, free schools, and academies may employ teachers without qualified teacher status.

● Yes
○ No

SOURCE: IEA's Trends in International Mathematics and Science Study - TIMSS 2019

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Exhibit 21: Main Preparation Routes and Current Requirements for Fourth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Finland	All teachers receive a Master's of Education through a university degree program.	●	○	○	○	No change in policy
France	Since 2013, primary teachers complete a master's degree in teaching careers, education, and training organized by the *coles suprieures du professorat et de l'education* (higher education of the teaching staff and education). The program of study includes a competitive examination at the end of the first year and a practicum.	● (1 year)	●	●	●	From 1991 to 2010, primary teachers completed a 3-year university degree (*licence*), followed by 1-year training in a University Institute of Teacher Education that included supervised practicum and 12 weeks of training courses. From 2011 to 2013, primary teachers completed a master's degree that also included supervised practicum and coursework.
Georgia	Primary teachers must have at least a bachelor's degree and pass an examination in the subjects they will teach.	● (1 semester)	●	○	○	The requirement to pass examinations in the subjects the candidate will teach and to become involved in professional development/career advancement were introduced in 2015.
Germany	Teacher education consists of 2 stages—higher education, including periods of practical training, offered in universities and colleges of arts and music, and practical pedagogic training (*Vorbereitungsdienst*) in teacher training institutes and schools. For primary teachers, higher education consists of 10 semesters (6 bachelor's and 4 master's) and a total of 210 ECTS credits that devote attention to education science and practical teaching components.	● (varies by degree)	●	● (18 months)	●	The state examination is being replaced by bachelor's and master's degrees, and the amount of practical training in university has considerably increased in recent years. The number of side-entrants recruited to teach without completing the actual preparatory period also has increased.
Hong Kong SAR	Most teachers receive their professional training through a university degree program. Teachers also continually receive professional development.	●	●	●	○	In the 2019–2020 school year, the all-graduate teaching force policy was implemented in public sector primary and secondary schools. By the 2020–2021 school year, all schools must fully implement this policy.
Hungary	Lower primary teachers are required to hold a bachelor's degree. The degree may be earned in 8 semesters at an independent teacher training college at a university. In this system, students take courses in their specialty subjects and in pedagogy. Candidates participate in a continuous 8—10 week teaching practice and take an in-classroom teaching examination and a state examination.	● (2–3 months)	●	○	●	Beginning in 2013, training programs for primary school teachers introduced an 8+2 semester model (8 semester master's degree, 2 semesters of professional practice). As of 2017, all teacher training programs follow this model.
Iran, Islamic Rep. of	Most teachers receive their education through teacher education programs or from universities with majors in primary education.	● (2 semesters)	○	○	○	No change in policy
Ireland	Primary teachers may complete their Initial Teacher Education (ITE) through 1 of 2 routes. In the concurrent model, teachers complete a 4-year Bachelor's in Education; in the consecutive model, those who have already completed a basic degree complete a 2-year post-graduate Professional Master in Education (PME).	● (approximately 20 weeks)	●	● (100 days)	●	The duration of initial teacher education programs has increased from 3 to 4 years (concurrent) and from 18 to 24 months (consecutive). Since 2012, all newly qualified teachers are also required to participate in the national induction program.

● Yes
○ No

Exhibit 21: Main Preparation Routes and Current Requirements for Fourth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Italy	Primary teachers are required to complete a 5-year university degree program in education (*Laurea Magistrale in Scienze della Formazione Primaria*) to become a certified teacher. Students are required to attend a period of supervised practicum throughout years 2–5 of the course and to write a final report. The period of supervised practicum includes class observation activities, tutored teaching practice, and self-directed teaching activities.	● (600 hours)	●	● (1 year)	○	Since 2013, a specific training course (*Tirocinio Formativo Attivo*) is no longer required. A university degree is a compulsory and sufficient prerequisite for taking the qualifying examination to become a fully certified teacher.
Japan	Teachers of Grade 4 students in public schools must hold an elementary school teacher certificate (which can be earned through an associate or undergraduate degree program) and pass an examination offered by the local Board of Education.	● (4 weeks)	●	● (1 year)	●	No change in policy
Kazakhstan	Most teachers receive their education through a university degree program. Some attend a teacher college, but that is becoming less common.	● (3 months)	●	○	●	No chance in policy
Korea, Rep. of	Most teachers receive their education through a national university of education. Some receive their education through the department of elementary education in a teachers college.	● (8–9 weeks)	●	○	○	No change in policy
Kosovo	All teachers receive their education through a university degree program. These programs include training in a variety of topics offered by the Ministry of Education, Science, and Technology (MEST) and by nongovernmental organizations with MEST-accredited programs.	● (9 months)	●	● (1 year)	●	Since 2006–2007, teachers are required to complete an additional 2-year requalification program (Advancing Qualification of Teachers).
Kuwait	Primary teachers must have a university degree from the department of education at Kuwait University, a college of basic education, or any equivalent university degree from another institution.	● (4 months)	○	● (3.5 months)	●	No change in policy
Latvia	Teachers receive their education through a university degree program.	● (8–20 weeks)	●	○	○	Since 2018, new teacher candidates that did not complete a university teacher qualification program can earn their credentials by working under the guidance of a teacher mentor with higher education for a maximum of 1 year.
Lithuania	Most primary school teachers receive their education in pedagogical universities through a university degree program (bachelor's degree, 4 years) or primary teacher college programs (3–4 years).	● (3 months)	○	○	○	In 2014, the Minister of Education and Science approved new qualifications for becoming a teacher. One of the main changes was that pedagogical university students must finish their studies before they begin teaching in primary schools.

