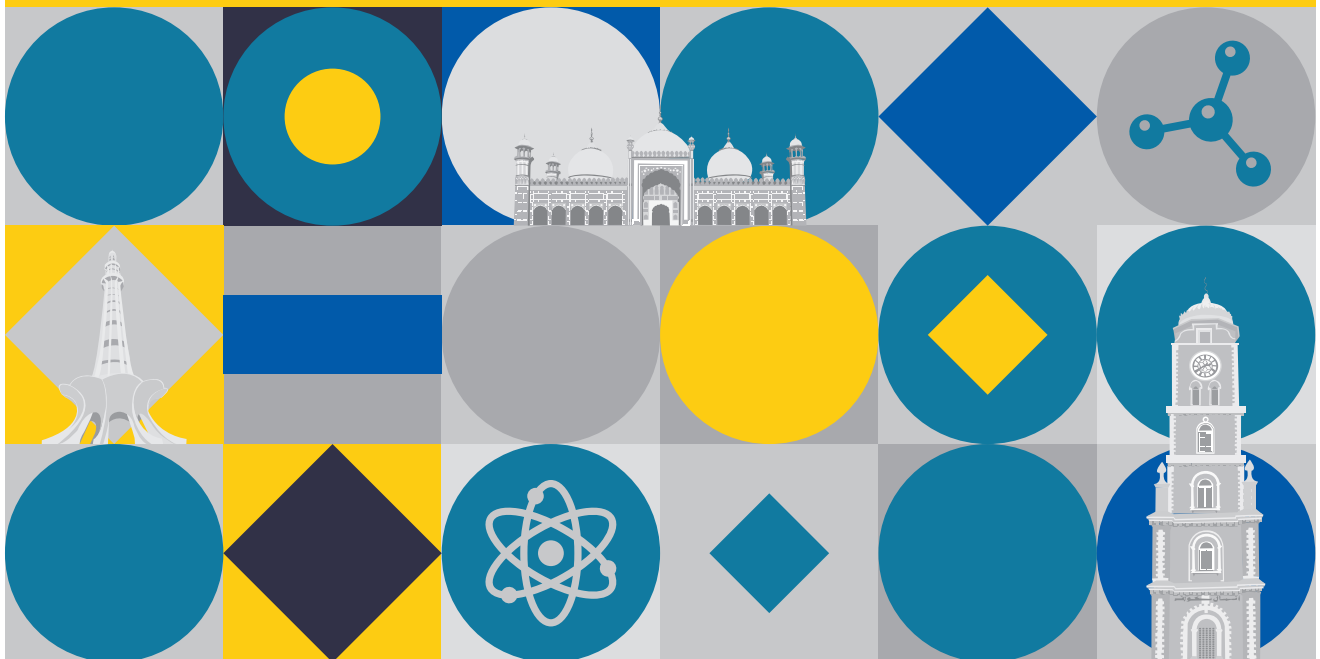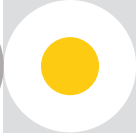# HOW MUCH ARE OUR FOURTH GRADERS LEARNING AT SCHOOL?

INSIGHTS FROM TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY (TIMSS) 2019

NATIONAL EDUCATION ASSESSMENT SYSTEM GOVERNMENT OF PAKISTAN

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CONTENTS

ABOUT NEAS

NEAS (National Education Assessment System) undertook the challenge of implementing the global Trends in International Mathematics and Science Study (TIMSS) across Pakistan for the first time in its history in 2019. The vision driven by the Ministry of Federal Education and Professional Training (MoFEPT) resulted in Pakistan becoming the first country in the South Asia region to be part of this global large-scale study to assess the quality of mathematics and science learning among fourth grade students.

NEAS was established in 2003 as a five-year development project with financial assistance from the World Bank and UK's Foreign, Commonwealth Development Office (FCDO) – then Department for International Development (DFID). Realizing its significance in the education system, NEAS was sustained beyond the life of this original project. Currently, NEAS has been institutionalized at the national level, and operates as a subordinate office under MoFEPT, with the cooperation of provincial and area centers. As part of its mandate, NEAS develops and implements a periodic national large-scale assessment – the National Achievement Test (NAT) across Pakistan. NEAS is also the leading agency responsible for implementing international large-scale assessments.

Message
From The Minister

This government has come with the mandate to bring institutional reforms, productive innovations and dynamic changings in every field of life to uplift this nation and country on war-footings. Undoubtedly, education is the fundamental right of every person and a unanimously decided indicator of change. Quality education is the most powerful weapon that can be used for change and self-enlightenment.

I am fully aware and determined to cope with all the challenges by adopting digitalized and globalized trends and practices in the field of education. Idea of single National Curriculum (SNC) and to participate in an international assessment study Trends in International Mathematics and Science Study, (TIMSS) in the subjects of Mathematics and Science at Grade-4 to determine an international competitive bench mark, reflects our clear and conscious intentions and devoted efforts.

I acknowledge the efforts of my ministry and NEAS team in executing and finalizing this huge and series based technical tasks. Although results are very dismal and alarming, but I think, this is not a May-day call but a wake-up call for all stakeholders to take results as a challenge to transform into a turning point towards reforms in education sector. This international assessment study has given us insight into our strengths and weaknesses in the core subjects of Mathematics and Science which are the mother of all innovations, discoveries and inventions.

No doubt, there is always a room and need for improvement towards the goal of perfection. I am well aware that we have to tackle local, regional national and global challenges with our limited and meager resources. The future of Pakistan is very bright and we can make it prosperous, advanced and influential only with the weapon of education.

Shafqat Mahmood
Federal Minister
Ministry of Federal Education
& Professional Training
Government of Pakistan
Islamabad.
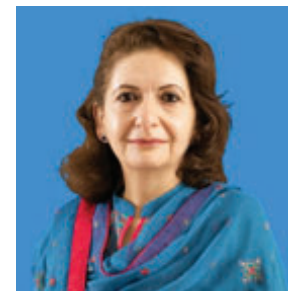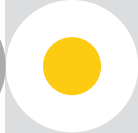
Message From The Secretary

Education is the most effective vaccine for nations to vitalize their immune system against all local and global challenges. Now we are living in a global village, so we can't move forward in isolation. In this era of digital and technological world, isolation is a suicidal death. Therefore, adaptation of international trends in every field of life is indispensable.

The government is fully focused and determined to bring innovative reforms through research based informed decisions. Informed decisions have a pivotal significance in bringing current and futuristic reforms in every field of life.

Participation in an international assessment study is a maiden venture of Pakistan in its history by establishing an international benchmark of our students at Grade-4, because primary level provides foundations and sound footings for higher and tertiary education of every academic field. Although the results of this study are very shocking and alarming but also delineate our true picture internationally. How can we shut our eyes to facts, figures and realities?

Our coming and promising generations have the right to get opportunities to compete world in every field of life. This miracle can only happen through quality education. Pakistan is also the signatory of Sustainable Development Goals (SDG-4) emphasize on quality of education. So, these results are a hall mark towards the provision of quality education. I acknowledge the efforts of whole ministry, NEAS management & his team, Provincial/Area's education departments & assessment centers and other stakeholders to make this study possible by their hectic and tireless efforts during its execution and administration.

Let us pledge and emphasize that the secure and dignified future of Pakistan is in competitive and quality education embedded in our religious, social and cultural values. Again, let us pledge to make secure and bright future of our common generations with quality education.

Farah Hamid Khan
Federal Secretary
Ministry of Federal Education
& Professional Training
Government of Pakistan
Islamabad.
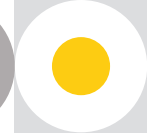
Message
From National Coordinator

National Education Assessment System (NEAS) have been established with the mandate to assess and diagnose the grows and glows of our education system. It has been the practice of NEAS to conduct large scale National Achievement Test on a periodic basis across the country. In the era of globalization and digitalization, it was deeply necessitated that Pakistan should also participate in an international assessment study to establish an international benchmark in the core subjects of Science and Mathematics at Grade-4 as it was also emphasized in National Education Policy (NEP-2009).

From the South Asian region, Pakistan is the first country who participated in Trends in International Mathematics and Science Study (TIMSS) in 2019. Samples schools were selected by the International Association for The Evaluation of Educational Achievement (IEA). All strata's i.e. gender (male, females), location (rural, urban), medium of instruction (English, Urdu and Sindhi) and status (public, private) were given proper representation as per their existing weightage. To access and convince private educational institutions was really a tedious and huge task. NEAS utilized all means of communication with proper facilitation and extended corporation of Higher, Tertiary and Medium educational administration and management to take on board the management of sampled schools.

