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Measuring global education goals:
How TIMSS helps

Monitoring progress towards Sustainable Development Goal 4 using TIMSS (Trends in International Mathematics and Science Study)

Why this booklet?

This booklet has been prepared for the international release of TIMSS (Trends in International Mathematics and Science Study) 2019 and in the context of the study's efforts to advance the global Sustainable Development Goal (SDG) 4, monitoring progress and promoting appropriate national, regional and international tools for measuring learning outcomes.

TIMSS is a flagship study of the International Association for the Evaluation of Educational Achievement (IEA), and TIMSS 2019 marks the seventh cycle of the study, providing 24 years of trends. Conducted every four years since 1995, TIMSS has been a valuable tool for monitoring international trends in mathematics and science achievement at the fourth and eighth grades. From the 2019 cycle onwards, an innovative computerized version of TIMSS enables countries to investigate complex areas of the mathematics and science framework that are difficult to measure with traditional paper and pencil tests.

The analyses presented in this booklet are based on results presented in the TIMSS 2019 international report, *TIMSS 2019 International Results in Mathematics and Science*[1], and additional analyses conducted by IEA and United Nations Educational, Scientific and Cultural Organization (UNESCO). This booklet provides further insights on how learning assessments not only can help monitor, but also improve learning outcomes through interventions related to equity, school violence, learning environment or teacher qualifications. In addition, it shows how learning is associated with particular factors that also need to be closely monitored. These include children's early childhood experiences, their motivation and educational aspirations, their home background, as well as their learning and teaching environments.

UNESCO and IEA have released this booklet to increase participants' understanding of TIMSS findings and their relevance for policy-making, the application of learning assessments to measure global education targets, and actions needed to translate the Education 2030 Agenda commitments into national education development efforts.

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[1] For the TIMSS 2019 international results visit: http://timssandpirls.bc.edu/timss2019/international-results/

IEA's TIMSS

For over 60 years, IEA (iea.nl) has been conducting international large-scale assessments (ILSAs) on educational achievement and other aspects of education, including TIMSS, with the aim of gaining in-depth understanding of the effects of policies and practices within and across systems of education.

TIMSS is directed by the TIMSS & PIRLS International Study Center in the Lynch School of Education at Boston College (timssandpirls.bc.edu), working in close cooperation with the IEA and the national centre of the participating countries. TIMSS and PIRLS (Progress in International Reading Literacy Study; an international assessment of reading), together comprise IEA's core cycle of studies measuring achievement in three fundamental subjects—mathematics, science and reading.

TIMSS provides internationally comparative data on how students perform in mathematics and science. Like the previous TIMSS assessments (conducted in 1995, 1999, 2003, 2007, 2011 and 2015), TIMSS 2019 collected detailed information about curriculum and curriculum implementation, instructional practices and school resources.

The TIMSS school, teacher, student and home questionnaires gather extensive information about the contextual factors at school and home which are known to be associated with learning and students' achievement. These include details on how the education system is organized to facilitate learning, students' home environment and supports for learning, school climate and resources, and how instruction usually occurs in classrooms. TIMSS also publishes an encyclopedia that provides rich data about each country's educational context for learning mathematics and science[2].

Seventy-two educational systems participated in TIMSS 2019, including 64 countries and dependent territories, and 8 benchmarking entities. Conducted every four years at the fourth and eighth grades, TIMSS has a quasi-longitudinal design, with the fourth-grade student cohort assessed four years later at the eighth grade. Assessing fourth-grade students can provide an early warning for necessary curricular reforms, and the effectiveness of these reforms can be further monitored at the eighth grade four years later.

THE ROSETTA STONE PROJECT

Rosetta Stone is a collaborative project proposed by IEA and TIMSS & PIRLS International Study Center, and led by the UNESCO Institute for Statistics.

The Rosetta Stone project aims to provide a concordance table and confidence regions[3] that will allow for associating countries' achievement on regional mathematics and reading assessments with

benchmarks on the TIMSS and PIRLS achievement scales, enabling countries to measure progress toward SDG target 4.1 (see page 6 of booklet).

The concordance table would represent the 'Rosetta Stone', analogous to the original Rosetta Stone which provided a link between the Greek script and Egyptian hieroglyphics.

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[2] For the *TIMSS 2019 Encyclopedia:* timssandpirls.bc.edu/timss2019/

[3] For further information on the Rosetta Stone project: http://gaml.uis.unesco.org/wp-content/uploads/sites/2/2019/08/GAML6-REF-4-_Rosetta-Stone-IEA.pdf

Educational response to the COVID-19 crisis

The year 2020 has been marked by the COVID-19 pandemic, a worldwide crisis that led to a level of educational disruption greater than anything seen before. According to UNESCO, more than 90% of all learners were affected by school closures caused by COVID-19 at the early peak of the disruption.

At the onset of the pandemic, UNESCO supported and facilitated policy learning, knowledge building and sharing through different initiatives and policy fora—for example, the Global Education Coalition, which provides a platform for collaboration and exchange to protect the right to education during the education disruption and beyond, the Global Education Meeting, which provides a platform for exchange among high-level political leaders, ministers, policy-makers, multilateral organizations, development partners and global education actors to protect and reimagine the future of education and the achievement of SDG 4.

As the crisis amplifies inequalities, and policy-makers are required to make decisions on real-time basis, what COVID-19 has taught us is the need for quick and reliable data. It has also never been more important to stay connected and collaborate with and learn from one another, across and within countries.

IEA's studies are recognized for focusing on the highest quality and comparable data, and the wealth of contextual data from studies such as TIMSS can offer insights at a time when education is facing uncertainty. Among some of the data collected from TIMSS includes how crowded teachers reported classrooms to be; students reporting arriving at school hungry; school hygiene; availability of computer resources; teacher professional development, especially relating to the integration of information and communication technology in teaching and learning; and student resources at home and if they have a quiet place to study.

Fortunately, TIMSS 2019 data collection started in the first half of 2019, before any traces of the COVID-19 pandemic, and was largely unaffected by school closures. This means that TIMSS can provide an effective baseline measure, for example of student performance or attitudes, against which to gauge how changes implemented during and after the pandemic may have affected students and schools.

Role of ILSAs in monitoring SDG 4

In 2015, UN Member States adopted a new set of ambitious goals to address poverty, inequality, disease, unsustainable patterns of consumption, climate change and other development challenges by 2030. The SDGs propose a comprehensive framework to ensure that no one is left behind. The SDG 4 aims to 'ensure inclusive and equitable quality education and promote lifelong learning opportunities for all', and its corresponding targets promote a renewed and broader focus on inclusion and equity. SDG 4 also expresses a clear concern with the outcomes of educational processes—in terms of both effective acquisition of basic competencies as well as of relevant learning for civic participation, social and cultural life, and employment. This global commitment has important implications for education policy, planning and practice, and particularly in areas that are critical to improving learning processes and outcomes. Such areas include teacher education and continuous professional development; curriculum development and the design of teaching and learning materials; school management; pedagogical approaches; and learning assessment.

Learning assessment refers to a wide range of methods and tools used to evaluate, measure and document learning outcomes and learning progress. Assessments gather information from multiple sources on what learners know, what they can do with what they have learned, and provide information on the processes and contexts that enable learning, as well as identifying factors that may be hindering progress in learning. More recently, there has also been a growing interest in learning assessment for accountability, to determine the extent to which education systems yield the desired learning and social outcomes.

