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New TIMSS 2019 findings reveal science and mathematics achievement is on the rise

International results find most countries are reaching minimum proficiency, gender equity eroded in mathematics at fourth grade, and teachers requiring more professional development for integrating technology into their teaching.

The Global Education 2030 Agenda places learning outcomes at the heart of the international education monitoring framework. The results of TIMSS (Trends in International Mathematics and Science Study) 2019 can provide further insights on how learning assessments not only can help measure and monitor, but also improve learning outcomes through interventions related to equity, school violence, learning environment or teacher qualifications.

Progress towards SDG 4 – students reaching minimum proficiency

One of the global indicators of target 4.1 is the percentage of students who meet a minimum proficiency level in mathematics, for which the **TIMSS Low International Benchmark (400 score points) serves as a reliable global indicator** among participating countries, according to the UNESCO Institute for Statistics [2019 Databook](#).

Several countries have experienced robust growth in this context, while other countries have stagnated. Among participating countries and territories in TIMSS 2019, **92% of fourth grade students** and **87% of eighth grade students** reached the Low International Benchmark in mathematics (median across countries). Positively, the percentage of students performing at or above the TIMSS Low International Benchmark in mathematics is the same across genders.

The findings do, however, highlight the disparity between home educational resources and achievement, with **96% of fourth grade students** from homes with many resources for learning reaching the TIMSS Low International Benchmark in mathematics. This is in contrast to only **70% of students** from homes with a few educational resources for learning. This is an important finding for policy consideration given the pandemic disruption and transition to home learning for many students.

Growing gender gap favoring boys in fourth grade mathematics

Eliminating gender disparities by 2030 is a key focus for SDG target 4.5. New findings reveal **gender equity has eroded** in the short-term from 2015 to 2019 for mathematics at the fourth grade, where boys achieved a higher score on average in almost half of the countries (27), compared to around a third of the countries (18) in 2015.

In science at both grades, there are more countries in which girls have higher average achievement compared to boys than countries where boys achieve higher on average than girls. This paints a vastly

different picture to the first TIMSS 1995 findings, in which there were no countries reporting girls performing higher than boys in science.

More than just a league table

The Education 2030 Agenda calls for an integrated approach to learning to **leave no one behind**. TIMSS sheds light on this by providing evidence and allowing for greater disaggregation of data on learning outcomes by gender, socioeconomic status, and language as well as by age, and other variables obtained from the background questionnaires.

In addition to mathematics and science learning assessments, TIMSS gathers extensive information about the **contextual factors at school and home** which are associated with learning and students' achievement. These include details on how the education system is organized to facilitate learning (see more on TIMSS 2019 Encyclopedia in notes to editors, below), students' home environment and supports for learning, school climate and resources, and classroom instruction.

Safe learning environments

For instance, we know from TIMSS 2019 that, on average, **around one third of both fourth and eighth grade students reported experiencing bullying** either 'About Weekly' or 'About Monthly' and these students' achievement was lower than students who reported never or almost never experiencing bullying. Further, TIMSS 2019 showed a higher average achievement was associated with students experiencing little or no bullying.

The importance of a safe environment as a factor determining learning outcomes has been recognized in the Education 2030 Agenda. From the TIMSS 2019 school principal questionnaire, we know that **most students attend schools with hardly any discipline problems** or minor problems and these students had higher achievements than where there are moderate to severe discipline problems.

More teacher professional development needed

The COVID-19 pandemic has led to a level of educational disruption greater than anything seen before, putting an immense pressure on students and teachers to adapt to home schooling programs and remote learning. New TIMSS 2019 results, collected in March to June of 2019 and before any trace of the pandemic, reveals over 70% of students are taught by eighth grade teachers already indicating a **need for more future professional development** towards integrating technology into mathematics and science instruction.

Early start has learning benefits

TIMSS 2019 continued to demonstrate the positive relationship between early childhood education and higher average achievement.

At fourth grade, students whose parents often engage them in more frequent literacy and numeracy activities during early childhood had much higher achievement, 60 points higher in mathematics and 86 points higher in science, than students whose parents never or almost never do. The same was the case for students who had more years of preprimary education.