All international standards required by IEA were adopted and observed at every stage and part of the assessment to maintain the secrecy, validity and reliability of this maiden execution. After cultural adaption tools were translated into Urdu, English and Sindhi languages. Proper trainings were provided to all concerned administrative staff as per international standards.
A communication track and trace system were laid down to tackle and solve any issue or quarry faced in the field at any institution spontaneously. Then data was collected and marked as per the assigned rubric codes by IEA hiring the skillful services of trained and qualified teachers of Federal Directorate of Education (FDE), Islamabad. Then a private firm was hired through bidding process for data entry. The raw data was submitted to IEA for data cleaning and findings.

With a very heavy heart, I admit that our results are very alarming and shocking, but I think we should have the courage to accept this reality that education sector have been the most neglected discipline in our national priorities in our previous history. So we should take it as a challenge and transform this challenge into opportunities. We can prove this as the turning point with our-intrepid resourcefulness,

consistent devotion and persistent struggle to bring evolutionary revolution through drastic reform in the education sector.

I extend my thanks to all officers of the Ministry of Federal Education and Professional Training, Provincial and Areas Educational Authorities, all stakeholders, District Education Officers, Principals and Subject Teachers of sampled schools, Private Educational Institutions Regulatory Authorities, NEAS team and all those who played any kind of role at any stage of this activity.

Muhammad Shakeel
National Coordinator (NEAS)/
National Research Coordinator
(TIMSS-2019),
National Education Assessment
System (NEAS),
Ministry of Federal Education and
Professional Training, Islamabad.

ACKNOWLEDGEMENTS

EXECUTIVE SUMMARY

Pakistan participated in the Trends in International Mathematics and Science Study (TIMSS) for the first time in 2019. The country's participation marks a significant step towards achieving the government's vision of promoting fair and quality education, and making students more competitive with their counterparts abroad.

The TIMSS 2019 results show important weaknesses in student learning in both mathematics and science. The country ranked second to last among the 64 countries participating in the study. Most fourth grade students did not reach minimum learning levels. It is as if most students were at the bottom of a mountain, with a long road ahead to climb to the top.

To understand low academic performance, it is important to put results into a broader context. Pakistan faces many social and economic challenges, and is among the lowest income countries participating in TIMSS 2019. Higher income countries tend to do better than lower income countries, and Pakistan is not the exception. The challenges highlighted in this report are not unique to Pakistan, but are shared by many other countries around the world.

TIMSS 2019 offers important insights on the quality and equity of education in Pakistan, and shed light on the road to follow to climb to the top of the mountain. These include:

• **Pakistan ranked second to last in both mathematics and natural sciences among all 64 countries participating in TIMSS 2019.** The performance of Pakistani fourth graders was much lower than the one of England, Turkey, or Iran. Pakistani students only scored significantly higher than their peers in the Philippines.

• **Approximately three out of four students in Pakistan did not reach minimum learning levels in mathematics and natural sciences.** Fourth graders seem to lack basic mathematics knowledge and skills, and knowledge or understanding of foundational

scientific concepts and facts. It is as if they were in a big plateau at the bottom of the mountain. These students are at risk of never being able to break the vicious cycle of poverty. They are at risk of not acquiring the knowledge and skills needed to complete their education, get a good job, and contribute to the social and economic development of their communities and country at large.

• **On a more positive note, approximately one in four Pakistani students reached at least minimum learning levels in mathematics and natural sciences.** Most of these fourth graders have some basic mathematics knowledge and skills (e.g., they can add, subtract, multiply, and divide), and some can apply their knowledge in simple situations. They have limited understanding of scientific concepts and limited knowledge of foundational science facts. These students are on their way climbing from the bottom to the top of the mountain.

• **An important achievement gap exists between top and bottom performing students in Pakistan.** While the top performers can apply basic knowledge in simple situations, the lowest performing cannot consistently demonstrate basic mathematical and scientific knowledge. Top performing students in Pakistan had an achievement comparable to an average performing students in Iran, Kazakhstan, or Saudi Arabia. Making steps toward a more equitable quality education will require lifting both top and bottom performing students, and to reduce the achievement gaps between them. Similar to a team of climbers in the road to the top of the mountain.

• **Many factors can help to understand the low performance of Pakistani students.** First, there are social and economic forces that help to explain why Pakistani students performed at the bottom of the country league table. Second, there are education related factors (e.g., school, teacher, student and parent characteristics) that help to understand why some students in Pakistan do better than others. These factors are key to inform education policy and practice. They are like the road marks that can guide climbers to reach to the top of the mountain.

• **Approximately two out of three children in Pakistan did not attend preprimary education.** This was the highest proportion compared to all other 63 countries participating in TIMSS 2019. Attending preprimary education is important for children and their families. Providing universal access to quality preprimary
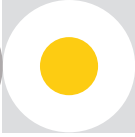
education should be a priority for Pakistan.

• Once in primary education, **fourth grade students did not seem to benefit from the most qualified teachers.** First, approximately two-thirds of Pakistani students were taught by teachers who did not have a bachelor degree, even though they were required to have one in government or public schools. This proportion was much higher than in other countries. Second, a higher proportion of Pakistani students were taught by relatively inexperienced teachers. While 40% of the fourth graders were taught by teachers with less than five years of experience in Pakistan, 25% or less were taught by teachers with that level of experience in Saudi Arabia, Kazakhstan or the Philippines. This may be the consequence of the prevailing practice in Pakistan of assigning teachers with more years of experience to the upper grades of primary education. This practice could be changed, so that that teachers with different levels of experience are more evenly distributed across school grades. This could allow for better in-service professional development, with more experienced teachers mentoring the development of less experienced teachers.

• Given the multicultural and linguistic background of Pakistan, TIMSS was administered in three different languages (English, Urdu, and Sindhi) that matched the language of instruction at grade 4. Nevertheless, **the language of the test was never spoken at home by around a third of the Pakistani students.** This was the highest proportion compared to all other 63 countries in the study. Not surprisingly, students facing difficulty understanding the language of instruction scored significantly lower than their peers in the mathematics and science tests. Efforts should be made to ensure that students can have a smooth, gradual transition from mother tongue to a second language for instruction in Pakistan.

• **Nearly two-thirds of Pakistani students attended schools that place high emphasis on academic success.** This proportion was much higher than most other countries, and may reflect some cultural bias in the principals' perceptions. Nevertheless, fourth grade students attending schools that placed greater emphasis on academic success had a better performance in both mathematics and science. These findings point to the importance of promoting a culture of high
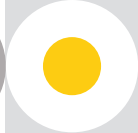
expectations in all Pakistani schools, where students are inspired by their teachers, and parents are committed to ensure that students are ready to learn.

• **Approximately three in four students had parents who are very satisfied with their child's school,** a proportion relatively higher than other countries. Students whose parents were very satisfied reached higher achievement levels in both mathematics and science. These findings point to the importance of monitoring parent satisfaction and the factors behind it. Parent surveys inquiring about school leadership, pedagogy, safety and participation can be used for this purpose. Addressing the issues identified by these surveys may increase parent satisfaction with the schools, while boosting learning among students.

• **Pakistan has many challenges ahead to ensure equitable quality education for all, as aimed in the United Nations' Sustainable Development Goals in Education (SDG 4).** At this time, only approximately one-third of children in Pakistan reported having access to preprimary education (SDG 4.2.2). In primary education, approximately 25% of the students achieved minimum proficiency level in mathematics (SDG 4.1.1), and only approximately 20% in natural sciences (SDG 4.7.5). In terms of gender parity (SDG 4.5.1), fewer girls had access to school compared to boys (parity index 45/55). While boys and girls attained similar performance in mathematics, girls outperform boys in natural sciences. The goal of providing safe, non-violent learning environments can be informed by the fact that near 1 in 5 students reported being bullied every week (SDG 4.a.2). Regarding the supply of qualified teachers, approximately one-third of the students were taught by a teacher who have the minimum required qualification of a bachelor degree (SDG 4.c.1). Over 80% of the fourth-graders were taught by teachers who received in-service training in the last two years (SDG 4.c.7).

TIMSS is an international global assessment in math and natural sciences. In 2019, TIMSS was administered in 64 countries, including some education systems, cities or regions within countries.