SDG 4 is a significant departure from the Millennium Development Goals in that there is a much greater emphasis on learning outcomes as opposed to participation. This imposes new challenges for data collection and reporting. The Education 2030 Agenda requires efficient and accurate systems to measure progress towards SDG 4 commitments. International learning assessments can make important contributions to this process by collecting cross-national data that assess progress towards learning goals, creating a common language for defining and discussing competency levels in learning. Further, these data also provide important measurements of quality education, complementing the commonly used proxy indicators such as student-teacher ratios, percentage of trained teachers or expenditure per student as a percentage of gross domestic product.

Policy implications

TIMSS is not explicitly designed to measure SDGs and therefore TIMSS data are not always an exact match for the target definition[4]. There are, however, important overlaps between what TIMSS measures and what is included in the SDGs. Therefore, the results of the analyses presented in this booklet can be considered proxy measures.

TIMSS data can shed light on and benchmark country progress to achieve some SDG 4 targets related to student achievement, access to early childhood care and education (ECCE), reducing inequities, knowledge and skills acquisition for sustainable development, and building better learning and teaching environments. Based on the data of TIMSS 2019, education policies need to continue developing evidence-based targeted strategies to address existing challenges.

While similar proportions of Grade 4 boys and girls reached minimum proficiency in mathematics, a widening gender gap based on average scores favouring boys compared to 2015 data suggests the need for a refocused strategy, additional resources and differentiated instruction beginning at early primary grades to eliminate the gender gap. Meanwhile, at Grade 8, more countries show more girls meeting minimum proficiency than boys suggesting the need for ongoing efforts to reduce disparity.

Data showed that where students had greater disparity of access to 'resources' (particularly in middle-income countries), the proportion of students that met minimum proficiency decreases. Efforts to improve access to various resources should not mimic or exacerbate disparities but aim to narrow them. Digital divides should also be minimized with teachers and students having access to a range of technologies including radio and television.

Based on the finding of fewer in-service training opportunities, Grade 4 students' teachers may require additional training or that the limited resources be spread out more equitably based on critical needs, especially where hybrid learning models will be used. More broadly, improvement to teacher quality would be a critical response including enhanced standards for initial teacher education. It also includes more and better-quality in-service teacher training. This is true for those high-income countries where in-service training is less common and for some middle-income countries where it is needed to improve upon teachers' lower initial qualifications and skills.

Online learning allows for greater anonymity in communication between students and teachers and students themselves. Due to the negative effects of all forms of bullying, better responses to combat it (including cyber-bullying) are needed, such as awareness/sensitization campaigns for students, training for teachers, and mechanisms for handling complaints.

Based on countries' varying progress in student outcomes, including knowledge of sustainable development and access to ECCE, government expenditures to education should be increased or at least sustained to target ongoing challenges, particularly in light of the ongoing COVID-19 pandemic.

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[4] http://tcg.uis.unesco.org/metadata/

SDG 4 Targets

Target 4.1: By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.
Global indicator 4.1.1 Proportion of children and young people in (a) Grade 2 or 3; (b) at the end of primary education; and (c) at the end of lower secondary achieving at least a minimum proficiency level in mathematics, by sex.
Analysis: Percentage of fourth- and eighth-grade students above the TIMSS Low International Benchmark in mathematics.

Target 4.2: By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education.
Global indicator 4.2.2 Participation rate in organized learning (one year before the official primary entry age), by sex.
Analysis: Participation in pre-school by years of attendance.

Target 4.5: By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.
Global indicator 4.5.1 Parity indices (female/male, rural/urban, bottom/top wealth quintile and others such as disability status, indigenous peoples and conflict-affected, as data become available) for all education indicators.
Analysis: Minimum proficiency level in mathematics by gender and resources at home.

Target 4.7: By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.
Global indicator 4.7.1 Extent to which … (ii) education for sustainable development … [is] mainstreamed in … (b) curricula.
Thematic indicator 4.7.5 Percentage of students in lower secondary education showing proficiency in knowledge of environmental science and geoscience.
Analysis: Percentage of fourth- and eighth-grade students above the TIMSS Low International Benchmark in science and Earth Science.
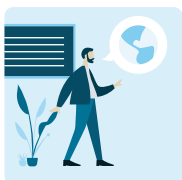
Target 4.a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all.
Global indicator 4.a.1 Proportion of schools offering basic services, by type of service.
Thematic indicator 4.a.2 Percentage of students experiencing bullying in the last 12 months.
Analysis: Incidence of bullying, availability of computers and accessibility of schools to students with disabilities.

Target 4.c: By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States.
Global indicator 4.c.1 Proportion of teachers with the minimum required qualifications, by education level.
Thematic indicator 4.c.7 Percentage of teachers who received in-service training in the last 12 months by type of training.
Analysis: Availability of qualified teachers and prevalence of teacher in-service training.
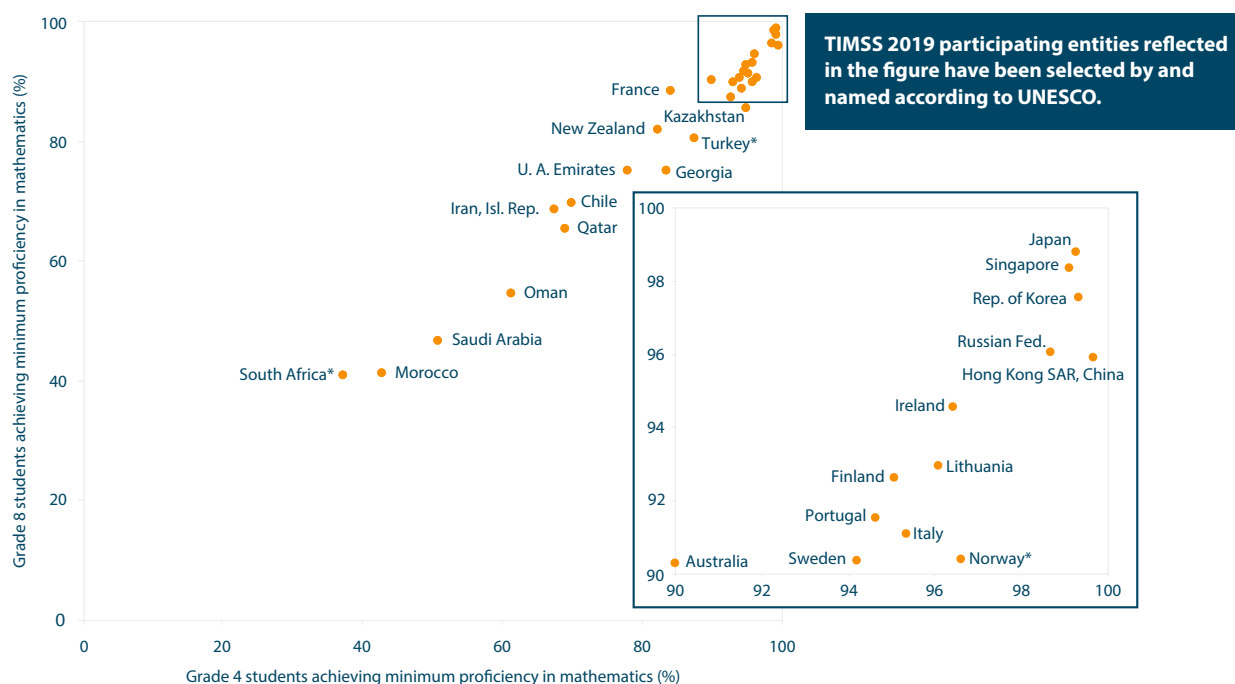
Target 4.1: Primary and Secondary Education

The Education 2030 Agenda places learning outcome indicators at the heart of the international education monitoring framework. One of the two global indicators of target 4.1 is the percentage of students who meet a minimum proficiency level in mathematics (a) in early grades, (b) at the end of primary education and (c) at the end of lower secondary education.