Commenting on the results, IEA Executive Director, Dr Dirk Hastedt said:

“TIMSS is of particular importance in assessing achievements towards the Education 2030 Agenda. Encouragingly, trends in mathematics and science are largely improving in fourth and eighth grades, with the majority of students achieving minimum proficiency. However, there is still a certain percentage not achieving the minimum benchmark standard, and we must not forget the large score gaps that remain in many countries between the top and bottom performing students, which has only been underlined by the COVID-19 pandemic this year.”

“An important aspect of TIMSS is the contextual questionnaires that are asked alongside the attainment data, and that cover a wide range of areas from the provision of resources and teaching for science and mathematics, but also the educational background of teachers, demographic information, the level of deprivation or affluence of the area that the school is in, right through to the attitudes of students about the subjects that they're taught, or topics like bullying and school safety.”

“This rich contextual information that goes alongside the attainment data allows us to try and link those contextual factors to their impact on performance in school and in those subjects, such as how socio economic disadvantage is associated with achievement. So, TIMSS provides a really rich database, in which to dig into those features and find some really important lessons for both policymakers and practitioners in those subject areas.”

“As a father of three girls and having myself a background in mathematics, I am deeply concerned about the growing gender gap in fourth grade mathematics and think it is especially important to continue monitoring this aspect closely!”

-ENDS-

For more information about this release, early access to the TIMSS 2019 International Report, or to arrange interviews with Dr Hastedt, IEA's Chair, Thierry Rocher or Dr Ina VS Mullis and Dr Michael O Martin, Executive Directors of the TIMSS & PIRLS International Study Center in the Lynch School of Education at Boston College, please contact:

Heather Millen

Media and Outreach Manager
+31 (0) 6 12 32 51 82



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International Association for the Evaluation of Educational Achievement
Tel. +31 (0) 20 625 36 25 | Fax +31 (0) 20 420 7136 | www.iea.nl

IEA Amsterdam | Keizersgracht 311 | 1016 EE Amsterdam | The Netherlands



Notes to Editors

Monitoring progress towards SDG 4 using TIMSS

On the occasion of the launch of these results, IEA and UNESCO are releasing a 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.

The 16-page joint report by IEA and UNESCO entitled '*Measuring global education goals: How TIMSS helps*', explores how the results contribute to the global Sustainable Development Goal 4 and will be released on 8 December 2020.

About the International Association for the Evaluation of Educational Achievement (IEA)

IEA is an independent, international cooperative of national research institutions, governmental research agencies, scholars, and analysts working to research, understand, and improve education worldwide. It conducts high-quality, large-scale comparative studies of educational achievement and other educational aspects, across the globe in order to provide educators, policymakers, and parents with insights into how students perform.

TIMSS International Study Center

TIMSS is directed by the [TIMSS & PIRLS International Study Center](#) in the Lynch School of Education at Boston College, working in close cooperation with the IEA and the national center 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.

About TIMSS 2019

TIMSS 2019 is the seventh assessment cycle of the IEA's TIMSS, and was administered to nationally representative samples of students in the fourth and eighth grades in 64 countries and 8 benchmarking systems. TIMSS has been conducted every four years since 1995, providing 24 years of trends in global student achievement in mathematics and science.

The TIMSS assessments of mathematics and science achievement are based on comprehensive frameworks developed collaboratively with the participating countries and covering a broad range of mathematics and science content and cognitive skills. TIMSS administers questionnaires to students and their teachers, school principals, and parents to collect information about contexts for learning. Taken together, more than 580,000 students participated in TIMSS 2019, with questionnaires completed by about 310,000 parents, 19,000 school principals, and 52,000 teachers. Read more about [TIMSS 2019](#).

The [TIMSS 2019 Encyclopedia](#) is a comprehensive compendium of how mathematics and science are taught around the world. It consists of a chapter prepared by each TIMSS 2019 country and

benchmarking participant, summarizing key aspects of mathematics and science education, and completed the TIMSS 2019 Curriculum Questionnaire.