PAKISTAN
IS THE FIRST COUNTRY FROM SOUTH ASIA TO PARTICIPATE IN
TIMSS
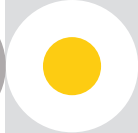
FACTS FROM THE TIMSS 2019 SURVEY IN PAKISTAN

139 SCHOOLS

3980
FOURTH GRADE STUDENTS, THEIR PRINCIPALS, TEACHERS AND PARENTS.

DATE ADMINISTERED

APRIL 23-24-2019

INSTITUTION IN CHARGE

NEAS

NATIONAL EDUCATION ASSESSMENT SYSTEM (NEAS)

AVERAGE AGE OF THE STUDENTS SURVEYED

$10\frac{1}{2}$ YEARS of AGE

SURVEY INSTRUMENTS

- MATH/SCIENCE TEST
- STUDENT QUESTIONNAIRE
- TEACHER QUESTIONNAIRE
- PRINCIPAL QUESTIONNAIRE
- HOME QUESTIONNAIRE
- HOME QUESTIONNAIRE

LANGUAGE OF TESTS AND QUESTIONNAIRES

ENGLISH   URDU   SINDHI

CHAPTER 1

INTRODUCTION

Ensuring that all students receive a fair and quality education is a national priority in Pakistan. In order to increase prosperity, all children need to be learning at school. This will help them to complete their education and fulfill their potential, find productive jobs, and contribute to the social and economic development of their communities and country at large.

To what extent are Pakistani students receiving a fair and quality education? To what extent they are learning the skills needed to succeed at school and in their adult life? What can Pakistan learn from other countries in order to improve its education system? To shed light on these questions, the Ministry of Federal Education and Professional Training, together with the National Education Assessment System (NEAS), decided to participate in the 2019 version of the Trends in International Mathematics and Science Study (TIMSS).

TIMSS is a survey from the International Association for the Evaluation of Educational Achievement (IEA) that allows participating countries to analyze their education system from a global, international perspective. TIMSS provides valid and reliable information that is critical to monitor quality and equity in education, and to support learning for all. The study has been carried out on a regular basis for more than 20 years. By joining the 2019 version of the study, Pakistan became the first South Asian country to ever participate in TIMSS.

The National Education Assessment System (NEAS) was the responsible agency for the implementation of TIMSS 2019 in Pakistan. NEAS functions under the administrative control of the Ministry of Federal Education and Professional Training, in Islamabad. By participating in TIMSS, Pakistan aims to:

- Monitor to what extent students are reaching the learning standards of the national curriculum
- Establish a national baseline of students' achievements
- Understand how different factors affect students' achievement
- Inform interventions to support quality and equity in education
- Inform reviews of the national curriculum and teaching practices
- Inform stakeholders (policy makers, curriculum developers, text

book writers, teacher trainers, and frontline practitioners,
parents and community members, media) about education quality and equity
- Develop institutional capacity to conduct periodic national and international assessments

TIMSS 2019 results show that Pakistan has significant challenges ahead to provide a fair and quality education for all. Pakistan ranked second to last among the 64 countries (and education systems, cities and regions) participating in TIMSS. The mathematics and science achievement of Pakistani fourth graders was far below that of students in England, Turkey, or Kazakhstan, and only higher to the Philippines. Approximately 3 out of 4 Pakistani students did not reach the minimum proficiency level considered acceptable by the international community. Students who do not reach this lower threshold are at risk of never learning the skills needed to progress at school and to succeed in life. It is as if a new generation of Pakistani children were at the bottom of a huge mountain, with a long way ahead to reach to the top.

The findings also raise some equity concerns. Significant achievement gaps arise when comparing high and low performing students, students affected by bullying, and students who have difficulties understanding the language of instruction. On the other hand, no significant differences in performance were identified among boys and girls, and urban and rural students. An important limitation though was that the TIMSS tests were too difficult to most students in Pakistan, and therefore it was hard to identify achievement gaps among different groups of students.

In analyzing the TIMSS results for Pakistan, it is important to bear in mind its social and economic context. Pakistan is among the lowest income countries participating in TIMSS 2019. Lower income countries tend to have a weaker academic performance than higher income countries, and Pakistan is not the exception. In fact, the actual performance of Pakistani students could have been closely predicted based on its GDP (Gross Domestic Product) per capita only. Nevertheless, the international evidence also shows that among countries with similar wealth there is a wide range of academic performance. What can explain these differences? What can Pakistan learn from the education systems of these countries?
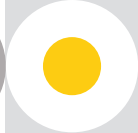
This report *"How much are our fourth graders learning at school? Insights from Trends in International Mathematics and Science Study (TIMSS) 2019"* is organized in three main chapters. The first chapter includes this introduction, provides basic information about TIMSS 2019, and lays out the broader social, economic and educational context of Pakistan in order to better situate the findings. The second and third chapters present the mathematics and science results, respectively. Achievement results are analyzed alongside key background information, such as school, teacher, student and parent characteristics. Visuals are presented for Pakistan alongside selected comparison countries, and further analyses and comments are provided along the mathematics results. The aim is that the insights presented in this report will raise awareness of the current status of education in Pakistan. More importantly, it is aimed that they shed light on the road to follow to climb to the top of the mountain.

SOCIAL AND EDUCATIONAL INDICATORS FOR PAKISTAN AND SELECTED COUNTRIES

SOCIAL INDICATORS					
	Country population (thousands)	Human Development Index value	Life expectancy at birth	Gross Domestic Product per capita (PPP $)	Gini index	Percent population under poverty line
ENGLAND	66,834	0.932	81.3	48,698.10	34.8	18.6
IRAN	82,914	0.783	76.7	12,937.50	40.8	
KAZAKHSTAN	18,514	0.825	73.6	27,517.60	27.5	2.5
PHILIPPINES	108,117	0.718	71.2	9,302.40	44.4	21.6
TURKEY	83,430	0.82	77.7	28,134.40	41.9	14.4
SAUDI ARABIA	34,269	0.854	75.1	49,040.30		
PAKISTAN	**216,565**	**0.557**	**67.3**	**4,898.10**	**33.5**	**24.3**

EDUCATION INDICATORS			
	Mean years of schooling	Net Enrolment Rate at primary age	Gender parity index - primary
ENGLAND	13.2	99	1
IRAN	10.3	100	1.06
KAZAKHSTAN	11.9	87	1.02
PHILLIPINES	9.4	94	0.96
TURKEY	8.1	88	0.99
SAUDI ARABIA	10.2	95	1.02
PAKISTAN	**5.2**	**68**	**0.86**

MATHEMATICS
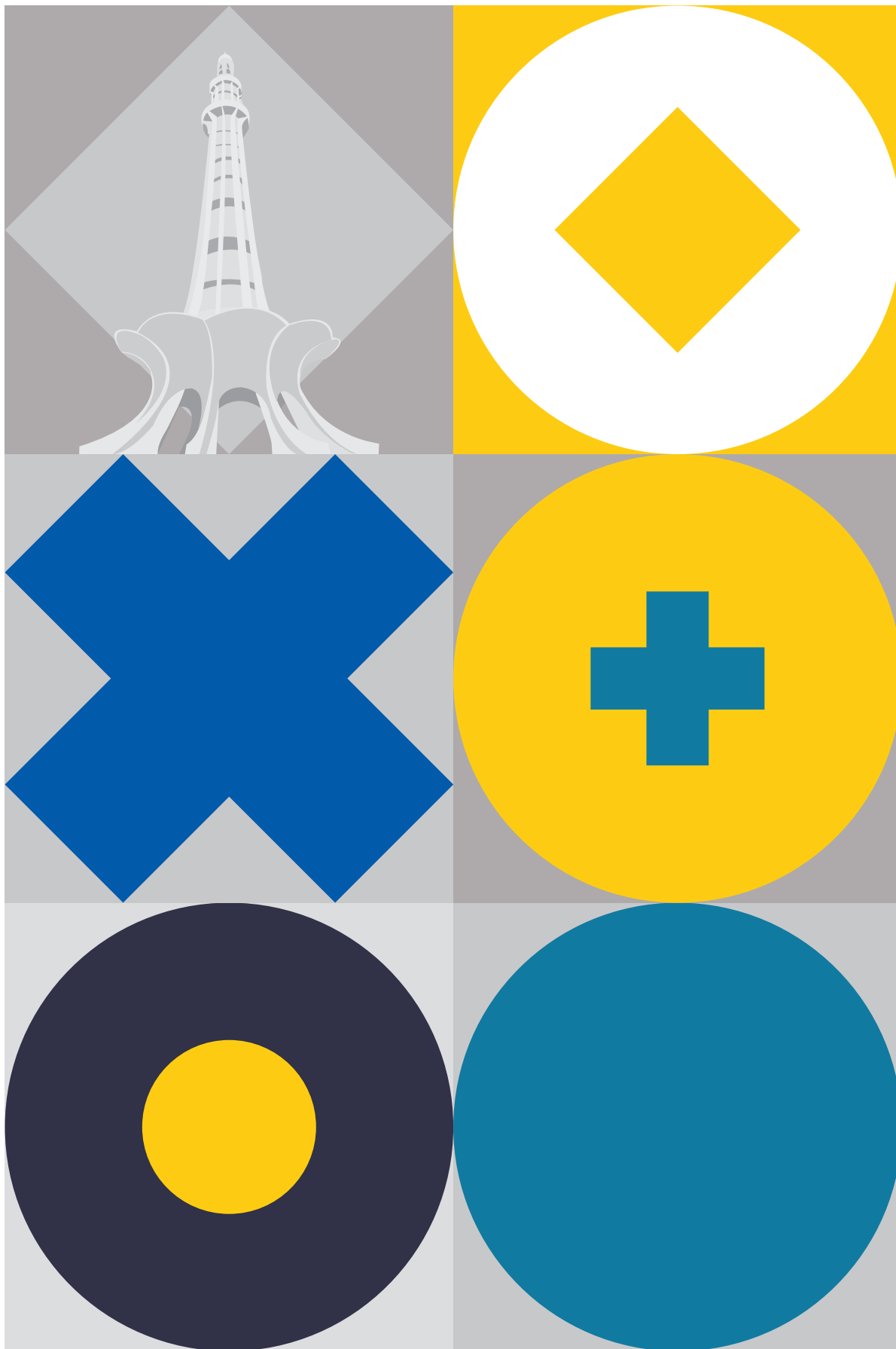
CHAPTER 2
MATHEMATICS RESULTS
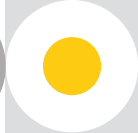
RANKING OF COUNTRIES
BY MATHEMATICS ACHIEVEMENT