● Yes
○ No

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Exhibit 21: Main Preparation Routes and Current Requirements for Fourth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Malta	Most teachers receive their initial teacher education through a 3-year university degree program followed by a 2-year post graduate Master in Teaching and Learning (MTL).	● (10 weeks)	○	● (1 calendar year)	●	Since 2017, an MTL is required.
Montenegro	Primary school teachers must have a higher education degree from a Faculty of Teacher Training and Education (3+2 year model).	● (1 year)	●	● (9 months)	●	Since 2017, teachers are required to have a master's degree (5 years) from a Faculty of Teacher Training.
Morocco	Almost all primary teachers attend a 1-year teacher training program at a teacher training school.	● (6 months)	●	● (1 school year)	●	Starting in 2016, primary teachers are being trained in the Regional Centers for the Professions of Education and Training.
Netherlands	All primary teachers must hold a diploma from 1 of the primary school teacher training colleges (higher vocational education). This diploma allows teachers to teach K1 to Grade 6.	● (varies by program)	●	● (6 months)	○	No change in policy
New Zealand	The most common preparation routes are either via a 3-year bachelor of education program (specializing in primary teaching), a 4-year conjoint degree program (e.g., Bachelor of Arts/Bachelor of Teaching), or a 1-year compressed graduate diploma program of study, which can be undertaken by candidates who already hold a university degree.	● (at least 14 weeks)	○	● (at least 2 years)	●	No change in policy
North Macedonia	All teachers receive their education through a university degree program.	● (120 hours)	●	● (1 year)	●	No change in policy
Northern Ireland	Teachers complete a 4-year Bachelor of Education (BEd-Honors) degree or a 1-year Postgraduate Certificate in Education (PGCE) course (both directed at primary level teaching).	● (32 weeks for B.Ed or 16 weeks for PGCE)	●	● (1 year)	○	No change in policy
Norway	Most teachers attend a specific teacher education program. Programs for teachers of Grades 1–7 are provided by the University Colleges.	● (at least 100 days)	●	○	○	Since 2014, teachers must have 30 ECTS credits in mathematics to teach Grade 4 mathematics. School owners are responsible for providing teachers who completed their education before this change was implemented with the opportunity to acquire the minimum required credits by 2025.
Oman	Most teachers receive their education through a university degree program.	● (1.5 years)	○	● (1 semester)	●	No change in policy
Pakistan	Teachers should have a university degree with a professional degree in education. Teachers are recruited on the basis of academic achievement, scores on a screening test, and an interview.	● (4 weeks)	●	● (1 year)	○	No change in policy

● Yes
○ No

Exhibit 21: Main Preparation Routes and Current Requirements for Fourth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Philippines	Most teachers hold a Bachelor's of Elementary Education, a college degree in Teacher Education, or have completed a Teacher Certificate Program. Teachers must pass the Licensure Examination for Teachers (LET), conducted by the Professional Regulation Commission, to begin teaching.	●	●	●	●	No change in policy
Poland	There are 3 teacher preparation routes. In the concurrent model, candidates must complete university education in the given field of study (e.g. mathematics, biology, Polish) with the teacher education module, consisting of additional courses in subject-specific pedagogy, psychology, and practicum. In one consecutive model, candidates must complete postgraduate studies for qualification to teach specific school subjects. In another consecutive model, candidates must complete pedagogical courses consisting of a teacher preparation module addressed to graduates of tertiary education (courses in subject-specific pedagogy, psychology plus required hours of practicum).	● (varies by model, but at least 150 hours)	○	●	○	Revised standards for teacher education were introduced in 2019 and emphasize the importance of practicum. They also dictate that starting in 2021, universities that provide teacher education must have at least scientific category B in the discipline to which the field of study is assigned.
Portugal	All teachers receive their education through a university program and hold a bachelor's or master's degree.	● (1 school year)	○	● (1 school year)	●	In 2015, a policy requiring teachers to pass a qualification examination to practice at state-endorsed schools was suspended.
Qatar	All teachers must hold a bachelor's degree in the subject they teach from a recognized university. Candidates who hold a degree from the Faculty of Education or from other faculties and have a minimum grade average of "good" may teach in Qatari schools without having previous teaching experience.	● (1 semester)	○	● (3–6 months)	○	The requirement for teachers to hold a university degree was introduced in the past 10 years.
Russian Federation	Most teachers receive their education in the pedagogical faculty at a university or through a teacher college program.	●	●	○	○	The Russian Ministry of Labor approved the Professional Teachers Standard in 2013, which requires that teachers possess new competencies to work with gifted students; implement inclusive education programs; teach Russian language to non-native speakers; and work with students with developmental issues, students who are socially neglected or vulnerable, and students with serious behavioral issues.
Saudi Arabia	Most teachers receive their education through a university degree program. Some have attended a teacher college program, but that is becoming less common.	● (1 academic term)	●	○	○	No change in policy

● Yes
○ No

Exhibit 21: Main Preparation Routes and Current Requirements for Fourth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Serbia	All teachers receive their education through a university master's degree program.	● (1 month)	●	● (1 year)	●	Starting in 2016, Grade 4 mathematics and science teachers must complete a master's teacher program. Teachers with bachelor's degrees may only teach afterschool activities (e.g., extracurricular activities and homework).
Singapore	All prospective primary school teachers are required to complete 1 of 4 pre-service teacher education programs conducted by the National Institute of Education, Nanyang Technological University. They can obtain either a 2-year Diploma in Education, a 4-year Bachelor of Arts/Science (Education), a 16-month Postgraduate Diploma in Education (Primary), or a 2-year Postgraduate Diploma in Education (Physical Education).	● (at least 10 weeks)	●	● (1 year)	●	No change in policy
Slovak Republic	Primary school teachers (Grades 1–4) are required to graduate from a second stage of university study (5-year master's degree program usually from a Faculty of Pedagogy). Teachers are trained to teach all subjects in Grades 1–4 except for foreign languages.	● (varies by program, approximately 100 hours)	●	○	●	No change in policy
South Africa	Most teachers receive their education through a university degree or diploma program.	● (9 weeks per year)	○	● (1 year)	○	The Revised Minimum Requirements of Teacher Education Qualifications Policy (2015) provides guidelines for initial teacher education with 2 training options. Teachers may complete a 4-year Bachelor of Education (BEd) degree or complete an appropriate degree followed by a 1-year Advanced Diploma in Education, and register with the South African Council for Educators.
Spain	Primary teachers complete a 4-year university degree including a compulsory practicum.	● (50 ECTS)	○	● (varies by region, up to 1 school year)	○	In 2010, the university degree for primary school teachers was extended from 3 to 4 years according to The Bologna Process and in accordance with the European process of convergence.
Sweden	Teachers receive their education through a university teacher program.	● (20 weeks)	●	○	●	Since 2011, teachers must apply for a certificate from the Swedish National Agency for Education to obtain permanent employment and to grade students.
Turkey	Teachers receive their education through faculties of education across the country.	● (6 hours per week for 2 semesters)	●	● (at least 1 year)	●	Since 2013, teachers must take a general examination completed by all public personnel and a professional teaching knowledge examination. Following the written examination, teachers must pass an oral examination to become a contract teacher.
United Arab Emirates	All teachers receive their education through a university degree program.	●	●	● (1–2 months)	●	No change in policy