TIMSS 2019 International Report and Results

The full TIMSS 2019 International Report provides detailed results from TIMSS 2019 and will be released on 8 December 2020. Further findings from the TIMSS 2019 International Report are outlined below.

Mathematics and Science overall achievement (average scale score)

Singapore was the highest achieving country in mathematics and science at both the fourth and eighth grade, according to the new report from TIMSS 2019. Chinese Taipei, the Republic of Korea, Japan and Hong Kong SAR were also among the highest achieving participants.

Positively, in mathematics, at the fourth and eighth grades, both the long-term (since 1995) and short-term trends (since 2015) show **more improvements than declines in average achievements**. This pattern was similar in science, although at fourth grade in the short-term, there were **as many declines as improvements**.

From 2015 to 2019, the top five countries with the greatest improvement in fourth grade mathematics achievement are Kuwait, United Arab Emirates, Bahrain, Georgia and Armenia. For fourth grade science, the greatest improvers from 2015 to 2019 are Kuwait, Bahrain, Cyprus, Armenia and Morocco. For eighth grade mathematics they are Turkey, Jordan, Bahrain, Saudi Arabia and Egypt. For eighth grade science they are Saudi Arabia, Kuwait, Jordan, Turkey and Bahrain.

Results can be explored further by subject and grade in [IEA's TIMSS 2019 infographics dashboard](#).

Progress towards SDG 4 – students reaching minimum proficiency

The top five countries and territories with the greatest percentage of fourth grade students reaching the TIMSS 2019 Low International Benchmark in mathematics are Hong Kong SAR, Chinese Taipei, Japan, Republic of Korea and Singapore. At the eighth grade the top five are Japan, Singapore, Chinese Taipei, Republic of Korea and Russian Federation.

Since 2015, there are nine countries with a positive change in the percentage of students reaching minimum proficiency in mathematics at fourth grade. They are Kuwait, Saudi Arabia, Qatar, United Arab Emirates, Bahrain, Georgia, Armenia, Cyprus and Italy.

At eighth grade, ten countries had a positive change in the percentage of students reaching the lowest international benchmark. They are South Africa (*ninth grade assessment), Saudi Arabia, Egypt, Jordan, Islamic Republic of Iran, Chile, Turkey, Bahrain, Chinese Taipei and Japan.

Girls outperforming boys in science in more countries

The countries with the biggest difference where fourth grade girls outperformed boys in science are Bahrain, Oman, Saudi Arabia, Kuwait, Pakistan and Philippines. For science at the eighth grade, the largest differences with girls outperforming boys are in Bahrain, Oman, Jordan, Kuwait and Saudi Arabia. For eighth grade mathematics, the largest differences with girls outperforming boys are in Bahrain, Romania, Malaysia, Jordan, Oman, Saudi Arabia and South Africa.

One third of students report experiencing bullying

Around one third of both fourth and eighth grade students reported experiencing bullying either 'About Weekly' or 'About Monthly'. The five countries and territories with the least frequency of bullying reported at fourth grade are Albania, Armenia, Serbia, Kosovo and Montenegro. At the eighth grade they are Japan, Georgia, Chinese Taipei, Republic of Korea and Finland.

More teacher professional development needed

51% of grade 8 students are taught by teachers that reported they had participated in professional development aimed at integrating technology into mathematics instruction in the past two years. The percentages of students with teachers reporting that they participated in this type of professional development were highest in the following countries: Bahrain, United Arab Emirates and Qatar.

Early start has learning benefits

The top five countries and territories with fourth grade students whose parents reported that they often engaged in early literacy and numeracy activities before primary school are Russian Federation, Northern Ireland, Serbia, Malta and Montenegro.