TIMSS data inform global indicator 4.1.1a for countries that administer the assessment to fourth-grade students, 4.1.1b for countries that administer the assessment to fifth-grade students, and 4.1.1c for countries that administer the assessment to eight- and ninth-grade students. Following a process managed by the UNESCO Institute for Statistics[5], which is the custodian agency of most of the SDG 4 global indicators, the TIMSS Low International Benchmark of 400 score points is provisionally considered equivalent to the minimum proficiency level[6].

For instance, according to the TIMSS Low International Benchmark definition[7], fourth-grade students at that level have some basic mathematical knowledge; can add, subtract, multiply, and divide one- and two-digit whole numbers; solve simple word problems; and have some knowledge of simple fractions and common geometric shapes. They can read and complete simple bar graphs and tables; are familiar with numbers into the thousands; can order, add, and subtract whole numbers; have some knowledge of multiplication and division involving two-digit numbers; can solve one-step word problems and number sentences; and can recognize pictorial representations of simple fractions. Finally, they can recognize basic measurement ideas; recognize and visualize common two- and three-dimensional geometric shapes; and read and complete simple bar graphs and tables.

FIGURE 4.1.1: Percentage of fourth- and eighth-grade students who achieved minimum proficiency in mathematics, 2019

Notes: *The figure includes only countries that participated in both fourth- and eighth-grade assessments in 2019. The scales for Grade 4 and Grade 8 are not equivalent. *Norway, South Africa and Turkey administered the fourth-grade assessment to fifth-grade students, Norway and South Africa administered the eighth-grade assessment to ninth-grade students.*

[5] http://tcg.uis.unesco.org/metadata/

[6] Taking the minimum proficiency as defined by UNESCO Institute for Statistics on page 16 of http://uis.unesco.org/sites/default/files/documents/sdg4-databook-global-ed-indicators-2019-en.pdf, which match TIMSS 2015 statistics on performance at the TIMSS Low International Benchmark found here: http://timss2015.org/timss-2015/mathematics/performance-at-international-benchmarks/percentages-reaching-international-benchmarks-across-assessment-years/

[7] For full benchmarking definitions see the *TIMSS 2019 International Results in Mathematics and Science:* http://timssandpirls.bc.edu/timss2019/international-results/
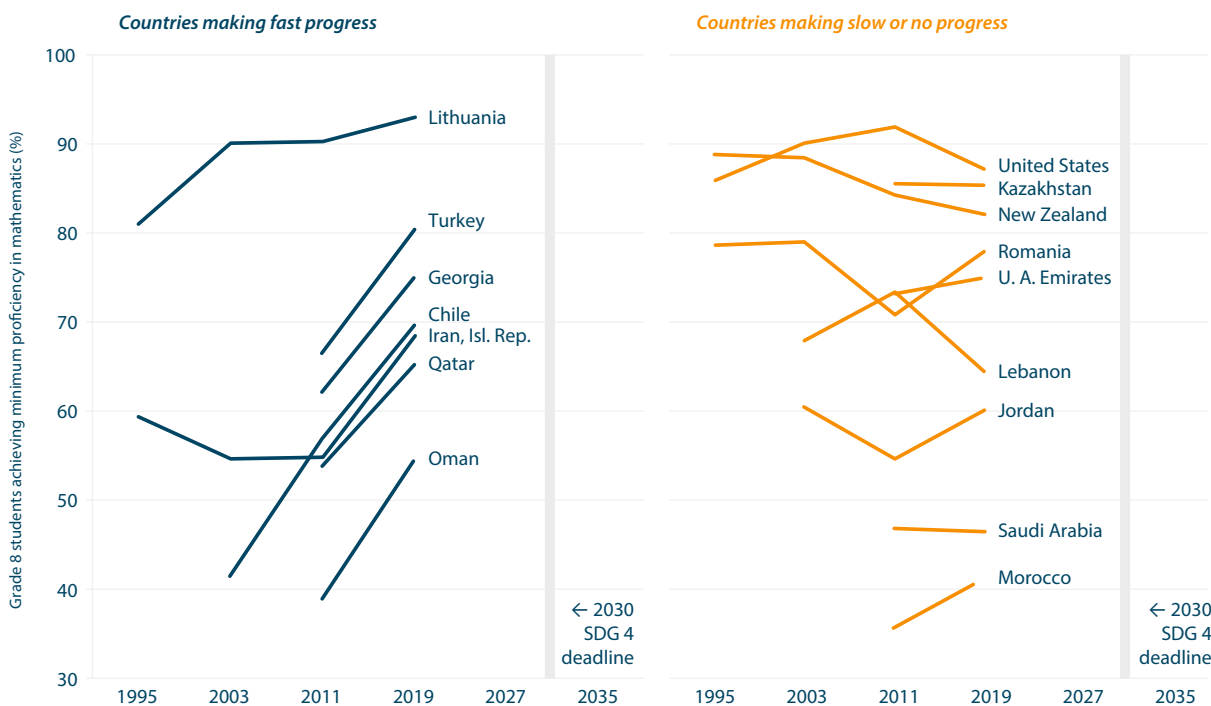
Among participating countries and territories in TIMSS 2019, 86% of Grade 4 students and 80% of Grade 8 students achieved minimum proficiency in mathematics. While the vast majority of students in high-income countries achieve this level, far fewer do so in middle-income, and especially lower-middle-income countries. For example, in Morocco, 43% of fourth-grade and 41% of eighth-grade students achieve the Low International Benchmark *(Figure 4.1.1)*.

TIMSS has been implemented for a quarter of a century. While 10, mostly high-income, countries have taken part in each of the seven rounds since 1995, many more have taken part in at least two rounds. Valuable information can therefore be extracted to assess countries' potential to ensure that all students achieve minimum proficiency level by 2030. Among

countries that took part in the 2015 and 2019 rounds, the average growth in the percentage of students that achieved minimum proficiency in mathematics was 0.3 percentage points at fourth grade and 0.5 percentage points at eighth grade, in annual terms.

Some countries are on course to achieve the SDG 4 target by 2030 and several countries have experienced robust growth *(Figure 4.1.2)*. For instance, in Chile the percentage of eighth-grade students that achieved minimum proficiency in mathematics has grown from 41% in 2003, to 57% in 2011 and 70% in 2019. If the country were able to maintain the same growth rate, it would be on course to achieve the SDG 4 target by 2030. However, other countries have stagnated. For instance, 79% of Romanian students achieved minimum proficiency in 1995 and 78% in 2019 *(Figure 4.1.2)*.

FIGURE 4.1.2: **Percentage of eighth-grade students who achieved minimum proficiency in mathematics, selected countries, 1995–2019**

TIMSS 2019 participating entities reflected in the figure above have been selected by and named according to UNESCO.

Note: *The figure includes selected countries that have participated in more than one Grade 8 TIMSS round since 1995. Percentages are estimates; standard errors not displayed*[8].