● Yes
○ No

Exhibit 21: Main Preparation Routes and Current Requirements for Fourth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
United States	The traditional preparation route for public school teachers includes a degree from a 4-year college or university and completion of a teacher education program, including a practicum of supervised teaching experience. Elementary teachers (Grades 1–5) may hold a bachelor's degree in education or another subject area. All public school teachers must be licensed by the state in which they are teaching. States have the autonomy to determine the qualifications that teachers need to obtain certification to teach specific subject areas by grade level.	● (varies by state, typically 8–12 weeks)	●	● (varies by state, typically 1–3 years)	●	The Every Student Succeeds Act of 2015 requires all teachers to hold a license/certification from their state and grants states the autonomy to set requirements for highly qualified teachers. This requirement reflects a change from the No Child Left Behind Act of 2002, which included specific federally mandated requirements for elementary, middle school, and high school teachers.
Benchmarking Participants						
Ontario, Canada	Teachers are trained at faculties of education and generally hold a Bachelor's of Education. Programs may be either consecutive (4 semesters post-undergraduate) or concurrent (4 semesters concurrent with undergraduate).	● (at least 80 days)	●	○	●	Since 2015, initial teacher education programs doubled in length (from 2 to 4 academic semesters), and the minimum practicum requirements doubled (from 40 to 80 days). The Ontario College of Teachers Act was amended to include a provision requiring teachers to pass a mathematics proficiency test to teach in public schools.
Quebec, Canada	Most teachers hold a bachelor's degree in preschool and elementary education from a university in Quebec.	● (700 hours)	●	● (900 hours)	○	No change in policy
Moscow City, Russian Fed.	Most teachers receive their education through a 4-year bachelor's program with a specialization in pedagogy. Some teachers attend a teacher college program, but this is becoming less common.	● (16–20 weeks)	●	●	●	The Russian Ministry of Labor approved the Professional Teachers Standard in 2013, which requires that teachers possess new competencies to work with gifted students; implement inclusive education programs; teach Russian language to non-native speakers; and work with students with developmental issues, students who are socially neglected or vulnerable, and students with serious behavioral issues.
Madrid, Spain	Same as Spain					
Abu Dhabi, UAE	Same as United Arab Emirates					
Dubai, UAE	Same as United Arab Emirates					

● Yes
○ No

Exhibit 22: Main Preparation Routes and Current Requirements for Eighth Grade Teachers

Reported by National Research Coordinators

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Australia	Most teachers receive a 4-year university degree in education or complete a 2-year postgraduate qualification program following a 3- or 4-year noneducation degree. Secondary mathematics and science teachers typically major in the subject they teach, then complete a graduate certification program.	● (varies by course)	●	● (varies by state)	○	In 2011, all Ministers of Education endorsed a nationally consistent approach to teacher registration that includes requiring the same standards and consistent processes across states and territories. Since 2016, all initial teacher education candidates take the Literacy and Numeracy Test for Initial Teacher Education Students to demonstrate that they are in the top 30% of the adult population for personal literacy and numeracy.
Bahrain	Teachers are required to hold a subject-specific bachelor's degree and attend in-service training.	● (6–12 weeks)	○	○	○	No change in policy
Chile	Teachers receive their education through a university degree program. The most common degree is "basic education pedagogy" (*pedagoga en educacin basica*), which includes Grades 1–8.	● (6 months–1 year)	●	○	○	In 2016, the Teacher Professional Development System Law was passed, changing the way teachers are selected into initial training programs, their preparation, their working conditions and salaries, and their professional development. Now, all teacher preparation programs are housed at universities, and additional admission requirements are being gradually introduced. Pedagogy students must take 2 diagnostic evaluations–1 administered by universities at the beginning of the program and 1 by the Ministry of Education during the 12 months leading up to graduation.
Chinese Taipei	Most teachers attend a teacher education program while they receive their education in universities.	● (6 months)	●	○	●	No change in policy
Cyprus	Teachers are obliged to have a university degree from a recognized institution of higher education in the subjects they will teach and attend a 1-year preservice education program.	● (39 days)	○	● (2 years)	○	No change in policy
Egypt	Most teachers receive their education through a university degree program. Some have attended a teacher college program, but that is becoming less common.	● (2 years)	●	○	○	No change in policy
England	Teachers must have a degree to obtain Qualified Teacher status and meet threshold General Certification of Secondary Education (GCSE) standards in English and mathematics. For Grade 8 teachers, there is no science GCSE requirement. Teachers in academy schools (state-funded but independent of the Local Authority) do not need to be qualified.	● (24 weeks)	●	● (1 school year)	●	As of 2012, all independent schools, free schools, and academies may employ teachers without qualified teacher status.

● Yes
○ No

Exhibit 22: Main Preparation Routes and Current Requirements for Eighth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Finland	Most Grade 8 teachers have subject-specific teacher education provided in cooperation with different university departments and faculties. Candidates complete subject-specific courses in the department of the particular subject and pedagogical courses in the department of teacher education.	● (20 credits)	○	○	○	No change in policy
France	Grade 8 teacher qualification programs are subject-specific. Candidates complete a university-level course (equivalent to a master's degree) in a specific subject.	● (1 year)	○	● (1–2 years)	○	Before 2010, teacher qualification programs commenced with a bachelor's degree.
Georgia	Teachers must have at least a bachelor's degree and pass an examination in the subjects they will teach. The bachelor's degree programs for primary education are separately accredited programs in universities.	● (1 semester)	●	○	○	The requirement to pass examinations in the subjects the candidate will teach and to become involved in professional development/career advancement were introduced in 2015.
Hong Kong SAR	Most teachers receive their professional training through a university degree program. Grade 8 mathematics and science teachers hold a Hong Kong bachelor's degree with a major in the subject they will teach, or the equivalent, or in another subject, with a postgraduate certificate in education, or equivalent, from a Hong Kong tertiary education institution.	●	●	●	○	In 2019, the all-graduate teaching force policy was implemented in public sector primary and secondary schools. By 2021, all schools must fully implement this policy.
Hungary	Teachers are required to hold a bachelor's degree. The degree may be earned in 8 semesters at an independent teacher training college at a university. In this system, students take courses in their specialty subjects and in pedagogy. Candidates participate in a continuous 8–10 week teaching practice and take an in-classroom teaching examination and a state examination.	● (2–3 months)	●	○	●	Beginning in 2013, training programs for secondary school teachers introduced a 10+2 semester model (10 semester master's degree, 2 semesters of professional practice). As of 2017, all teacher training programs follow this model.
Iran, Islamic Rep. of	Most teachers receive their education through teacher education programs or from universities with majors in primary education.	● (2 semesters)	○	○	○	Since 2009, new teachers are required to hold at least a master's degree.
Ireland	Teachers must hold an Honors Bachelor Degree or equivalent that the Teaching Council deems satisfies the requirements for at least 1 curricular subject and hold a Teaching Council-approved Initial Teacher Education qualification directed toward students ages 12–18, or a Teaching Council-approved concurrent degree qualification in post-primary initial teacher education, which combines the study of 1 or more curricular subjects that satisfy the requirements for at least 1 subject.	●	●	● (300 hours)	●	Since 2014, candidates are required to complete a 2-year Master's of Education and probation period, instead of a 1-year Higher Diploma in Education.