MATHEMATICS SCORE

700
600
500
400
300
200

625 Singapore

England
556

Turkey
523

512 Kazakhstan

443 Iran

398 Saudi Arabia

328 Pakistan

297 Philippines
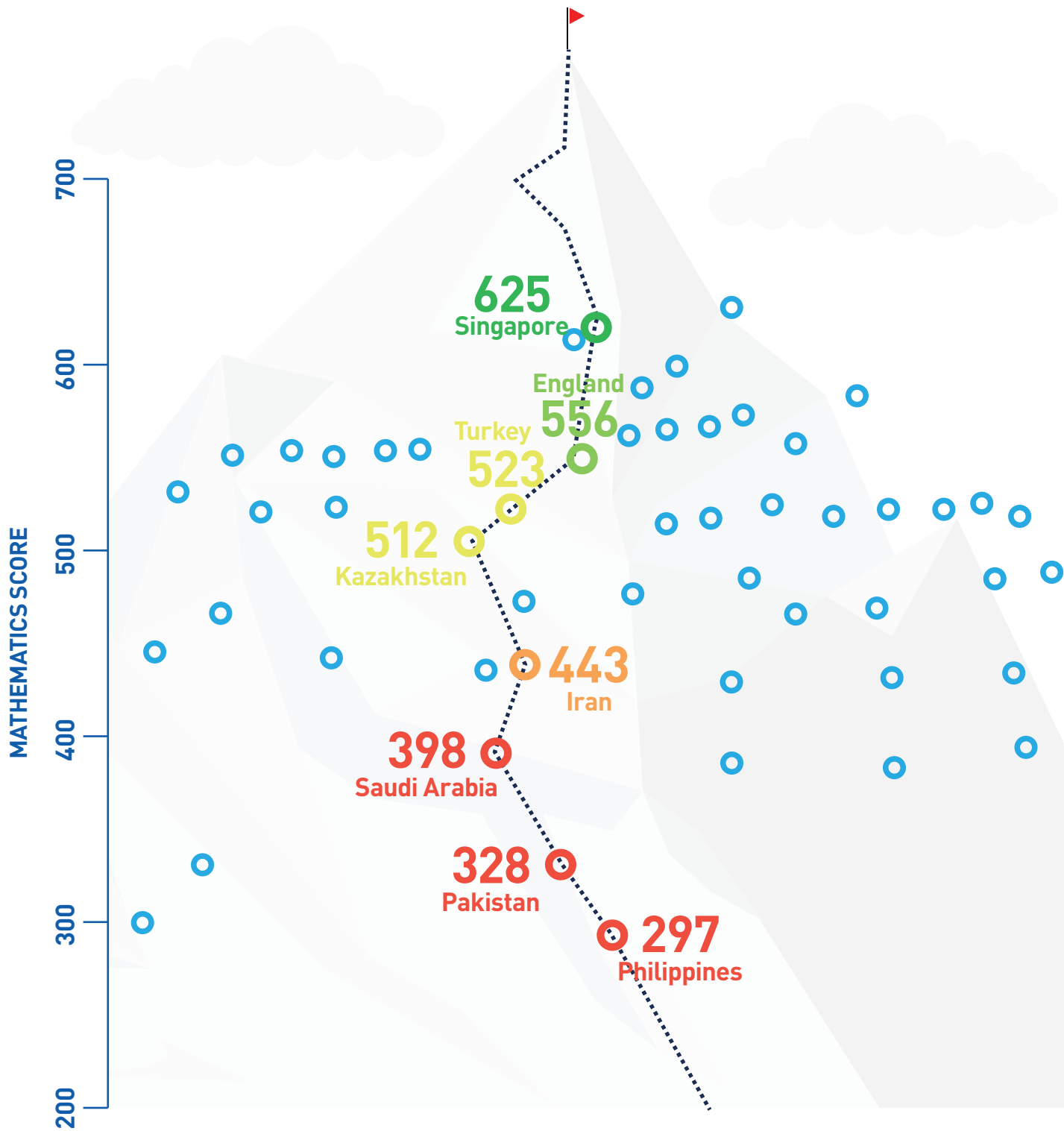
The most fundamental finding from TIMSS 2019 is that Pakistan lags behind all the 63 participants countries or education systems, with the exception of one. The performance of Pakistani fourth graders was significantly lower than the performance of countries such as Saudi Arabia, Iran, Kazakhstan, England and Singapore. Pakistani students only outperformed their peers in the Philippines.

These results are equivalent to being at the bottom of a big mountain, with a long road ahead to reach to the top. Quantum improvements are required for Pakistani students to learn the mathematics knowledge and skills needed to reach their full potential, to be success at school, and to be globally competitive.
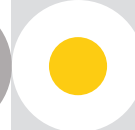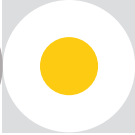
MATHEMATICS ACHIEVEMENT BY WEALTH OF COUNTRIES

WEALTH OF THE COUNTRIES (GDP PER CAPITA, PPP, USD)
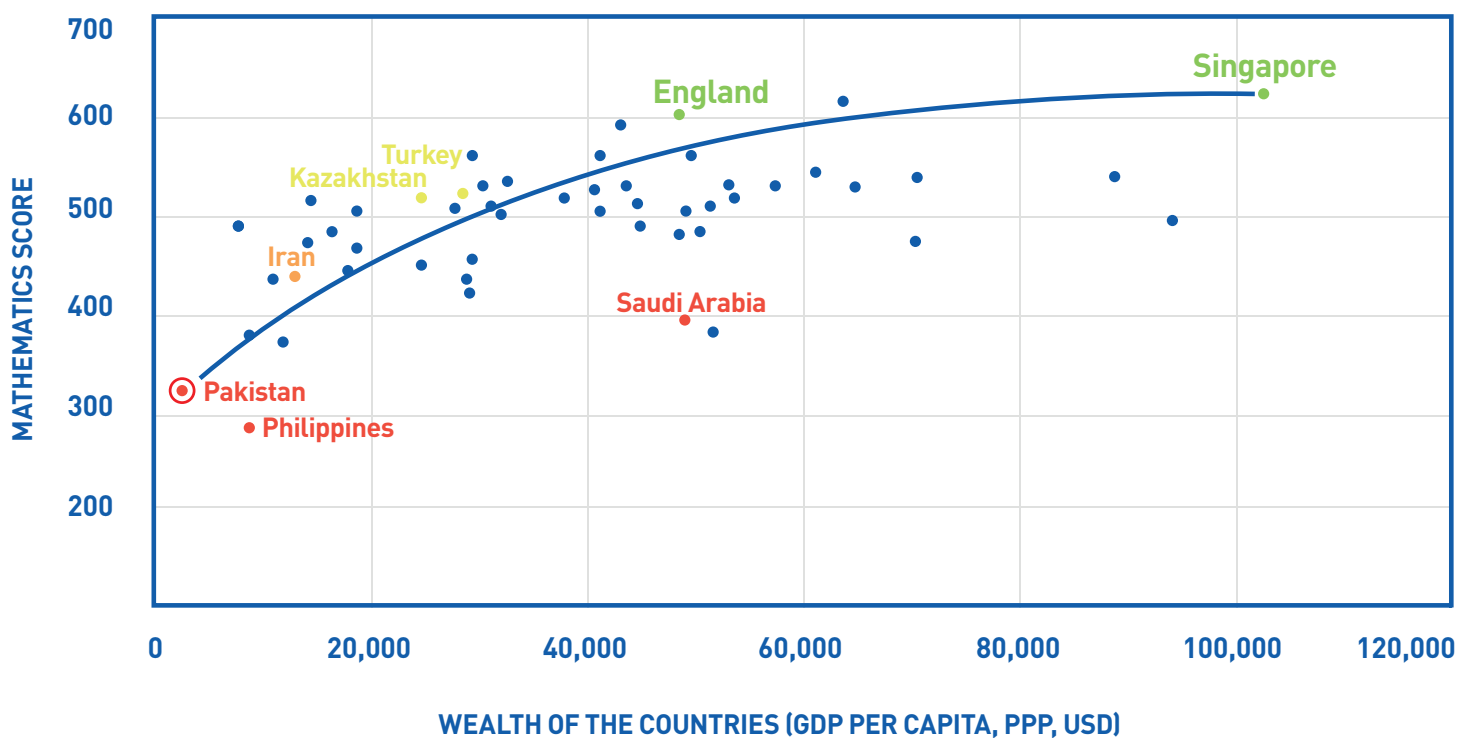
GDP PER CAPITA, PPP, USD (GROSS DOMESTIC PRODUCT
USING PURCHASING POWER PARITY)