[8] For detailed trend results, please view the *TIMSS 2019 International Results in Mathematics and Science:* http://timssandpirls.bc.edu/timss2019/international-results/
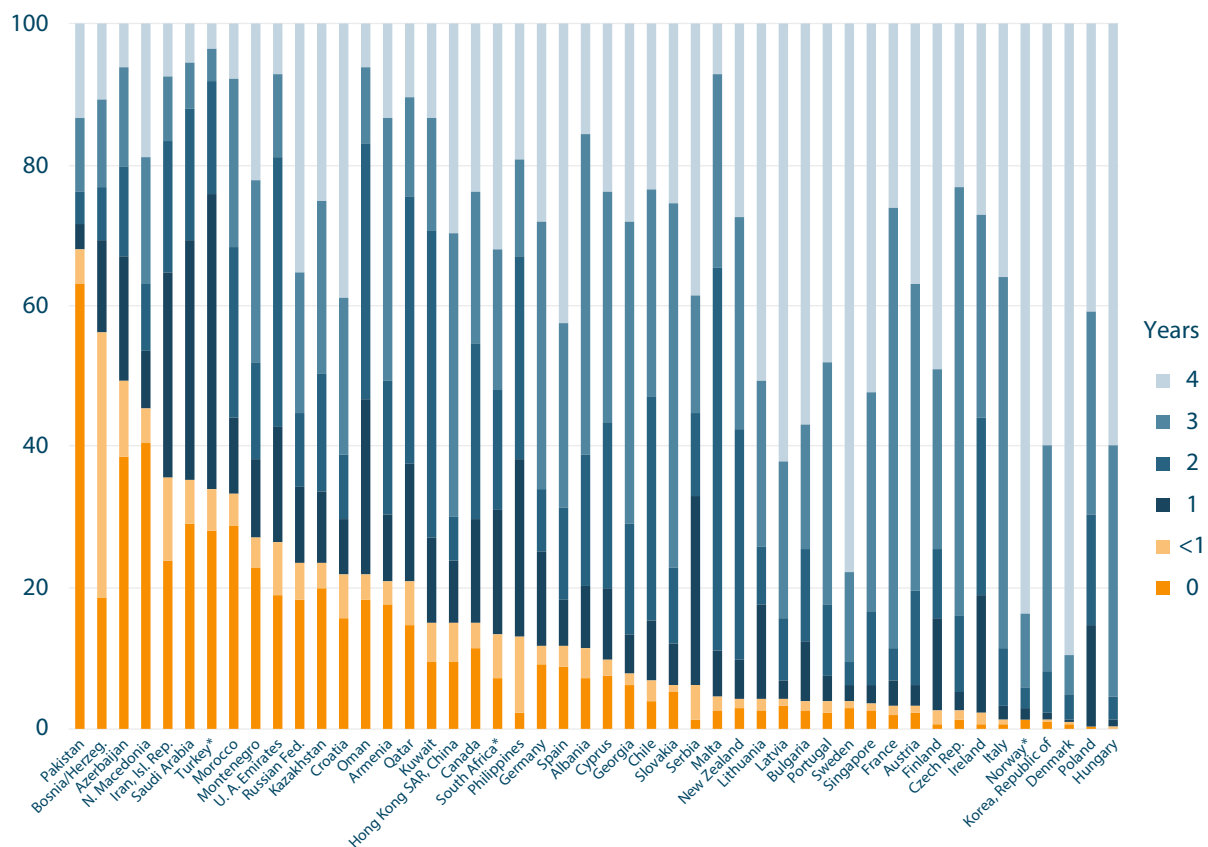
Target 4.2: Early Childhood

One of the Education 2030 agenda goals is to ensure that all children have access to quality early childhood development, care and pre-primary education so that they are ready for primary education. TIMSS 2019 continued to demonstrate the positive relationship between early childhood development of skills and higher average achievement[9]. While TIMSS is a primary and lower secondary education assessment, parents of fourth-grade students are asked to report how many years of early childhood education their child had attended (including early childhood and pre-primary)[10]. This question offers useful insights on the distribution of exposure to early childhood education, which complement information available from administrative data, even if it is available with a four-year lag.

In the majority of countries, fourth-grade students participated for at least one year in early childhood education. The country with the highest percentage of fourth-grade students who had attended less than one year of pre-school is Pakistan (68%). In three countries, around one in two had attended less than one year of pre-school: Bosnia and Herzegovina (56%), Azerbaijan (49%) and North Macedonia (45%). In four countries around one in three had attended less than one year of pre-school: the Islamic Republic of Iran (36%), Saudi Arabia (35%), Turkey (34%) and Morocco (33%).

Distinct patterns are observed also in other countries: in Malta the majority of Grade 4 students had attended exactly two years of pre-school (54%); in France and Czechia, the majority had attended exactly three years (over 60%); and in Denmark and Norway, the vast majority had attended exactly four years (over 80%).

FIGURE 4.2.1: Distribution of early childhood education attendance, by years, fourth-grade students, 2019

TIMSS 2019 participating entities reflected in the figure above have been selected by and named according to UNESCO.

Note: * Norway, South Africa and Turkey administered the assessment to fifth-grade students.

[9] See the *TIMSS 2019 International Results in Mathematics and Science:* http://timssandpirls.bc.edu/timss2019/international-results/
[10] For the TIMSS 2019 parent context questionnaires visit: https://timssandpirls.bc.edu/timss2019/

Target 4.5: Equity

The Education 2030 Agenda calls on 'leaving no one behind' and requires access to disaggregated data. TIMSS allows for greater disaggregation of data on learning outcomes by sex, socio-economic status and language, as well as by age and other variables obtained from the different background questionnaires.
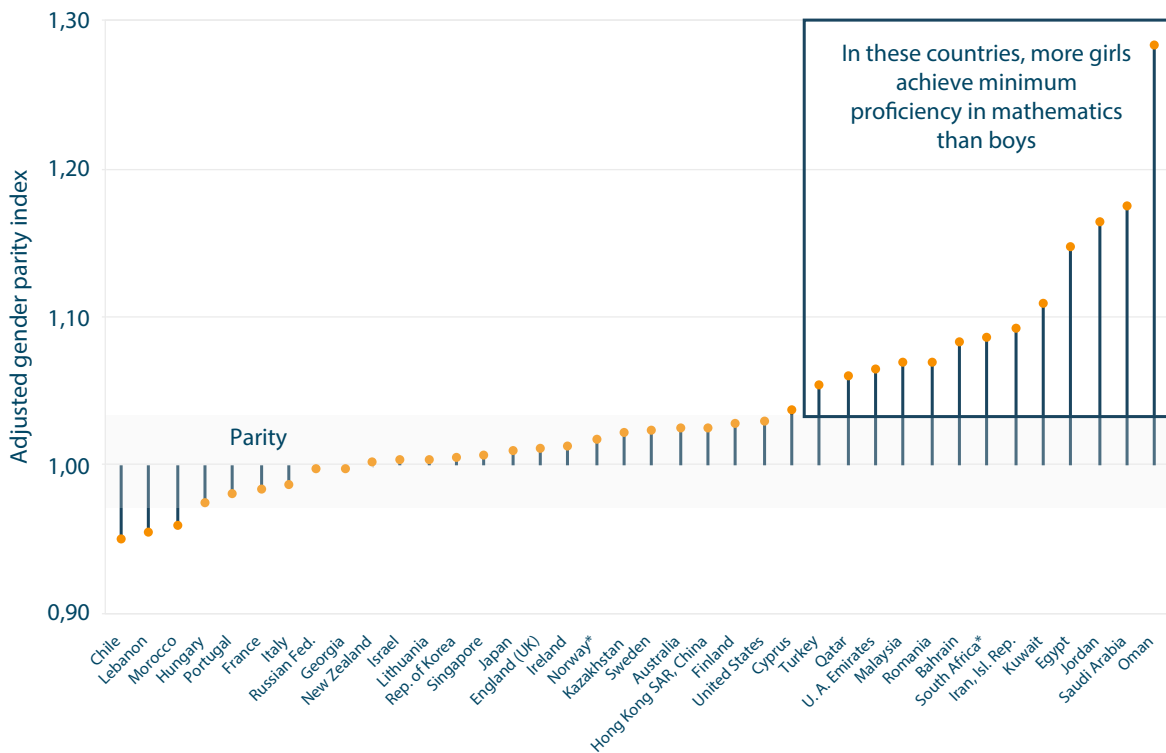
GENDER