● Yes
○ No

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Exhibit 22: Main Preparation Routes and Current Requirements for Eighth Grade Teachers

Reported by National Research Coordinators

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(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Israel	Most teachers receive their education through teachers' college of education programs toward a Bachelor of Education (BEd), which also provides a teaching qualification (4 years). Some receive their education through a university degree, followed by 1 year of study toward a teaching license (3 years toward a Bachelor of Arts/Bachelor of Science (BA/BSc) and an additional 1-2 year program toward a teaching certificate). Courses for elementary and junior/high school teachers differ, but all other requirements are the same.	● (2 years)	○	● (1 year)	●	No change in policy
Italy	Lower secondary school teachers are required to hold a master's degree in mathematics or a science (e.g. physics, natural sciences, biology, geology, or chemistry). Teacher Qualification and 24 credits in pedagogical courses are also required.	● (1 year)	●	● (1 year)	●	The requirement to complete 24 university course credits in pedagogical courses was introduced in 2017.
Japan	Teachers of Grade 8 students in public schools must hold a middle school teacher certificate, which can be earned through an associate or undergraduate degree program, and pass an examination offered by the local Board of Education.	● (4 weeks)	●	● (1 year)	●	No change in policy
Jordan	Teachers receive their education through a university degree program.	○	○	○	○	No change in policy
Kazakhstan	Most teachers receive their education through a university degree program. Some attend a teacher college program, but that is becoming less common.	● (3 months)	●	● (3 months)	●	No change in policy
Korea, Rep. of	Secondary school teachers are required to get a certificate in the subject they teach. Teachers graduating from Teachers' College major in their specific subject or general college with a teacher certificate. Candidates who decide to become a teacher after graduating from a noneducation college or university may attend a graduate school of education.	● (4 weeks)	●	○	○	No change in policy
Kuwait	Teachers must have a university degree from the department of education at Kuwait University or from a college of basic education, or have an equivalent university degree from another institution.	● (4 months)	○	● (3.5 months)	●	No change in policy
Lebanon	Most teachers receive their education through a university degree program. Some have attended a teacher college program, but that is becoming less common.	● (1 year)	●	● (1 year)	●	No change in policy

● Yes
○ No

Exhibit 22: Main Preparation Routes and Current Requirements for Eighth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Lithuania	Most primary school teachers receive their education in pedagogical universities through a university degree program (bachelor's degree, 4 years) or primary teacher college programs (3–4 years).	● (3 months)	○	○	○	In 2014, the Minister of Education and Science approved new qualifications for becoming a teacher. One of the main changes was that pedagogical university students must finish their studies before they begin teaching in primary schools.
Malaysia	Teachers must obtain a degree in education through a university program in the subjects they will teach.	● (16 weeks)	●	● (1–3 years)	●	Since 2007, teacher candidates are selected in stages. First, candidates take the Malaysian Educators Selection Inventory (MEDSI) examination. If they pass, candidates are interviewed. Also, local universities were given autonomy to select candidates.
Morocco	Teachers must hold a bachelor's degree, pass a national examination, and sit for an interview.	○	●	○	○	Since 2016, teacher recruitment is done regionally.
New Zealand	Most teachers complete a 1-year compressed graduate diploma program of study, which can be undertaken by candidates who already hold a university degree.	● (at least 14 weeks)	○	● (at least 2 years)	●	No change in policy
Norway	Teachers may follow two separate tracks, depending on whether they will teach Grades 5–10 or Grades 8–13. Since 2017, both are 5-year master's programs. Grade 8 mathematics teachers must have 60 credit points (1 year of full-time study) in mathematics/mathematics education in their teacher education program; Grade 8 science teachers must have 30 credit points.	● (100 days)	●	○	○	Until 2010, the University College program was for Grades 1–10, and teacher education programs were 4 years. By 2025, all in-service mathematics and science teachers must meet the credit requirements.
Oman	Teachers must hold a bachelor's degree with a specialization in a specific subject. Grade 8 teachers complete more credit hours in academic subjects and different pedagogical courses than Grade 4 teachers.	● (1.5 years)	●	○	●	No change in policy
Portugal	All teachers receive their education through a university program and hold a bachelor's or master's degree.	● (1 school year)	○	● (1 school year)	●	In 2015, a policy requiring teachers to pass a qualification examination to practice at state-endorsed schools was suspended.
Qatar	All teachers must hold a bachelor's degree in the subject they teach from recognized universities. Candidates who hold a degree from the Faculty of Education or from other faculties and have a minimum grade average of "good" may teach in Qatari schools without having previous teaching experience. Grade 8 mathematics and science teachers study more mathematics and science as their secondary education major.	● (10 weeks)	●	○	●	The requirement for teachers to hold a university degree was introduced in the past 10 years.
Romania	Teachers must have a university degree in the subject they teach.	● (1–3 years)	●	●	●	No change in policy