Generally higher income countries perform better than lower income countries. TIMSS 2019 results confirm this pattern, with Pakistan being among the lowest income countries and also having one of the weakest mathematics performances.

However, the results also show that among countries with similar income levels there is a wide range of mathematics performance. Take the case of England and Saudi Arabia: both are similar in terms of their wealth, but widely different in terms of their academic performance. What can explain these differences? What can Pakistan learn from the education system of these countries? How do these countries differ from Pakistan in terms of school characteristics, curriculum and pedagogy, and home support? These are some of the questions that this report aims to address.

INTERNATIONAL BENCHMARKS OF MATHEMATICS ACHIEVEMENT

MATHEMATICS SCORE

625

550

475

400

ADVANCED
>625

Students can apply their understanding and knowledge in a variety of relatively complex situations and explain their reasoning. Students can solve a variety of multistep word problems involving whole numbers and show an understanding of fractions and decimals. They can apply knowledge of two- and three-dimensional shapes in a variety of situations. Students can interpret and represent data to solve multistep problems.

HIGH
550-625

Students apply conceptual understanding to solve problems. They can apply conceptual understanding of whole numbers to solve two-step word problems. They show understanding of the number line, multiples, factors, and rounding numbers, and operations with fractions and decimals. Students can solve simple measurement problems. They demonstrate understanding of geometric properties of shapes and angles. Students can interpret and use data in tables and a variety of graphs to solve problems.

INTERMEDIATE
475-550

Students can apply basic mathematical knowledge in simple situations. They can compute with three- and four-digit whole numbers in a variety of situations. They have some understanding of decimals and fractions. Students can identify and draw shapes with simple properties. They can read, label, and interpret information in graphs and tables.

LOW
400-475

Students have some basic mathematical knowledge. They can add, subtract, multiply, and divide one- and two-digit whole numbers. They can solve simple word problems. They have some knowledge of simple fractions and common geometric shapes. Students can read and complete simple bar graphs and tables.

BELOW LOW
<400

Students do not systematically demonstrate the knowledge and skills of the "Low" benchmark

INTERNATIONAL BENCHMARKS OF MATHEMATICS ACHIEVEMENT

What are the mathematics competencies, knowledge and skills of Pakistani students? What do they know and are able to do with that knowledge? TIMSS describes the achievement of students using four international benchmarks or learning levels: Advanced, High, Intermediate, and Low. Students that do not reach the Low level are by default classified in the Below Low category. Students are classified in each level based on their overall mathematics score.

PERCENTAGES OF PAKISTANI STUDENTS REACHING INTERNATIONAL BENCHMARKS OF MATHEMATICS ACHIEVEMENT

0% PERCENTAGE OF STUDENTS REACHING ADVANCED BENCHMARK

1% PERCENTAGE OF STUDENTS REACHING HIGH BENCHMARK

7% PERCENTAGE OF STUDENTS REACHING INTERMEDIATE BENCHMARK

20% PERCENTAGE OF STUDENTS REACHING LOW BENCHMARK

73% PERCENTAGE OF STUDENTS NOT REACHING THE LOW BENCHMARK

0   10   20   30   40   50   60   70   80   90   100

PERCENTAGE OF STUDENTS
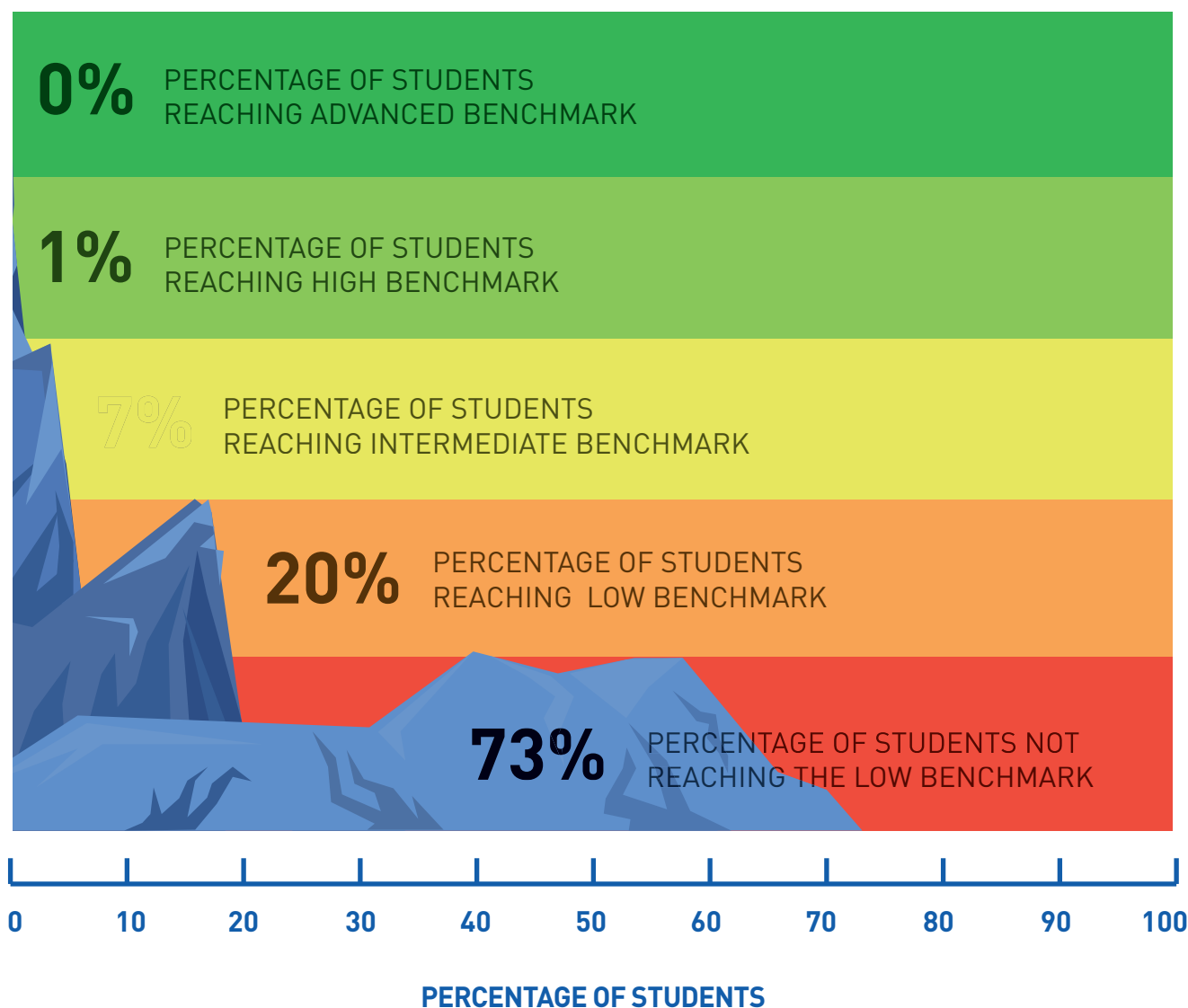
SOURCE: IEA'S TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY TIMSS 2019

RESULTS MAY NOT ADD UP TO 100%
BECAUSE THEY WERE ROUNDED TO THE NEAREST WHOLE NUMBER.