TIMSS 2019 findings suggest gender equity is eroding in mathematics at fourth grade: boys had higher average achievement in 27 of the 58 countries participating at fourth grade, and a gap favouring boys appeared in 9 countries since 2015[11]. While this finding refers to the average score, a different picture emerges when the performance of boys and girls is compared in terms of the percentage of students who achieve minimum proficiency. Analysis of results of fourth-grade students shows there was no significant difference in the percentage of girls and boys reaching the Low

International Benchmark in 52 out of 58 countries and territories.

The analysis of eighth-grade students' performance in mathematics shows similar results. Overall, the average percentage of students performing at or above the Low International Benchmark is 81% for girls and 78% boys. In no country do significantly more boys than girls reach the low benchmark. In 13 countries, significantly more girls than boys reach the Low International Benchmark. For instance, in Oman, 128 girls reach the minimum benchmark for every 100 boys *(Figure 4.5.1)*. In the other countries and territories, there is no significant difference between girls and boys. By contrast, in 8 of 31 countries, significantly more boys reached the Advanced International Benchmark in mathematics in Grade 8, compared to only one country (Bahrain) where significantly more girls reached that benchmark. For some countries there was insufficient data to estimate the percentages at the advanced level.

FIGURE 4.5.1: Adjusted gender parity index in mathematics, eighth-grade students, 2019

TIMSS 2019 participating entities reflected in the figure above have been selected by and named according to UNESCO.

Notes: *The gender parity index is a measure of inequality defined as the ratio of the values of an education indicator for females relative to males. An index value between 0.97 and 1.03 indicates parity. A value below 0.97 indicates disparity whereby boys are doing better than girls. A value above 1.03 indicates disparity whereby girls are doing better than boys. The adjusted gender parity index is symmetrical around 1 and limited to a range between 0 and 2. * Norway and South Africa administered the assessment to ninth-grade students.*

[11] For the full results, see the *TIMSS 2019 International Results in Mathematics and Science:* http://timssandpirls.bc.edu/timss2019/international-results/
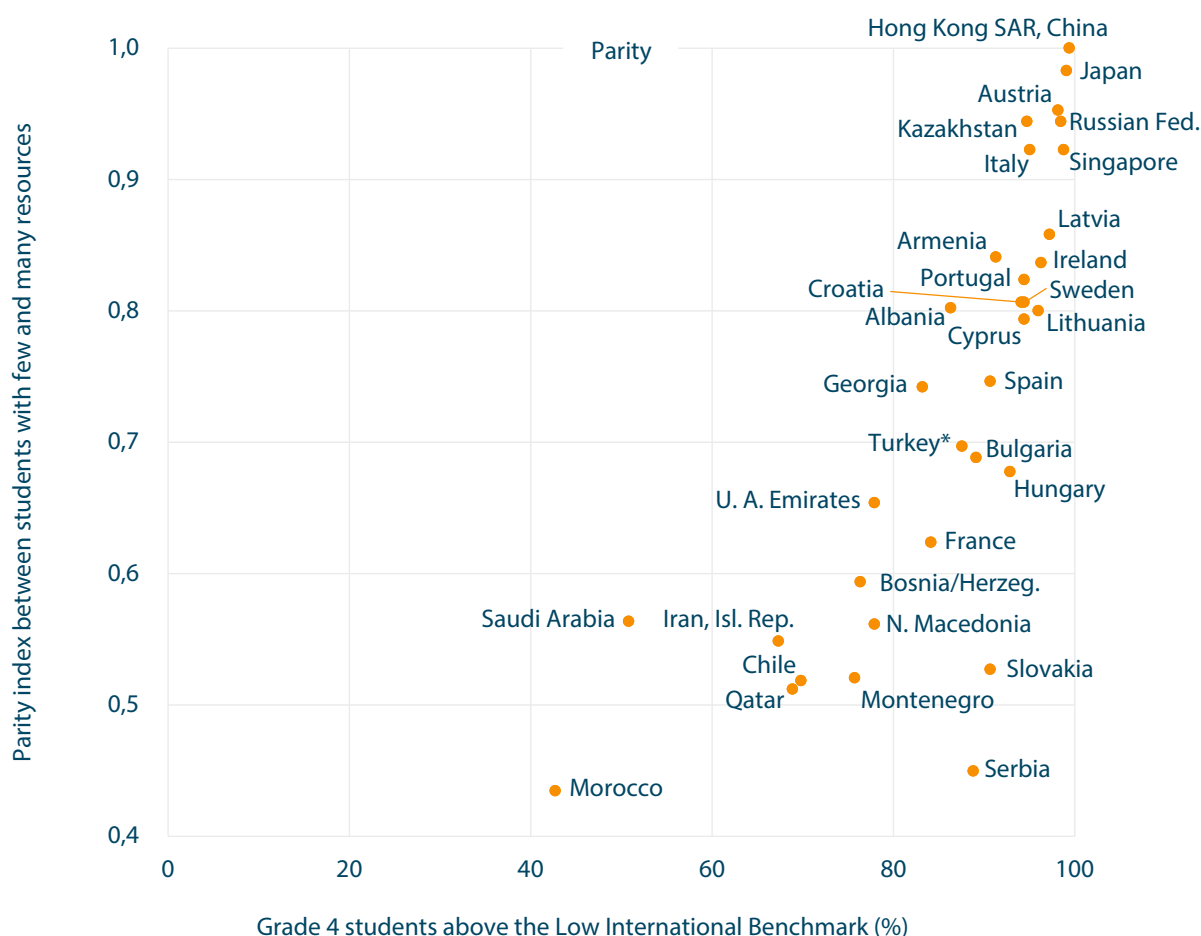
SOCIOECONOMIC STATUS

To assess students' socio-economic background the approach used by TIMSS is to construct an index of 'resources', which combines information from students (education resources available at home) and, at fourth grade, parents (e.g. their education and occupation). A comparison between students who have 'few' and those who have 'many' resources, shows large disparity in learning outcomes.

The socio-economic status parity index is a measure of inequality defined as the ratio of the values of an education indicator for students with 'few' resources relative to students with 'many' resources. Comparisons should be made with caution, as the groups of students

with 'few' and 'many' resources are not equal in size in every country. In lower-income countries, there are more students in the group with 'few' resources; the opposite is the case in richer countries.