● Yes
○ No

Exhibit 22: Main Preparation Routes and Current Requirements for Eighth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
Russian Federation	Grade 8 teachers must be subject specialists. Teachers receive their education in their subjects and adolescent psychology in the Faculty of Mathematics, Physics, Biology, Philology, or Chemistry, etc. of the Pedagogical University or another university. Teachers with a bachelor's degree can teach Grades 5–9, and those with a master's degree can teach Grades 5–11.	●	●	○	○	The Russian Ministry of Labor approved the Professional Teachers Standard in 2013, which requires that teachers possess new competencies to work with gifted students; implement inclusive education programs; teach Russian language to non-native speakers; and work with students with developmental issues, students who are socially neglected or vulnerable, and students with serious behavioral issues.
Saudi Arabia	Most teachers receive their education through a university degree program. Some have attended a teacher college program, but that is becoming less common.	● (1 academic term)	●	○	○	No change in policy
Singapore	All prospective secondary school teachers are required to complete 1 of 3 preservice teacher education programs conducted by the National Institute of Education, Nanyang Technological University. They can obtain either a 4-year Bachelor of Arts/Science (Education), a 16-month Postgraduate Diploma in Education (Secondary), or a 2-year Postgraduate Diploma in Education (Physical Education).	● (at least 10 weeks)	●	● (1 year)	●	No change in policy
South Africa	Most teachers receive their education through a university degree or diploma program.	● (9 weeks per year)	○	● (1 year)	○	The revised Minimum Requirements of Teacher Education Qualifications Policy (MRTEQP; 2015) provides guidelines for initial teacher education with 2 training options. Teachers may complete a 4-year Bachelor of Education (BEd) degree, or complete an appropriate first degree, followed by a 1-year Advanced Diploma in Education, and register with the South African Council for Educators. This policy replaces the MRTEQP of 2011 and aligns qualifications for teacher education with the Higher Education Qualifications Sub-Framework (2013).
Sweden	Teachers receive their education through a university teacher program.	● (20 weeks)	●	○	●	Since 2011, teachers must apply for a certificate from the Swedish National Agency for Education to obtain permanent employment and to grade students.
Turkey	Teachers receive their education through faculties of education across the country.	● (6 hours per week for 2 semesters)	●	● (at least 1 year)	●	Since 2013, teachers must take a general examination completed by all public personnel and a professional teaching knowledge examination. Following the written examination, teachers must pass an oral examination to become a contract teacher.
United Arab Emirates	All teachers receive their education through a university degree program.	●	●	● (1–2 months)	●	No change in policy

● Yes
○ No

Exhibit 22: Main Preparation Routes and Current Requirements for Eighth Grade Teachers

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Teacher Preparation Route	Current Requirements				Description of Policy Changes Within Past 10 Years
		Supervised Practicum During Teacher Education Program	Passing a Qualifying Examination	Completion of Probationary Teaching Period	Completion of Mentoring or Induction Program	
United States	It is common for secondary school teachers (including Grade 8) to hold a bachelor's degree in their specific subject area, a double major in their subject and education, or a master's degree in education in addition to the bachelor's degree in their subject area. All public school teachers must be licensed by the state in which they are teaching. Under the Every Student Succeeds Act (ESSA; 2015), states have the autonomy to determine teacher qualifications for specific subject areas by grade level. It is common for states to require teachers to have specialized certifications (either through their undergraduate program or through state-specific programs) beginning in middle school, although some states require specialized certification for elementary school teachers.	● (varies by state, typically 8–12 weeks)	●	● (varies by state, typically 1–3 years)	●	ESSA (2015) requires all teachers to hold a license/certification from their state and grants states the autonomy to set requirements for highly qualified teachers. This requirement reflects a change from the No Child Left Behind Act of 2002, which included specific federally mandated requirements for elementary, middle school, and high school teachers.
Benchmarking Participants						
Ontario, Canada	Grade 8 teachers complete initial teacher education programs to obtain certification from the Ontario College of Teachers. Teachers may be certified to teach Junior–Intermediate (Grades 4–10) or Intermediate–Senior (Grades 7–12).	● (at least 80 days)	○	○	●	Since 2015, initial teacher education programs doubled in length (from 2 to 4 academic semesters) and the minimum practicum requirements doubled (from 40 to 80 days). The Ontario College of Teachers Act was amended to include a provision requiring teachers to pass a mathematics proficiency to teach in public schools.
Quebec, Canada	Teachers must hold a bachelor's or master's degree in teacher education and specialize in 1 (sometimes 2) specific subjects. Grade 8 mathematics and science teachers must have 45 credits in their discipline in university training.	● (700 hours)	●	● (900 hours)	○	No change in policy
Moscow City, Russian Fed.	Most teachers complete in-depth teacher training in the subject areas they will teach.	● (16–20 weeks)	●	○	○	No change in policy
Gauteng, South Africa	Same as South Africa					
Western Cape, South Africa	Same as South Africa					
Abu Dhabi, UAE	Same as United Arab Emirates					
Dubai, UAE	Same as United Arab Emirates					

● Yes
○ No

Exhibit 23: Main Preparation Routes and Current Requirements for Principals of Schools with Fourth or Eighth Grade Students

Reported by National Research Coordinators

Country	Main Principal Preparation Route	Current Requirements		Description of Policy Changes Within Past 10 Years
		Teaching Experience	Completion of Specialized School Leadership Training Program	
Albania	–	–	–	–
Armenia	In addition to receiving their teaching qualifications, principals must have a principal certificate.	●	●	Since 2015, principals must attend compulsory training and have a principal certificate.
Australia	Principals are not required to have any specific qualifications in addition to teaching qualifications and teacher registration. However, most will have substantial experience as teachers and in leadership roles within schools, and may also have further qualifications in educational leadership.	●	○	No policy change
Austria	School principals in Austria come from the teacher ranks. Candidates must have at least 5 years of teaching experience in a school regulated by law and have completed at least 20 ECTS credits of the Professional Leadership in Schools university course or an equivalent certification. Upon nomination, a candidate must complete the Professional Leadership in Schools course (60 ECTS total) within 4.5 years.	●	●	The requirement for a certificate or degree in leadership was introduced in 2017. Every newly appointed principal now needs to have a certificate/degree or obtain one within 4.5 years of appointment. This requirement will be enforced for tenured principals beginning in 2023.
Azerbaijan	Principals should have a university degree; no specific major is required.	●	○	Starting in the 2013–2014 school year, principals are required to complete an examination and an interview.
Bahrain	All principals are former teachers. They also must have a diploma in leadership and school administration and pass an interview with the Ministry of Education.	●	●	In 2016, the requirements to hold a leadership and school administration diploma and to attend an in-service training program were introduced.
Belgium (Flemish)	There is no specific preparation route for principals, but candidates need both pedagogical competence and a higher education diploma. There are various forms of training, often organized by an umbrella organization in collaboration with their pedagogical counseling service.	○	○	No policy change
Bosnia and Herzegovina	No specific preparation routes.	●	○	No policy change
Bulgaria	Principals are required to have at least a bachelor's degree and should have several years of teaching experience.	●	○	No policy change
Canada	Provinces have different requirements for principal training. Most provinces require formal initial university training (resulting in multiple degrees, specifically, an undergraduate degree, teacher qualification degree, and a master's degree), relevant teaching experience, and additional principal qualifications.	●	●	Since 2019, principals in the province of Prince Edward Island are required to hold a master's degree, in addition to the basic requirements.
Chile	Most principals have a degree in education and at least 5 years of experience in the education system. Public school principals are required to be a teacher or hold a bachelor's degree and at least 4 years of teaching experience, complete a specialized program in school leadership, and be classified as "advanced" according to the Teacher Professional Development System Law.	●	●	In 2011, the Public Senior Management System (*sistema de alta dirección pública*) introduced a law that changed the way principals are appointed in public schools. In 2016, the requirement for applicants to be classified as "advanced" according to the Teacher Professional Development System Law was introduced.
Chinese Taipei	Elementary school principals should hold a Teacher's Certificate for elementary schools and meet qualifications of teaching and administrative service. Candidates without administrative qualifications must meet additional requirements. Junior high school principals should hold a Teacher's Certificate for secondary schools and meet qualifications of teaching and administrative service. If a candidate has served only as a junior high school teacher, he/she must have held the position of junior high school teacher for at least 5 years and served as a director of a school's first-level administrative unit for at least 3 years. If the candidate has additional experience other than as a junior high school teacher, there are other regulations.	●	●	The requirement to hold a Teacher's Certificate was officially adopted in 2011. The qualifications for years of experience in different roles and institutions have also been clarified.