Contact persons for country specific TIMSS 2019 questions

Country/ Territory	NRC Name	Email	Telephone
Albania	Rezana Vrapı	rezana.vrapi@akp.gov.al	
Armenia	Arsen Baghdasaryan	angen@arminco.com	+374 10 57 54 26
Australia	Sue Thomson	communications@acer.org	+61 419 340 058
Austria	Ursula Itzlinger- Bruneforth	u.itzlinger@bifie.at	+43 662 620 088 5021
Azerbaijan	Nermina Aliyeva	nermine.aliyeva@edu.gov.az	+994 12 496 62 75
Bahrain	Huda Alawadi	huda_al_awadi@hotmail.com	
Belgium (Flemish)	Jerich Faddar	jerich.faddar@uantwerpen.be	
Bosnia and Herzegovina	Zaneta Dzumhur	zaneta.dzumhur@aposo.gov.ba	
	Branka Popic	branka.popic@aposo.gov.ba	

Bulgaria	Marina Vasileva Mavrodieva	m.mavrodieva@mon.bg	+359 2 970 56 57
Canada	Kathryn O'Grady	k.ogrady@cmecc.ca	
	Tanya Scerbina	t.scerbina@cmecc.ca	
Canada/ Ontario	Laurie McNelles	laurie.mcnelles@eqao.com	
Canada/ Quebec	Latifa Elfassihi	Latifa.Elfassihi@education.gouv.qc.ca	+1 418 781 0451
Chile	Camila Ayala	camila.ayala@agenciaeducacion.cl	
	Victoria Martínez	victoria.martinez@agenciaeducacion.cl	
Chinese Taipei	Che-DiJohn Le	chedi.lee@ntnu.edu.tw	+886 2 7734 6774
	Chun-Yen Chang	changcy@ntnu.edu.tw	+886 2 2935 4393
Croatia	Ines Elezović	ines.elezovic@ncvvo.hr	38514501868
	Sandra Antulic	sandra.antulic@ncvvo.hr	
Cyprus	Yiasemina Karagiorgi	karagiorgi.y@cyearn.pi.ac.cy	35722402317
Czech Republic	Vladislav Tomášek	vladislav.tomasek@csicr.cz	
Denmark	Christian Christrup Kjeldsen	kjeldsen@edu.au.dk	+45 5137 0188
Egypt	Khaled Mohamed Sayed	timssegyptgroup@gmail.com	
England / UK	Grace Grima	grace.grima@pearson.com	44 20 7190 4330
	Naomi Maguire	Naomi.MAGUIRE@education.gov.uk	
Finland	Jouni Vettenranta	jouni.vettenranta@jyu.fi	+358 40 805 4285
France	Franck Salles	franck.salles@education.gouv.fr	
	Marc Colmant	marc.colmant@education.gouv.fr	+33 1 55 55 77 23
Georgia	Tamari Shoshitashvili	tamarshoshitashvili1@gmail.com	
Germany	Knut Schwippert	knut.schwippert@uni-hamburg.de	
Hong Kong SAR	Maurice Man-Wai Cheng	aslwong@hku.hk	
	Frederick K.S. Leung	frederickleung@hku.hk	
Hungary	Ildikó Balázi	balazi.ildiko@oh.gov.hu	+36 1 374 2431
Islamic Republic of Iran	Abdol'azim Karimi	timss@rie.ir	98 21 8892 8318
Ireland	Rachel Perkins	rachel.perkins@erc.ie	+353 1 806 5218
	Aidan Clerkin	aidan.clerkin@erc.ie	+353 1 806 5219
Israel	Georgette Hilu	ghiluiron.rama@education.gov.il	+972 3 520 5553
	Inbal Ron-Kaplan	iron.rama@education.gov.il	+972 3 520 5554
Italy	Elisa Caponera / Laura Palmerio	pirls-timss@invalsi.it	+39 06 94 185 304
Japan	Fumi Ginshima	ginshima@nier.go.jp	
Jordan	Khattab M.A. Abulibdeh	klebdeh@nchrd.gov.jo	
Kazakhstan	Aigul Baigulova	timss-kz@rambler.ru	
Republic of Korea	Kyongah	kasang@kice.re.kr	+82 2 3704 3629
Kosovo	Fatmir Elezi	fatmir.elezi@rks-gov.net	