One way of expressing inequality is to compare students with 'few' and 'many' resources in terms of the percentage who were at or above the Low International Benchmark. Inevitably, as a country comes closer to ensuring that all, even the most disadvantaged, students reach the Low International Benchmark, inequality 'disappears'. However, even in countries where at least 80% of students reach the Low International Benchmark, disparity can be large, as in Serbia and Slovakia *(Figure 4.5.2)*.

FIGURE 4.5.2: **Socio-economic status parity index, percentage of fourth-grade students who reached minimum proficiency level in mathematics, 2019**

TIMSS 2019 participating entities reflected in the figure above have been selected by and named according to UNESCO.

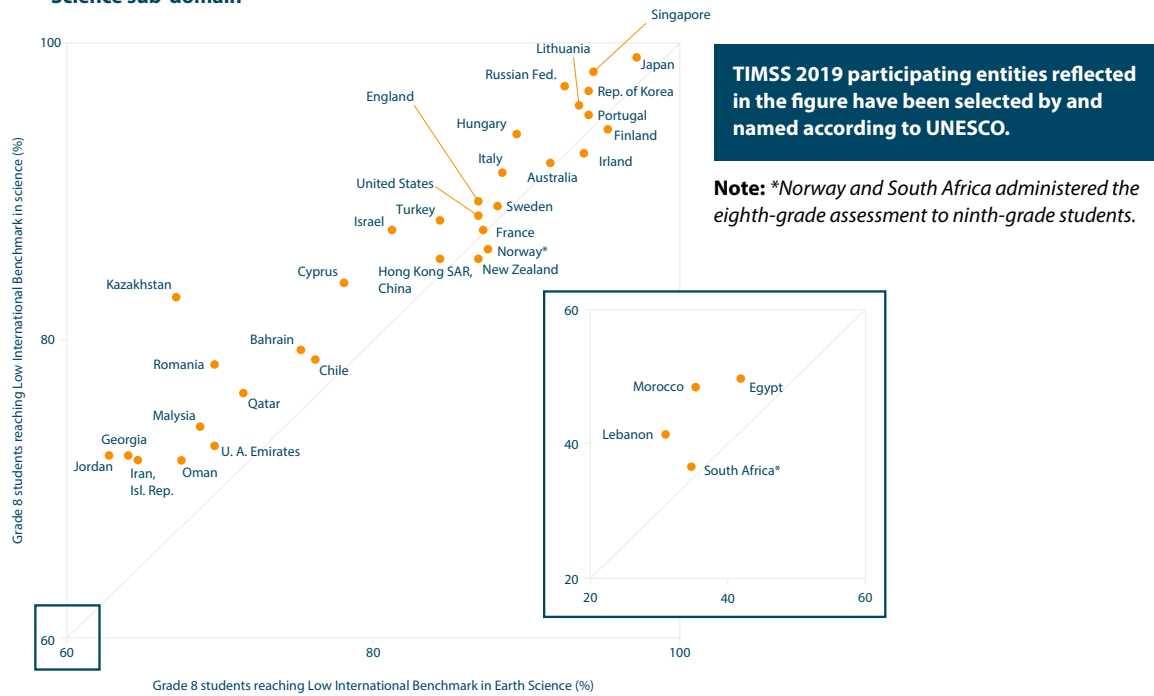**Note:** ** Turkey administered the assessment to fifth-grade students.*

Target 4.7: Education for Sustainable Development

Monitoring the core aspiration of target 4.7—acquisition of knowledge and skills needed for sustainable development—is not easy. A major challenge is the broad range of the target's topics. Preparing learners for a future of climatic and environmental instability begins by helping them understand issues such as why and how climate change takes place, and its likely effects on habitats and ecosystems. TIMSS 2019 Grade 8 science assessment included questions designed to assess knowledge in four domains, one of which is Earth Science[12]. This domain assessed students, among other things, on their knowledge of the structure and physical features of Earth and the atmosphere, as well as processes, cycles and patterns, including geological processes that have occurred over Earth's history, the water cycle, and patterns of weather and climate. Earth's resources and their use and conservation were also covered. What

TIMSS does in a somewhat unique way is provide some insights to the threat of climate change and instability by measuring students' understanding of Earth Science and the associated knowledge and understanding that may be important to mitigating the worst threat.

There are not many learning achievement surveys that provide fine-grained information on proficiency in the more specific domain of Earth Science. By contrast, the assessment of more general competence in science is comparatively more common. Results from TIMSS 2019 show that the percentage of students who achieved the Low International Benchmark is two percentage points higher for science than for Earth Science, on average. In three countries, the gap exceeds ten percentage points: Kazakhstan, Lebanon and Morocco.

FIGURE 4.7: Percentage of eighth-grade students who reached minimum proficiency level in the science domain and in its Earth Science sub-domain

TIMSS 2019 participating entities reflected in the figure have been selected by and named according to UNESCO.

Note: *Norway and South Africa administered the eighth-grade assessment to ninth-grade students.*

TIMSS 2019 also collects information from teachers on whether particular Earth Science or Life Science concepts had been taught prior to or during eighth grade. For instance, on average across all participating countries, 72% of students had been taught interdependence of populations of organisms in an ecosystem and 69% had been taught Earth's resources, their use and conservation, according to science

teachers. The coverage of this material does not always correspond to performance. For instance, in Japan, just 5% of students had been taught the two concepts; yet, the performance of students was the highest of all participating countries. The fact that these students did well even though they had not been taught specific content suggests that education systems can help prepare students in more than one way.
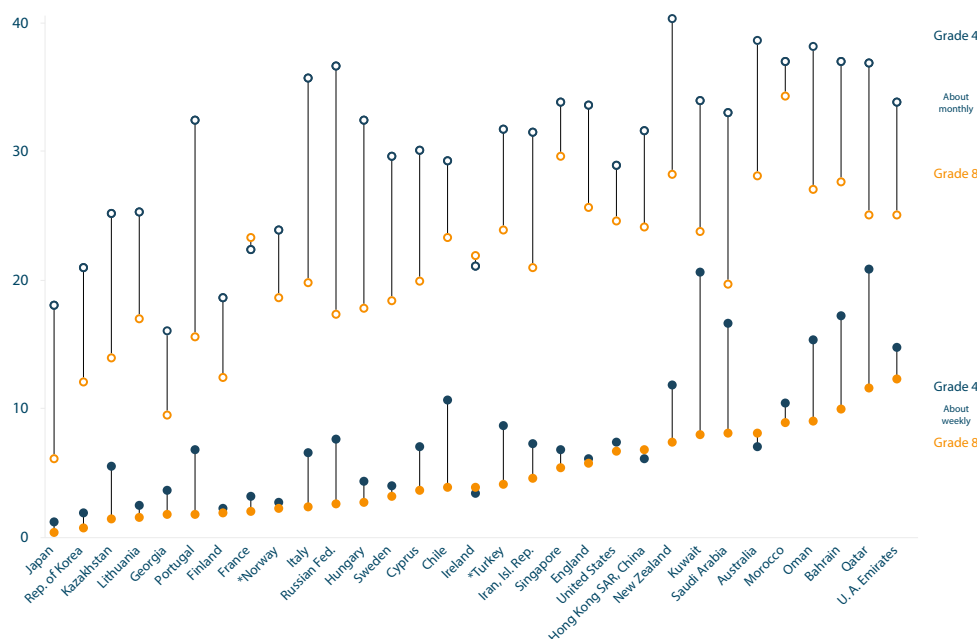
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[12] For more detail on the *TIMSS 2019 Mathematics Frameworks* and the *TIMSS 2019 Science Frameworks* please visit: http://timssandpirls.bc.edu/timss2019/frameworks/

Target 4.a: Learning Environments

The importance of a safe environment as a factor determining learning has been recognized in the Education 2030 Agenda. Learning assessments are a prime source of information on the prevalence of bullying. TIMSS 2019 offers interesting insights on the incidence of this behaviour in primary and secondary education from the student questionnaires[13]. Students bullied 'about weekly' had a score that was similar to a student having experienced 6 of 11 behaviours 'once or twice a month' (e.g. 'made fun of me or called me names' or 'sent me nasty or hurtful messages online') and the other 5 behaviours 'a few times a year', on average. Higher scores were classified as corresponding to students being bullied 'about monthly', so less frequently.