● Yes
○ No

Note: 60 European Credit Transfer and Accumulation System (ECTS) credits are equivalent to one full year of study or work.
A dash (–) indicates data not provided.

Exhibit 23: Main Preparation Routes and Current Requirements for Principals of Schools with Fourth or Eighth Grade Students

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Principal Preparation Route	Current Requirements		Description of Policy Changes Within Past 10 Years
		Teaching Experience	Completion of Specialized School Leadership Training Program	
Croatia	There are no additional requirements beyond those for becoming a teacher. School expert service members (psychologists, pedagogues, special education experts, and librarians) that meet the requirements for work experience in education also may become principals.	●	○	No policy change
Cyprus	Most principals have a postgraduate degree. New principals complete a compulsory training program, during which they attend training sessions for 1 day per week during their first year as a principal. New principals are also matched with more experienced principals as mentors who provide support and consultation.	●	●	No policy change
Czech Republic	In addition to receiving their teacher qualification, principals are required to pass a school management course.	●	●	No policy change
Denmark	Preparation routes vary. Almost all principals have teaching experience, and some have served as the head of a department within a school or as a vice principal. It is common for principals to hold master's degrees in leadership or education or complete further education in these areas.	○	○	No policy change
Egypt	In addition to receiving their teaching qualifications, most principals have a degree in educational leadership.	●	●	The requirements for being a principal have changed; the candidate must have high qualifications, experience in education, leadership skills, pass training on various and multilevel professional development programs, and pass a set of tests for crisis management, attitudes, and decision making.
England	The vast majority of head teachers (principals) in publicly funded schools hold a teaching qualification, and most prepare for their first headship by completing the National Professional Qualification for Headship. However, neither of these steps is mandatory in either publicly funded or independent schools.	○	○	Since 2012, it is no longer mandatory for principals completing their first headship in a local authority maintained school to complete the National Professional Qualification for Headship (NPQH) before employment.
Finland	In addition to teaching qualifications at their respective education level, all principals must have a degree in educational administration or basic studies in educational leadership, or have acquired sufficient knowledge of educational administration and sufficient teaching experience in another way.	●	●	No policy change
France	Primary school director candidates must be members of the national school teachers team. They also must demonstrate 2 years of effective service as a primary teacher, receive a recommendation from the district inspector to apply to the Director of Departmental Services of Education, and complete an interview with the Director of Departmental Services of Education, a district inspector, and a school director.	●	○	No policy change
Georgia	Principal candidates should pass a Ministry of Education approved examination that consists of testing, an interview at the Ministry with a special commission, and an interview with the school board of trustees.	○	○	Before 2011, principals were randomly assigned to a school. Now, principal candidates may choose the school in which they serve as principal.
Germany	A teaching degree, professional experience, and a special qualification are required to become a principal. As a rule, the additional qualification takes the form of further training, but it is also possible to obtain it through a part-time master's program. At the beginning of the professional activity, the states' teacher education institutes offer optional training courses for preparation or accompaniment.	●	●	The completion of a specialized school leadership training program (including a school leadership degree program) became a requirement in 2016.
Hong Kong SAR	In addition to holding a teaching qualification and years of recognized teaching experience, candidates for public sector schools, including Direct Subsidy Schools, must complete the Certification for Principalship.	●	●	No policy change

● Yes
○ No

Exhibit 23: Main Preparation Routes and Current Requirements for Principals of Schools with Fourth or Eighth Grade Students