A staggering 73% of students did not reach the Low learning level in Pakistan. This means that an overwhelming majority of Pakistani fourth graders did not reach the minimum proficiency level considered acceptable by the international community. Students who do not reach this threshold are at risk of never learning the skills needed to progress at school and to succeed in life. It is as if a new generation of Pakistani children were stuck at the bottom of a huge mountain.

On the other side, around 1 in 4 (27%) Pakistani students attained the Low learning level or higher. Most of these fourth graders have only some basic mathematics knowledge, and only some of them can apply this knowledge in simple situations. These students are on their way from the bottom to the top of the mountain.
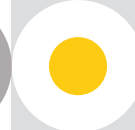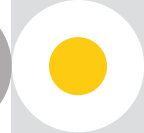
PERCENTAGES OF STUDENTS REACHING INTERNATIONAL BENCHMARKS OF MATHEMATICS ACHIEVEMENT IN PAKISTAN AND OTHER COUNTRIES

ENGLAND

| 4% | 13% | 29% | 32% | 21% |

KAZAKHSTAN

| 5% | 24% | 42% | 25% | 5% |

TURKEY

| 12% | 17% | 28% | 27% | 15% |

IRAN

| 32% | 29% | 26% | 11% | 2% |

SAUDI ARABIA

| 49% | 28% | 17% | 5% | 1% |

PAKISTAN

| 73% | 20% | 7% | 1% |

PHILIPPINES

| 81% | 14% | 5% | 1% |

0   10   20   30   40   50   60   70   80   90   100

PERCENTAGE OF STUDENTS

- ● Students reaching advanced benchmark
- ● Students reaching high benchmark
- ● Students reaching intermediate benchmark
- ● Students reaching low benchmark
- ● Students not reaching the low benchmark
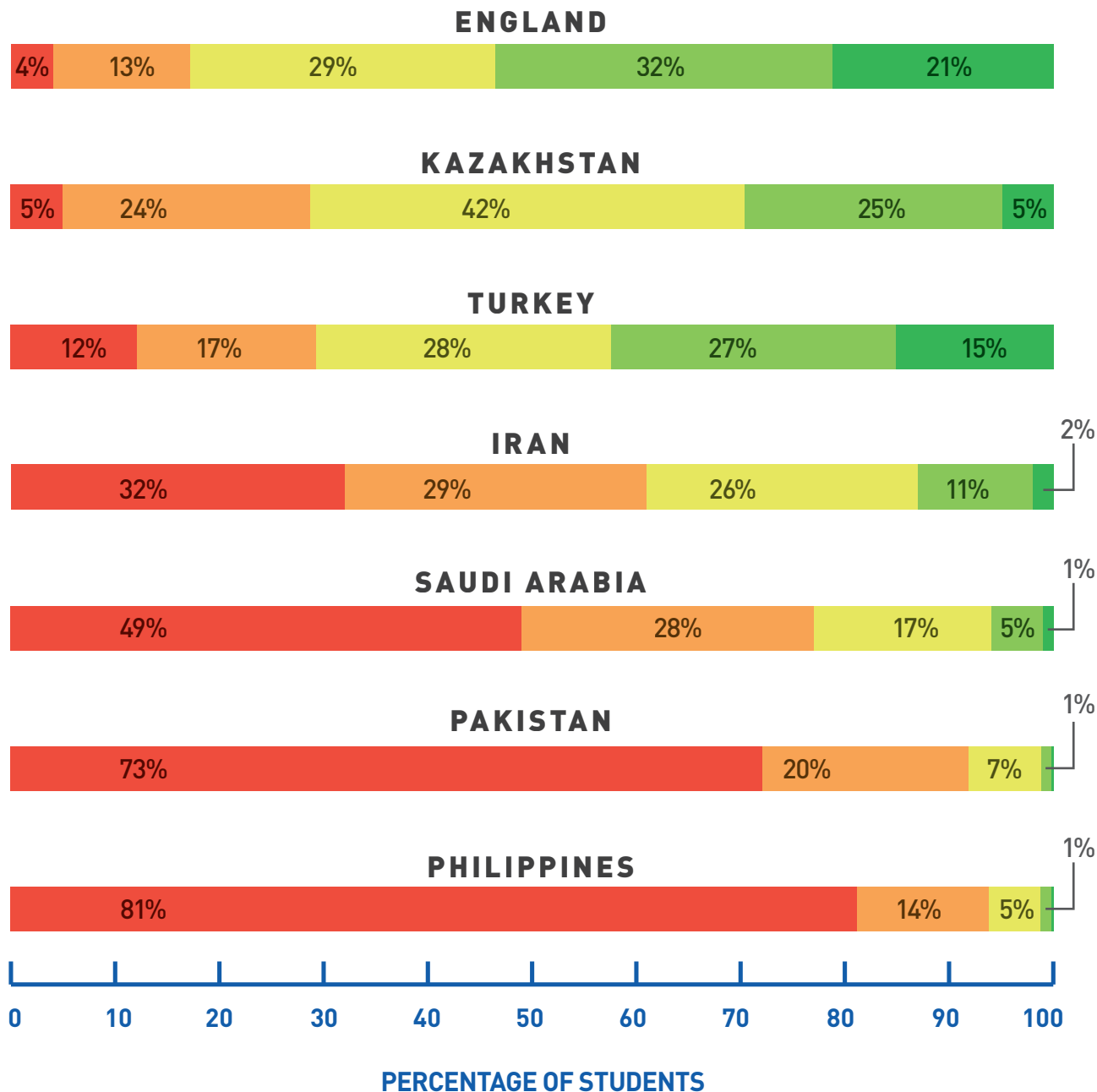
RESULTS MAY NOT ADD UP TO 100%
BECAUSE THEY WERE ROUNDED TO THE NEAREST WHOLE NUMBER.

How do the results by learning levels of Pakistan compare to the results of other countries? In Pakistan, almost 3 in 4 (73%) students were below the Low learning level in mathematics. Among all the TIMSS participating countries, only the Philippines had a higher proportion (81%) of students in that situation. In contrast, only a marginal percentage of Pakistani students (1%) reached the High or Advanced learning levels. In England, most of the students (53%) were concentrated in those two categories.
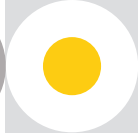
EXAMPLE
MATHEMATICS ITEMS

What kind of problems did the students have to solve in the TIMSS mathematics test? This section shows some examples of the type of questions, problems, or items that fourth graders around the world had to solve. They illustrate the different content and skills, difficulty levels, and question formats (multiple choice and open-ended) used in the study. Overall, the TIMSS test included near 200 mathematics questions. These were distributed in different booklets, so that each student only had to answer between 20 and 28 questions.

Pakistan, together with other 10 countries, administered a less difficult version of the TIMSS mathematics test. This version was more appropriate to measure the mathematics knowledge and skills of students in low- and middle-income countries. The results of the easiest test could still be reported in the same quantitative score scale than the results of countries that opted to administer the regular TIMSS test (which included harder questions).

The examples items presented in this section compare the results of Pakistan against the results of the other countries that administered the less difficult version of the TIMSS mathematics test. These items do not represent all the items in the TIMSS mathematics test, but are useful for illustrative purposes.

What was the difficulty level or percent correct responses of Pakistani students in each item? How does the percentage correct compares to students in other countries? What do Pakistani students need to learn before being able to correctly answer this type of questions? All these are important questions to address in order to boost mathematics achievement among fourth graders in Pakistan.
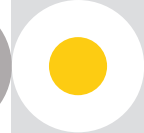
LOW INTERNATIONAL BENCHMARK

Summary description

Students have some basic mathematical knowledge. They can add, subtract, multiply, and divide one- and two-digit whole numbers. They can solve simple word problems. They have some knowledge of simple fractions and common geometric shapes. Students can read and complete simple bar graphs and tables.

Full description

Students at this level are familiar with numbers into the thousands. They can order, add, and subtract whole numbers. They have some knowledge of multiplication and division involving two-digit numbers. They can solve one-step word problems and number sentences. They can recognize pictorial representations of simple fractions. Students can recognize basic measurement ideas. They can recognize and visualize common two- and three-dimensional geometric shapes. Students can read and complete simple bar graphs and tables.

There are no example items from the Low International Benchmark

INTERMEDIATE INTERNATIONAL BENCHMARK

Summary description

Students can apply basic mathematical knowledge in simple situations. They can compute with three- and four-digit whole numbers in a variety of situations. They have some understanding of decimals and fractions. Students can identify and draw shapes with simple properties. They can read, label, and interpret information in graphs and tables.