Overall, among 31 countries with observations at both levels, Grade 4 students are more likely to report bullying—for 32% it occurred on a monthly basis and for 7% on a weekly basis, on average. By contrast, among Grade 8 students, the prevalence rates were 22% and 4% on average. While the frequency differs between grades, the scales between grades are different, and eighth grade includes more negative experiences than fourth grade. The prevalence rates of bullying in Grade 8 are at least twice the average of this sample in the Gulf Countries. For instance, 21% of Grade 4 students in Kuwait and Qatar and 12% of Grade 8 students in Qatar and the United Arab Emirates reported having experienced bullying on a weekly basis.

FIGURE 4.A: **Percentage of Grade 4 and 8 students who experience bullying, by frequency**

TIMSS 2019 participating entities reflected in the figure above have been selected by and named according to UNESCO.

Note: *Norway and Turkey administered the fourth-grade assessment to fifth-grade students, Norway administered the eighth-grade assessment to ninth-grade students.*

The 2019 TIMSS also collects information on school characteristics that correspond to SDG global indicator 4.a.1 around the proportion of schools offering basic services. For instance, it can be a source on the availability of computers in school. In Grade 8, across all participating countries, there were 2.8 students per computer in urban and 4.1 students per computer in rural schools. Turkey had the highest disparity with a ratio of 3.4 in urban and 10.3 in rural schools. By contrast, Lebanon had the highest reverse disparity with a ratio of 8.4 in urban and 5.0 in rural schools.

TIMSS 2019 also provides some insights on accessibility of school infrastructure for learners with disabilities. According to responses provided by principals, the percentage of students at schools where instruction is 'affected a lot' by a lack of resources for students with disabilities is 16% at Grade 4 and 12% at Grade 8. Countries in South-Eastern Europe appear to be doing much worse than this average. For instance, at Grade 4 level, 57% of students in Albania and 56% in North Macedonia and at Grade 8 level, 27% of students in Romania were reported to be affected a lot by principals.
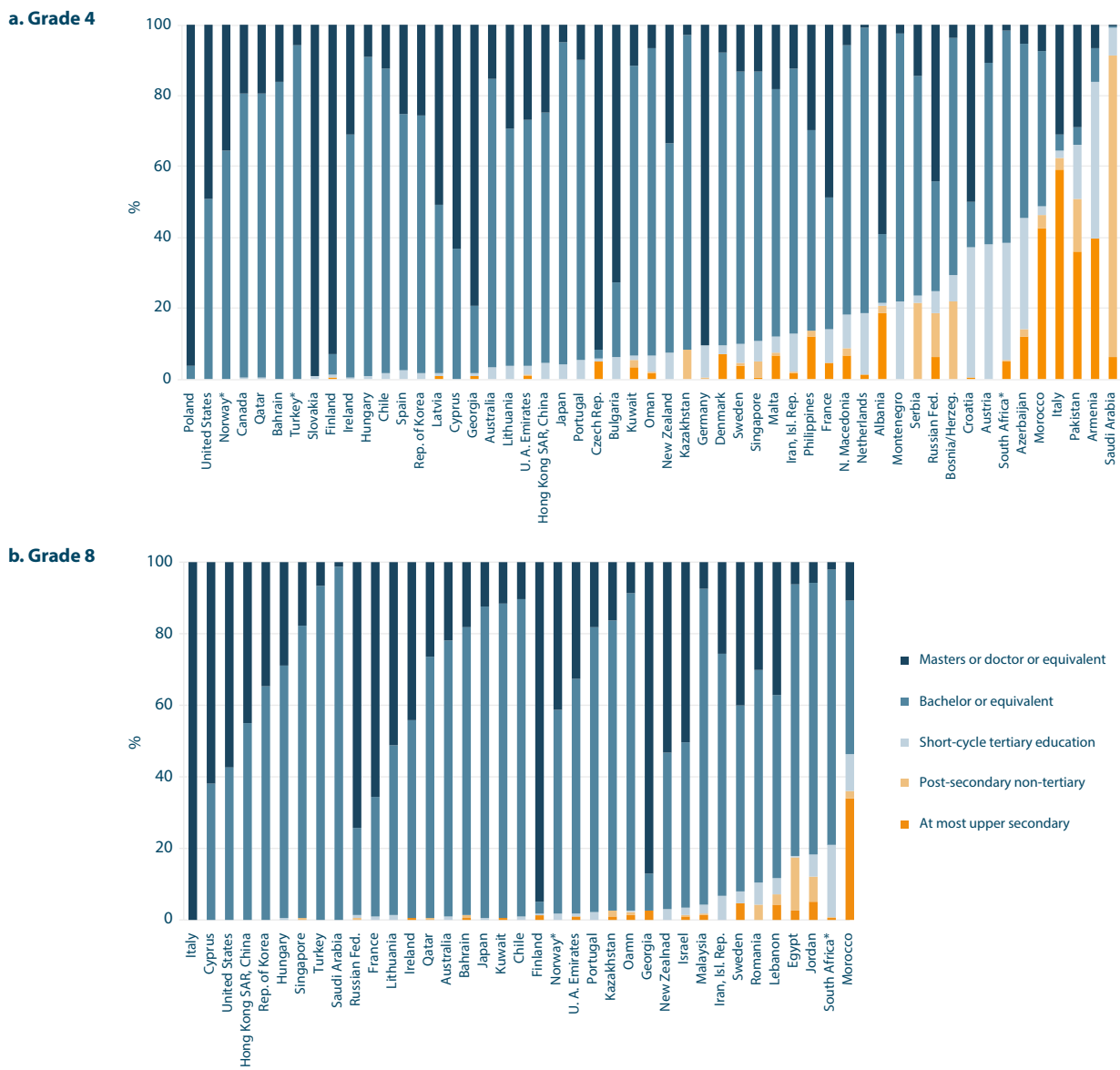
[13] For the TIMSS 2019 student context questionnaires visit: https://timssandpirls.bc.edu/timss2019/

<div style="background:#1b3a5b; color:white;">**Target 4.c: Teachers**</div>

The Education 2030 Agenda calls for countries to increase the supply of qualified teachers. Although there is no international consensus yet on how to define a qualified teacher, one indicator is the highest level of formal education completed. The 2019 TIMSS offers the possibility to compare the relative qualifications of Grade 4 and 8 mathematics and science teachers. Grade 8 mathematics teachers have higher qualifications on average, with 95% of students being taught by a teacher who has at least a bachelor's or equivalent degree of long cycle tertiary education, compared with 85% of their Grade 4 peers. In some countries, a sizeable share of students are being taught by mathematics teachers who only have at most a secondary education qualification, including, for instance, Albania (19%) in Grade 4 and Morocco (34%) in Grade 8.