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Principal Preparation Route	Current Requirements		Description of Policy Changes Within Past 10 Years
		Teaching Experience	Completion of Specialized School Leadership Training Program	
Hungary	Principals must have 3 years of teaching experience and a professional qualification or degree in educational leadership.	●	●	The requirement to hold a professional qualification or degree in educational leadership was introduced in September 2012.
Iran, Islamic Rep. of	No specific preparation route.	○	○	No policy change
Ireland	The vast majority of candidates must have at least 5 years of teaching experience, and many have served in posts of responsibility within their previous position (e.g., deputy principal, assistant principal). Although not a requirement, many candidates also complete post-graduate courses in management or leadership. Newly appointed principals may complete the Misneach program, which helps them develop leadership skills and school management techniques.	●	○	In 2016, a standardized process was introduced for assessing the suitability of principal candidates and teachers applying for leadership and management roles.
Israel	In addition to receiving their teaching qualifications, principals must hold a Master of Arts/Master of Science(MA/MSc) and participate in a 2-year specialized school leadership program.	●	●	No policy change
Italy	Principals must have at least 5 years of experience as a tenured teacher.	●	○	No policy change
Japan	Candidates applying to public schools must pass a principal examination offered by the local board of education. In most cases (more than 90%), teaching experience is required to become a principal, but there are exceptions. School leadership training is not required to be a principal, but most candidates have received school leadership training before and after becoming principals based on the Special Act for Education Personnel for professional development.	●	○	No policy change
Jordan	Principals are selected from the pool of qualified teachers. They must have at least 5 years of teaching experience, a university degree, have at least 1 year of study in leadership and school administration, and pass an interview with the Ministry of Education.	●	●	No policy change
Kazakhstan	In addition to receiving their teaching qualifications, most principals have a degree in educational leadership.	●	●	No policy change
Korea, Rep. of	Teachers can become principals in several different ways. Experienced teachers can become educational professionals (school inspectors), and then vice principals, or advance directly to vice principals. Some candidates then complete the Ministry of Education's principal qualification program. This program covers the national curricula, encouraging learning, leadership, school management, schools' budget plans, and senior principals' mentoring, etc. Experienced teachers may also become principals through the open recruitment system, which allows school members to apply for a principal position.	●	●	No policy change
Kosovo	Principals have teacher qualifications and a degree in educational leadership.	●	●	Since 2011, principals must have teacher qualifications and have completed training in educational leadership.
Kuwait	For a teacher to become a principal, she/he must have a university degree from the Department of Education at Kuwait University, college of basic education, or any equivalent university degree from another country. She/he must then be promoted to the head of a department, and pass a test and interview. For the head of a department to be promoted to vice principal and for the vice principal to be promoted to principal, she/he must pass an interview.	●	●	No policy change
Latvia	Principals must have a bachelor's degree in pedagogical education, but most also have a master's degree in education pedagogy.	○	○	Before 2018, candidates with a bachelor's degree in a major other than pedagogical education could complete a 72-hour pedagogical course to become a principal.

● Yes
○ No

Exhibit 23: Main Preparation Routes and Current Requirements for Principals of Schools with Fourth or Eighth Grade Students

Reported by National Research Coordinators

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(Continued)

Country	Main Principal Preparation Route	Current Requirements		Description of Policy Changes Within Past 10 Years
		Teaching Experience	Completion of Specialized School Leadership Training Program	
Lebanon	Principals are typically teachers that are selected by the Ministry of Education.	●	●	No policy change
Lithuania	The Minister of Education and Science stipulates requirements for principals. All candidates are evaluated, and the individual with the highest evaluation and who meets all the requirements assumes the position.	●	○	Since 2015, the National School Evaluation Agency evaluates only some personal competencies (not all of them as before). All other competencies will be evaluated by a process determined by the Ministry of Education and Science.
Malaysia	All principals must have at least 10 years of experience in school administration. They must also possess a (prerequisite) National Professional Qualification for Educational Leaders (NPQEL) certificate.	●	●	Based on current needs, the Ministry of Education has ordered *Institut Aminuddin Baki* (IAB) to implement a National Professional Qualification for Executive Leadership (NPQEL) course/training for potential headmasters (for Grades 1–6) or principals (for Grades 7–11). Since 2014, the NPQEL program is a prerequisite for principalship. As of July 2019, about 10 cohorts that have completed the training.
Malta	In addition to teaching qualifications, heads of school need to have at least a post-graduate diploma in education specializing in leadership, management, and administration.	●	●	No policy change
Montenegro	Principals must fulfill the conditions for an educator, or a professional assistant (a pedagogue, a psychologist, and a special education teacher) for preschool institutions, as well as for a teacher or professional associate for school. Principals must also pass the professional exam and have 5 years of teaching/education experience. The principal of a public institution is appointed and released by the Minister, upon the request of the school board (whose members include representatives of the Ministry).	●	●	No policy change
Morocco	Candidates must attend a 1-year school administration program at the Regional Center for the Professions of Education and Training.	●	●	The requirement to attend the 1-year program at the Regional Center was introduced in 2016.
Netherlands	In addition to receiving their teaching qualifications, most principals take courses in educational leadership.	○	●	No policy change
New Zealand	There are no additional requirements beyond teacher qualifications.	●	○	No policy change
North Macedonia	In addition to receiving their teaching qualifications, all principals should have a leadership for director of school license.	●	●	No policy change
Northern Ireland	In addition to receiving their teaching qualifications, most principals undertake the Professional Qualification for Headship qualification and various other leadership courses offered by other providers. However, these additional qualifications are not mandatory.	●	○	No policy change
Norway	All principals must hold teacher qualifications and have teaching experiences. Many also complete leadership courses.	●	○	No policy change
Oman	Principals are selected according to seniority and experience in teaching and classroom management. Qualified candidates have to attend a 2-year leadership training program conducted by the Specialized Institute for Professional Training of Teachers.	●	●	Previously, the Ministry of Education provided a 2-week Leadership and Supervision skills workshop as well as a leadership diploma from the Sultan Qaboos University (SQU) for candidates who do not hold a university degree. Now, these candidates must pass a 2-year program. Qualified applicants usually attend the 2-week workshop during the academic year.
Pakistan	The most experienced teachers are selected to be principals.	●	○	No policy change

● Yes
○ No

Exhibit 23: Main Preparation Routes and Current Requirements for Principals of Schools with Fourth or Eighth Grade Students

Reported by National Research Coordinators

IEA TIMSS 2019

(Continued)