Full description

Students at this level demonstrate an understanding of four-digit whole numbers. They can add and subtract four-digit numbers in a variety of situations, including problems involving two steps. Students can multiply and divide three-digit numbers by a one-digit number. They can identify expressions representing simple situations. Students at this level can add and order decimals and work with non-unit fractions. Students can solve simple measurement problems such as identifying the appropriate metric unit for linear objects and volume. Students can solve addition and subtraction problems involving hours and minutes. They can identify and draw shapes with simple properties and relate two- and three-dimensional shapes. Students can read, label, and interpret information in graphs and tables.

EXAMPLE ITEM 1

INTERNATIONAL BENCHMARK	INTERMEDIATE
CONTENT DOMAIN	NUMBER
TOPIC AREA	WHOLE NUMBERS
COGNITIVE DOMAIN	KNOWING
DESCRIPTION	IDENTIFIES A THREE-DIGIT NUMBER GIVEN THE PLACE VALUES OF TWO OF ITS DIGITS

MP02_01

13 Which number has 7 in the hundreds place and 6 in the ones place?

- Ⓐ 167
- Ⓑ 176
- ● 716
- Ⓓ 761

MP71219

Country	Percentage correct responses
Pakistan	**35**
Philippines	36
Kosovo	51
South Africa	57
International Average	**58**
Morocco	59
Kuwait	59
Saudi Arabia	65
Bosnia and Herzegovina	66
North Macedonia	68
Montenegro	68
Albania	71

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

EXAMPLE ITEM 2

INTERNATIONAL BENCHMARK	INTERMEDIATE
CONTENT DOMAIN	MEASUREMENT AND GEOMETRY
TOPIC AREA	GEOMETRY
COGNITIVE DOMAIN	APPLYING
DESCRIPTION	COMPLETES A SYMMETRIC FIGURE ON A SQUARE GRID GIVEN HALF THE SHAPE AND THE LINE OF SYMMETRY

Country	Percentage correct responses
Philippines	13
Pakistan	**18**
Bosnia and Herzegovina	30
Saudi Arabia	40
Montenegro	52
Kuwait	52
International Average	**54**
South Africa	54
North Macedonia	77
Morocco	81
Kosovo	86
Albania	90

EXAMPLE ITEM 3

INTERNATIONAL BENCHMARK	INTERMEDIATE
CONTENT DOMAIN	DATA
TOPIC AREA	READING, INTERPRETING, AND REPRESENTING
COGNITIVE DOMAIN	KNOWING
DESCRIPTION	IREADS DATA FROM A LINE GRAPH

MP02_10

22 The graph shows the water level in a dam for 10 weeks.

Water Level in the Dam
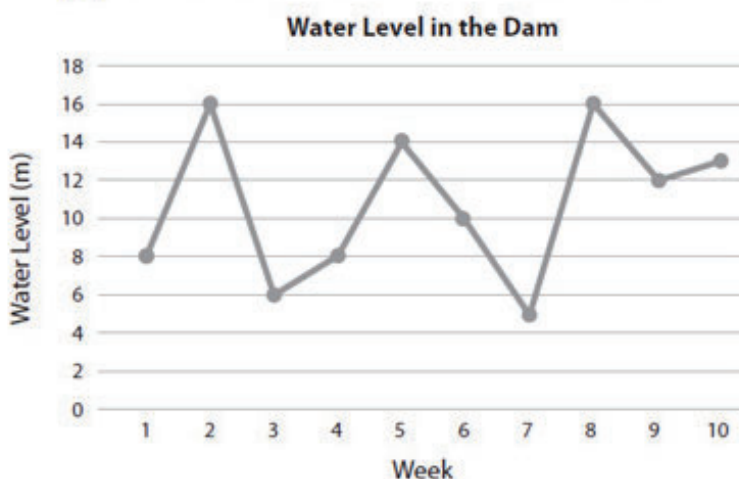
A. What was the water level for week 8?

Answer: _____ m

B. From which week to the next did the water level drop the most?

- (A) week 1 to 2
- ● week 2 to 3
- (C) week 6 to 7
- (D) week 8 to 9
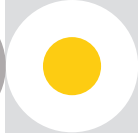
MP71217

Country	Percentage of responses fully correct
Pakistan	**21**
Philippines	28
Bosnia and Herzegovina	32
Morocco	32
Saudi Arabia	34
Kuwait	40
International Average	**40**
Montenegro	41
Kosovo	43
South Africa	52
North Macedonia	52
Albania	68

HIGH INTERNATIONAL BENCHMARK

Summary description

Students apply conceptual understanding to solve problems. They can apply conceptual understanding of whole numbers to solve twostep word problems. They show understanding of the number line, multiples, factors, and rounding numbers, and operations with fractions and decimals. Students can solve simple measurement problems. They demonstrate understanding of geometric properties of shapes and angles. Students can interpret and use data in tables and a variety of graphs to solve problems.

Full description

Students at this level demonstrate an understanding of four-digit whole numbers. They can add and subtract four-digit numbers in a variety of situations, including problems involving two steps. Students can multiply and divide three-digit numbers by a one-digit number. They can identify expressions representing simple situations. Students at this level can add and order decimals and work with non-unit fractions. Students can solve simple measurement problems such as identifying the appropriate metric unit for linear objects and volume. Students can solve addition and subtraction problems involving hours and minutes. They can identify and draw shapes with simple properties and relate two- and three-dimensional shapes. Students can read, label, and interpret information in graphs and tables.

EXAMPLE ITEM 4

INTERNATIONAL BENCHMARK	HIGH
CONTENT DOMAIN	NUMBER
TOPIC AREA	WHOLE NUMBERS
COGNITIVE DOMAIN	APPLYING
DESCRIPTION	SOLVES A WORD PROBLEM INVOLVING DIVISION OF A TWO-DIGIT NUMBER BY A ONE-DIGIT NUMBER

MP02_02

14 Marya traveled by bicycle for 4 days. She traveled the same distance each day.

In total she traveled 76 kilometers.

How many kilometers did Marya travel each day?

Ⓐ 18

Ⓑ 19

Ⓒ 20

Ⓓ 24

MP71021

Country	Percentage correct responses
South Africa	19
Philippines	20
Saudi Arabia	25
Morocco	27
Kuwait	28
Pakistan	**31**
International Average	34
Montenegro	36
Kosovo	39
North Macedonia	45
Bosnia and Herzegovina	46
Albania	56

**SOURCE: IEA's Trends in International
Mathematics and Science Study TIMSS 2019**
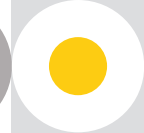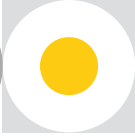
ADVANCED INTERNATIONAL BENCHMARK

Summary description

Students can apply their understanding and knowledge in a variety of relatively complex situations and explain their reasoning. Students can solve a variety of multistep word problems involving whole numbers and show an understanding of fractions and decimals. They can apply knowledge of two- and three-dimensional shapes in a variety of situations. Students can interpret and represent data to solve multistep problems.

Full description

Students at this level can solve a variety of multistep word problems involving whole numbers. They can find more than one solution to a problem. Students can solve problems that show an understanding of fractions, including those with different denominators. They can order, add, and subtract one- and two-place decimals. Students can apply knowledge of two- and three-dimensional shapes in a variety of situations. They can draw parallel lines and solve problems involving area and perimeter of shapes. They can use a ruler to measure lengths of objects beginning or ending at a half-unit and read other measurement scales. Students can interpret and represent data to solve multistep problems. They can give a mathematical argument to support their solutions.
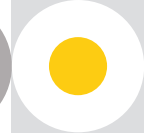
EXAMPLE ITEM 5

INTERNATIONAL BENCHMARK	ADVANCED
CONTENT DOMAIN	MEASUREMENT AND GEOMETRY
TOPIC AREA	MEASUREMENT
COGNITIVE DOMAIN	REASONING
DESCRIPTION	SOLVES A MULTI-STEP WORD PROBLEM INVOLVING MULTIPLICATION AND DIVISION OF WEIGHTS

MP02_07

19

2 pears   4 clementines

= 60 grams
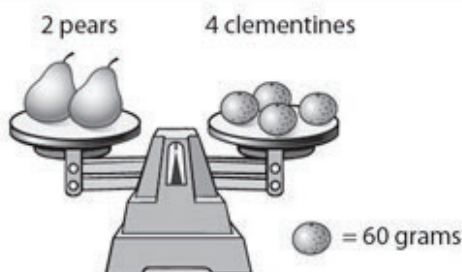
The 2 pears weigh the same amount as 4 clementines.