FIGURE 4.C.1: Percentage of Grade 4 and 8 students taught by teacher with different levels of qualifications

a. Grade 4

b. Grade 8

- Masters or doctor or equivalent
- Bachelor or equivalent
- Short-cycle tertiary education
- Post-secondary non-tertiary
- At most upper secondary

TIMSS 2019 participating entities reflected in the figure above have been selected by and named according to UNESCO.

Note: *Norway, South Africa and Turkey administered the assessment to fifth-grade students instead of fourth-grade students, while Norway and South Africa administered the assessment to ninth-grade students instead of eighth-grade students.*
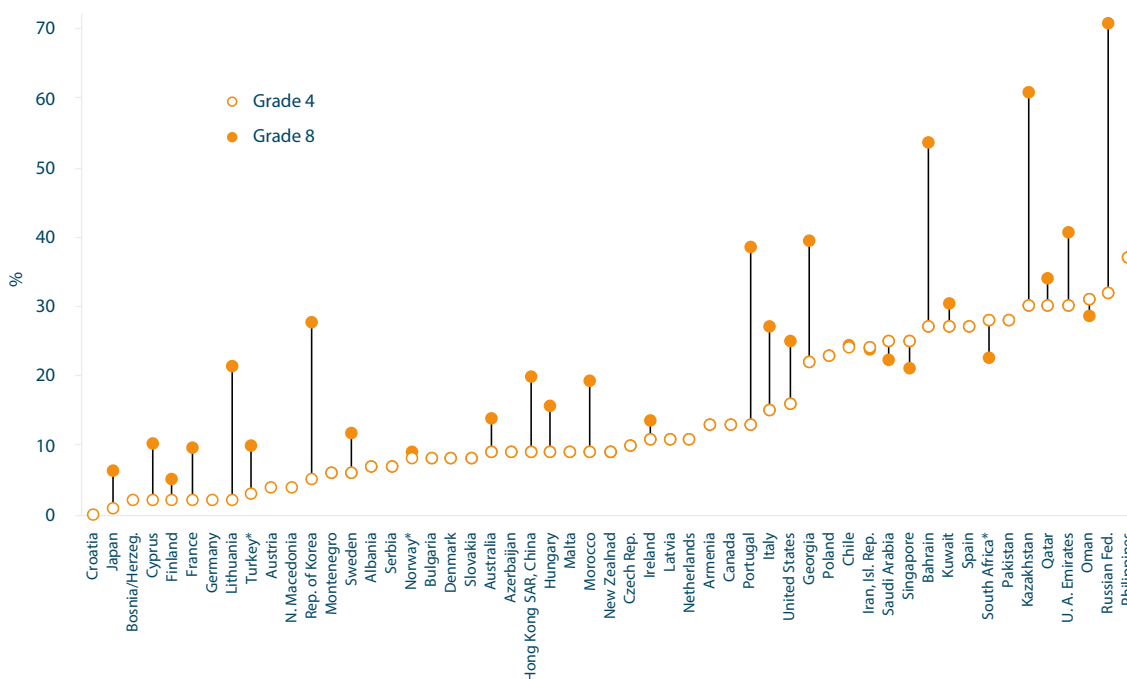
Some notable differences exist between qualification levels in some countries. For instance, Italy has the highest percentage of Grade 4 students whose mathematics teachers only have a secondary education qualification (59%) but also the highest percentage of Grade 8 students whose teachers had a postgraduate education qualification (100%)[14]. Other large gaps between the two levels, such as in terms of the percentage of students taught by a mathematics teacher who had at least a bachelor's degree or equivalent, are observed in the Russian Federation (75% and 99%) and South Africa (62% and 79%).

Teachers are also asked whether they have received in-service training. Figures are expressed in terms of the percentage of students who are being taught by teachers who had received at least 35 hours of professional development during the two years before the assessment. On average, Grade 8 students (23%) are more than twice as likely as their Grade 4 peers (10%) to be taught by a teacher who received at least this amount of professional development.

In Croatia, teachers reported a low level of in-service training, while levels were also very low in countries which enjoy a high reputation for their education systems, such as Japan (1% in Grade 4 and 6% in Grade 8) and Finland (2% and 6%, respectively). Institutionalized training appears common in Kazakhstan (30% and 61% in Grades 4 and 8, respectively) and the Russian Federation (32% and 71%).

FIGURE 4.C.2: **Grade 4 and 8 students whose mathematics teacher had spent more than 35 hours on professional development during the past two years**

TIMSS 2019 participating entities reflected in the figure above have been selected by and named according to UNESCO.

Note: *Norway, South Africa and Turkey administered the assessment to fifth-grade students instead of fourth-grade students, while Norway and South Africa administered the assessment to ninth-grade students instead of eighth-grade students.*
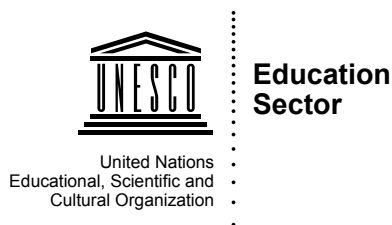
The same striking differences between some countries also appear in terms of the percentage of students taught by science teachers who had spent 35 hours or more on professional development during the past two years. On average across all participating countries in TIMSS 2019, this was the case for 10% of Grade 4 students and 25% of Grade 8 students. In three countries, Israel, Kazakhstan and the Russian Federation, more than half of Grade 8 students were taught by science teachers who spent 35 hours or more on professional development during the past two years. By contrast, this was the case only for 4% of students in Japan and Norway.

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[14] Requirements for primary teachers in Italy changed in 2013, before which a university degree was not required. This information can be found in the *TIMSS 2019 Encyclopedia* and is also in the *TIMSS 2015 Encyclopedia* exhibit about teacher preparation routes: http://timssandpirls.bc.edu/timss2015/encyclopedia/curriculum-questionnaire-exhibits/main-preparation-routes-and-current-requirements-for-teachers/

UNESCO Education Sector

Education is UNESCO's top priority because it is a basic human right and the foundation on which to build peace and drive sustainable development. UNESCO is the United Nations' specialized agency for education and the Education Sector provides global and regional leadership in education, strengthens national education systems and responds to contemporary global challenges through education with a special focus on gender equality and Africa.

Education Sector

UNESCO

United Nations
Educational, Scientific and
Cultural Organization

The Global Education 2030 Agenda

UNESCO, as the United Nations' specialized agency for education, is entrusted to lead and coordinate the Education 2030 Agenda, which is part of a global movement to eradicate poverty through 17 Sustainable Development Goals by 2030. Education, essential to achieve all of these goals, has its own dedicated Goal 4, which aims to *"ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."* The Education 2030 Framework for Action provides guidance for the implementation of this ambitious goal and commitments.

Education 2030

IEA

The International Association for the Evaluation of Educational Achievement is an international cooperative of national research institutions, government research agencies, scholars and researchers working to evaluate, understand and improve education worldwide. IEA is a non-profit and independent organization. More than 60 countries are actively involved in the IEA network, and over 100 education systems participate in its studies.

IEA

Sustainable Development Goals