Kuwait	Ascia Hajiya	asia_h@nced.edu.kw	
Latvia	Linda Mihno	linda.mihno@lu.lv	
Lebanon	Brenda Ghazale	bghazale@yahoo.fr	
Lithuania	Asta Buineviciute	asta.buineviciute@nsa.smm.lt	
Malaysia	Dr. Nor Saidatul Rajeah Zamzam Amin	saidatul.amin@moe.gov.my	
	Rusliza Abdullah	rusliza.abdullah@moe.gov.my	
Malta	Gaetano Bugeja	gaetano.bugeja@ilearn.edu.mt	
	Louis Scerri	louis.scerri@gov.mt	
	Karen Grixti	karen.grixti@ilearn.edu.mt	
Montenegro	Marina Radović	marina.radovic@iccg.edu.me	
Morocco	Mohammed Sassi	mohammed.sassi@men.gov.ma	
	Ahmed Chaibi	a_chaibi@yahoo.fr	
	Said Bouderga	timsspirls2011@gmail.com	
Netherlands	Martina Meelissen	m.r.m.meelissen@utwente.nl	
New Zealand	Steve May	Steve.May@education.govt.nz	
North Macedonia	Reshat Ramadani	resatramadani@dic.edu.mk	
	Beti Lameva	betilameva@dic.edu.mk	
Northern Ireland	Bethan Burge	b.burge@nfer.ac.uk	
	David Thomas	d.thomas@nfer.ac.uk	
Norway	Hege Kaarstein	hege.kaarstein@ils.uio.no	
Oman	Zuwaina Saleh Al-Maskari	zuwaina@moe.om	
	Ishaq Alslumani	ishaq.slumani@gmail.com	
Pakistan	Muhammad Shakeel	nrc.timss@gmail.com	
Philippines	Nelia V. Benito	nelia.benito@deped.gov.ph	
Poland	Michał Sitek	m.sitek@ibe.edu.pl	
Portugal	Anabela Serrão	anabela.serrao@iave.pt	
Qatar	Asmaa Yousef Al-Harqan	a.alharqan@edu.gov.qa	
	Khalid Al-Harqan	khalid.alharkan@edu.gov.qa	
	Shaikha Al-Ishaq	shaikha@edu.gov.qa	
	Noora Al-Hashemi	noura@edu.gov.qa	
	Kareema Al-Hamad	Kareema@edu.gov.qa	
	Hend Jarrar	hend@edu.gov.qa	
Romania	Dragos Iliescu	dragos.iliescu@fpse.unibuc.ro	
Russian Federation	Galina Kovaleva	galina_kovaleva_rao@mail.ru	
	Sergey Stanchenko	stanch@yandex.ru	
Russian Federation/ Moscow City	Elena Zozulya	zozulya@mcko.ru	
Saudi Arabia	Abdullah Aljouiee	a.jouiee@etec.gov.sa	
Serbia	Ivana Djeric	ivana.brestiv@gmail.com	
	Nikoleta Gutvajn	gutvajnnikoleta@gmail.com	
Singapore	Chew Leng Poon	Poon_Chew_Leng@moe.gov.sg	
	Hui Leng Ng	ng_hui_leng@moe.gov.sg	

	HuiyuanLin	LIN_Huiyuan@moe.gov.sg	
Slovak Republic	Andrea Galádová	andrea.galadova@nucem.sk	
South Africa	Vijay Reddy	vreddy@hsrc.ac.za	
Spain / Madrid	CarmenTovar	carmen.tovar@educacion.gob.es	
	Rocío Carrascosa Sestines	rocio.carrascosa@mecd.es	
	Francisco Javier Garcia Crespo	javier.gcrespo@educacion.gob.es	
Sweden	Maria Axelsson	maria.axelsson@skolverket.se	
Turkey	Emine Özdemir	timss@meb.gov.tr	
United Arab Emirates	Hessa Al Wahhabi	hessa.alwahhbi@moe.gov.ae	
	Shaikha Ali Al Zaabi	shaikha.alzaabi@adec.ac.ae	
United Arab Emirates/ Abu Dhabi	Nada AbuBaker Husain Ruban	nadaa.ruban@moe.gov.ae	
United Arab Emirates/ Dubai	Mariam Al Ali	mariam.alali@khda.gov.ae	
United States	Stephen Provasnik	Stephen.Provasnik@ed.gov	
	Lydia Malley	Lydia.Malley@ed.gov	