Country	Main Principal Preparation Route	Current Requirements		Description of Policy Changes Within Past 10 Years
		Teaching Experience	Completion of Specialized School Leadership Training Program	
Philippines	Candidates must have 1 year of experience as Head Teacher, 2 years as a Teacher-in-Charge, 2 years as a Master Teacher, or 5 years as a Teacher III. They should also have 40 hours of relevant training, a performance of Very Satisfactory (VS) for the last 2 years, and a certification of no pending administrative case. Applicants must pass the National Qualifying Examinations for School Heads, which is conducted by the National Educators Academy of the Philippines.	●	●	A revision of the Philippine Professional Standards for School Heads includes policy amendments that have been implemented for aspiring principals or school heads in the Philippine public schools.
Poland	Most principals have teaching qualifications, have teacher experience, and have completed postgraduate educational management studies. Although it is possible to become a school principal without having teacher qualifications, it is rare.	○	●	No policy change
Portugal	School principals are fully certified teachers with at least 5 years of experience who have completed either specific training in school and/or educational and school administration, held administrative positions within the school (e.g., as assistant principal, president, vice-president and/or member of the executive board of directors), or have relevant curriculum vitae in school administration and school management. Most schools in Portugal are grouped into clusters offering all grades from primary to secondary education (Grades 1–12) with a single Board of Administrators.	●	●	No policy change
Qatar	All principals are required to have an accredited university degree (at least a bachelor's) as well as a degree from the faculty of education, or from other faculties such as master's or a doctorate.	●	●	No policy change
Romania	Principals are selected among the teachers in a school or educational establishment. They must hold a degree in higher education, a Didactic Degree I or a PhD, at least 8 years of teaching experience, and be a member of the national body of educational management experts.	●	●	No policy change
Russian Federation	Candidates must receive a management qualification and have work experience in teaching positions or receive teacher qualifications and further qualification in management.	●	○	Under the current Law of Education of 2012, principals are subject to mandatory assessment. The procedure and terms of the assessment are established by the founders of these educational organizations.
Saudi Arabia	In addition to receiving their teaching qualifications, most principals hold a higher degree or have completed a training course in educational leadership.	●	●	No policy change
Serbia	Principals should have a master's degree and a relevant bachelor's degree. They should also have a teaching or school counseling license, principal's training and license, and at least 8 years of work experience as a teacher or school counselor.	●	○	Since 2018, the standards of the competencies of principals of educational institutions are adopted by the Minister of Education instead of the National Education Council (NEC). The minister now appoints a principal, whereas before the minister only approved the school board's decision on the candidate. Candidates are now expected to complete a training program; after finishing the program, candidates prepare a portfolio documenting their competencies and report on the research they have undertaken in their institution. The first licensing exam was organized in 2018, and all appointed principals are expected to pass a licensing exam by the end of 2021.

● Yes
○ No

Exhibit 23: Main Preparation Routes and Current Requirements for Principals of Schools with Fourth or Eighth Grade Students

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(Continued)

Country	Main Principal Preparation Route	Current Requirements		Description of Policy Changes Within Past 10 Years
		Teaching Experience	Completion of Specialized School Leadership Training Program	
Singapore	All principals start their careers in education as classroom teachers and go through a mandatory preservice teacher education course at the National Institute of Education, Nanyang Technological University. Typically, candidates have first served in some middle management role (e.g., as Department Head, which also has teaching duties), before they are appraised, interviewed, and selected to participate in a full-time, 6-month Leaders in Education Programme conducted by the National Institute of Education, Nanyang Technological University, and fully paid for by the Ministry of Education.	●	●	No policy change
Slovak Republic	Principal candidates must have a minimum of 5 years of pedagogical practice, achieve first attestation, and accomplish the Leadership Programme for principals and other senior staff within 3 years after becoming a principal.	●	●	No policy change
South Africa	The minimum requirement is a 4-year tertiary qualification; certification through the South African Council of Educators, with proof of registration; and 7 years of teaching experience.	●	○	No policy change
Spain	In addition to receiving their teaching qualifications and passing the competitive exam, principals in public schools need 5 years of experience and to complete a specialized school leadership training program provided by the Ministry of Education and Vocational Training or the corresponding regional authorities.	●	●	The requirement to have a certificate of a specialized school leadership training taught by the Ministry of Education and Vocational Training was introduced in 2013.
Sweden	The National School Leadership Training Programme, or an equivalent program, is compulsory for newly employed principals in public and private institutions. Once employed, principals must begin the training program as soon as possible and complete the program within 4 years.	●	●	No policy change
Turkey	Appointment of school principals is regulated by the Administrative Appointment Regulation for Educational Institutions Affiliated to Ministry of National Education. A principal candidate must be a graduate of a higher education institution, work as a Ministry teacher, be qualified to teach at the type of educational institution to which they apply, and cannot have been discharged as an administrator in the last 4 years. The candidate also must have served as a principal; served at least 1 year as the founding principal, deputy principal, or teacher authorized to act as a principal; or served as a branch manager or higher position in the Ministry.	●	○	Since 2017, school principals are appointed for 4 years. At the end of this term, they are revaluated to be reappointed. The same person cannot work as school principal in the same school more than 8 years.
United Arab Emirates	Principals must have at least 3 years of experience as a vice principal, a master's degree, and a minimum IELTS (International English Language Testing System) band score of 6. Having a certificate in educational leadership is preferred. Vice principals must have a teaching degree from a university program and at least 5 years of teaching experience.	●	○	The master's degree and IELTS requirements were added for the 2017-2018 academic year.
United States	Preparation routes vary by state. In a majority of states, principals are expected to hold a master's degree, typically in education leadership or education administration, have several years of teaching experience, obtain a license for school administration, and pass an examination and background check.	●	●	There is no federal law detailing principal requirements. Under the Every Student Succeeds Act (ESSA; 2015), states have the autonomy to determine principal qualifications. ESSA eliminated the requirement under the No Child Left Behind Act (NCLB; 2002) for principal evaluation systems and/or linking results to student test scores.

● Yes
○ No

Exhibit 23: Main Preparation Routes and Current Requirements for Principals of Schools with Fourth or Eighth Grade Students

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(Continued)

Country	Main Principal Preparation Route	Current Requirements		Description of Policy Changes Within Past 10 Years
		Teaching Experience	Completion of Specialized School Leadership Training Program	
Benchmarking Participants				
Ontario, Canada	Principals are required to hold an undergraduate degree (BA, BS, etc.), a teacher qualification degree (Bachelor of Education), and either 2 subject specializations or a master's degree. Principals also must be qualified in at least 3 teaching levels (primary, junior, intermediate, or senior) and complete parts 1 and 2 of a Principals Qualifications Program (PQP).	●	●	No policy change
Quebec, Canada	In addition to a bachelor's degree in education, principals must complete a specialized higher education diploma consisting of 30 credits in a second cycle of university training program.	●	●	No policy change
Moscow City, Russian Fed.	In addition to receiving their teaching qualifications, all principals have a degree in educational leadership.	●	●	Under the current Law of Education of 2012, principals are subject to mandatory assessment. The procedure and terms of the assessment are established by the founders of these educational organizations. The assessment procedure of the Moscow school principal is defined by Moscow Department of Education and Science. It is carried out once in 3–5 years (depending on for what period the principal was assessed) and requires passing qualification tests and an interview with the Assessment Commission.
Gauteng, South Africa	Same as South Africa			
Western Cape, South Africa	Same as South Africa			
Madrid, Spain	Same as Spain			
Abu Dhabi, UAE	Same as United Arab Emirates			
Dubai, UAE	Same as United Arab Emirates			

● Yes
○ No

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