How much does 1 pear weigh?

(A)   480 g

(B)   240 g

(C)   120 g

(D)   60 g

MP71090

Country	Percentage correct responses
North Macedonia	21
South Africa	22
Philippines	23
Pakistan	**26**
Bosnia and Herzegovina	29
Kuwait	31
International Average	31
Saudi Arabia	32
Morocco	35
Kosovo	36
Montenegro	41
Albania	47
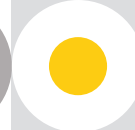
EXAMPLE ITEM 6

INTERNATIONAL BENCHMARK	ADVANCED
CONTENT DOMAIN	DATA
TOPIC AREA	READING, INTERPRETING, AND REPRESENTING
COGNITIVE DOMAIN	APPLYING
DESCRIPTION	DETERMINES THE Y-AXIS SCALE FOR A BAR GRAPH GIVEN THE DATA IN A TABLE

MP02_12

24 Kalsoom recorded the number of cars that traveled along her street each morning.

Day	Number of Cars
Monday	8
Tuesday	5
Wednesday	7
Thursday	10
Friday	12

She started making a graph of her data.

What numbers should Kalsoom use to label the horizontal lines on her graph?

Put the numbers in the boxes on Kalsoom's graph.

Number of Cars

Monday   Tuesday   Wednesday   Thursday   Friday
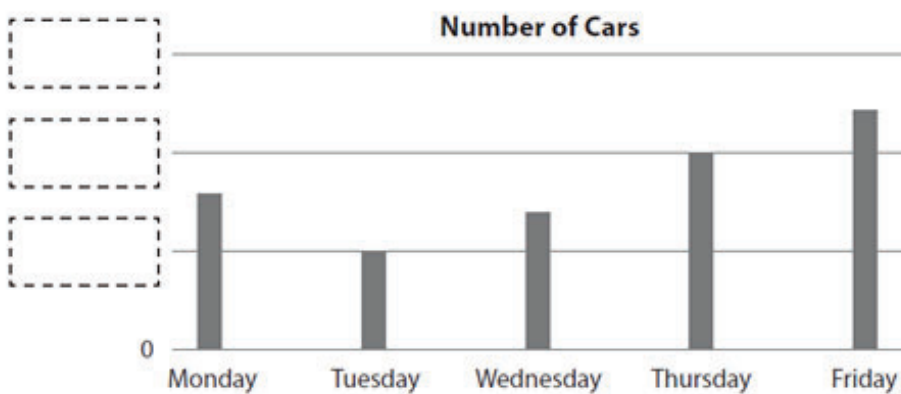
MP71204
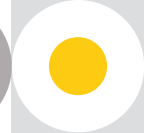
Country	Percentage of responses fully correct
Pakistan	**4**
Philippines	6
Bosnia and Herzegovina	8
Kuwait	11
South Africa	11
Saudi Arabia	13
Kosovo	14
International Average	14
Montenegro	14
Morocco	15
North Macedonia	29
Albania	30

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

ACHIEVEMENT GAP BETWEEN TOP AND BOTTOM PERFORMING STUDENTS

Mathematics achievement of top, average, and bottom performing students
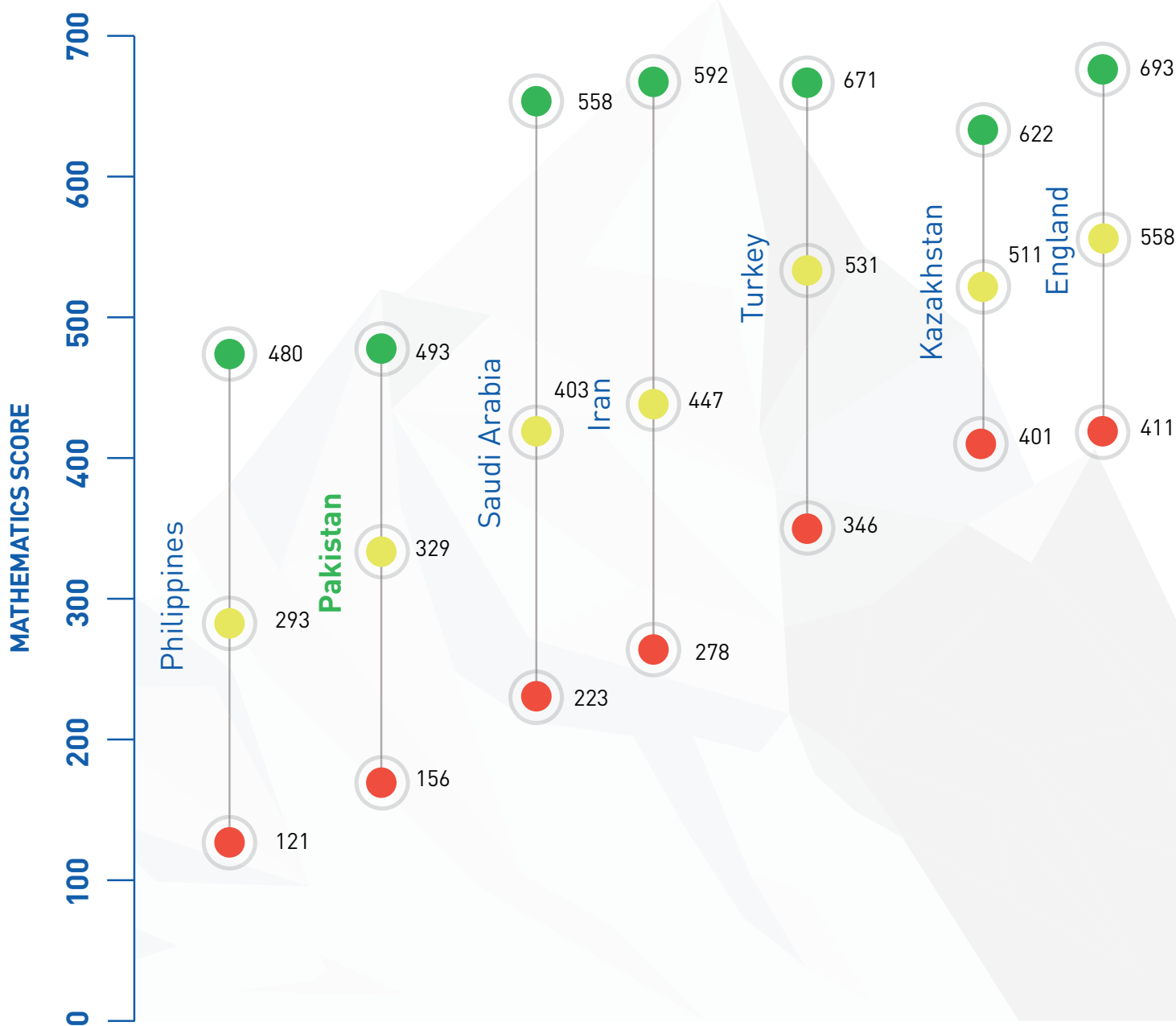
MATHEMATICS SCORE

Philippines
- 480
- 293
- 121

Pakistan
- 493
- 329
- 156

Saudi Arabia
- 558
- 403
- 223

Iran
- 592
- 447
- 278

Turkey
- 671
- 531
- 346

Kazakhstan
- 622
- 511
- 401

England
- 693
- 558
- 411

● Top performing students (95th percentile)

● Average performing students (50th percentile)

● Low performing students (5th percentile)

In Pakistan, the problem of learning achievement is two-fold. Firstly, the average achievement is much lower than rest of the world. Secondly, there is a big achievement gap between top and bottom performing students. While top performing Pakistani students reach the Intermediate learning level of the TIMSS scale, bottom performing students do not even reach the Low level.

Top performing students in Pakistan have a mathematics achievement comparable to the average performing students in Iran, Kazakhstan, or Saudi Arabia. On the other side of the spectrum, bottom performing students in Pakistan cannot even consistently demonstrate that they have some basic mathematics knowledge, such as adding, subtracting, multiplying, and dividing.

This scenario poses a tremendous quality and equity challenge for policymakers and practitioners. How to elevate the academic performance of all Pakistani students to a globally competitive level? How to ensure that this is done in an equitable way, without leaving behind the most vulnerable students?

ACHIEVEMENT GAP
FOR BOYS AND GIRLS

Mathematics achievement for boys and girls

MATHEMATICS SCORE

600

500

400

300

200

England
560
552

Turkey
525
521

Kazakhstan
512
512

Iran
447
439

Saudi Arabia
412
385

Pakistan
338
319

Philippines
315
280
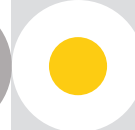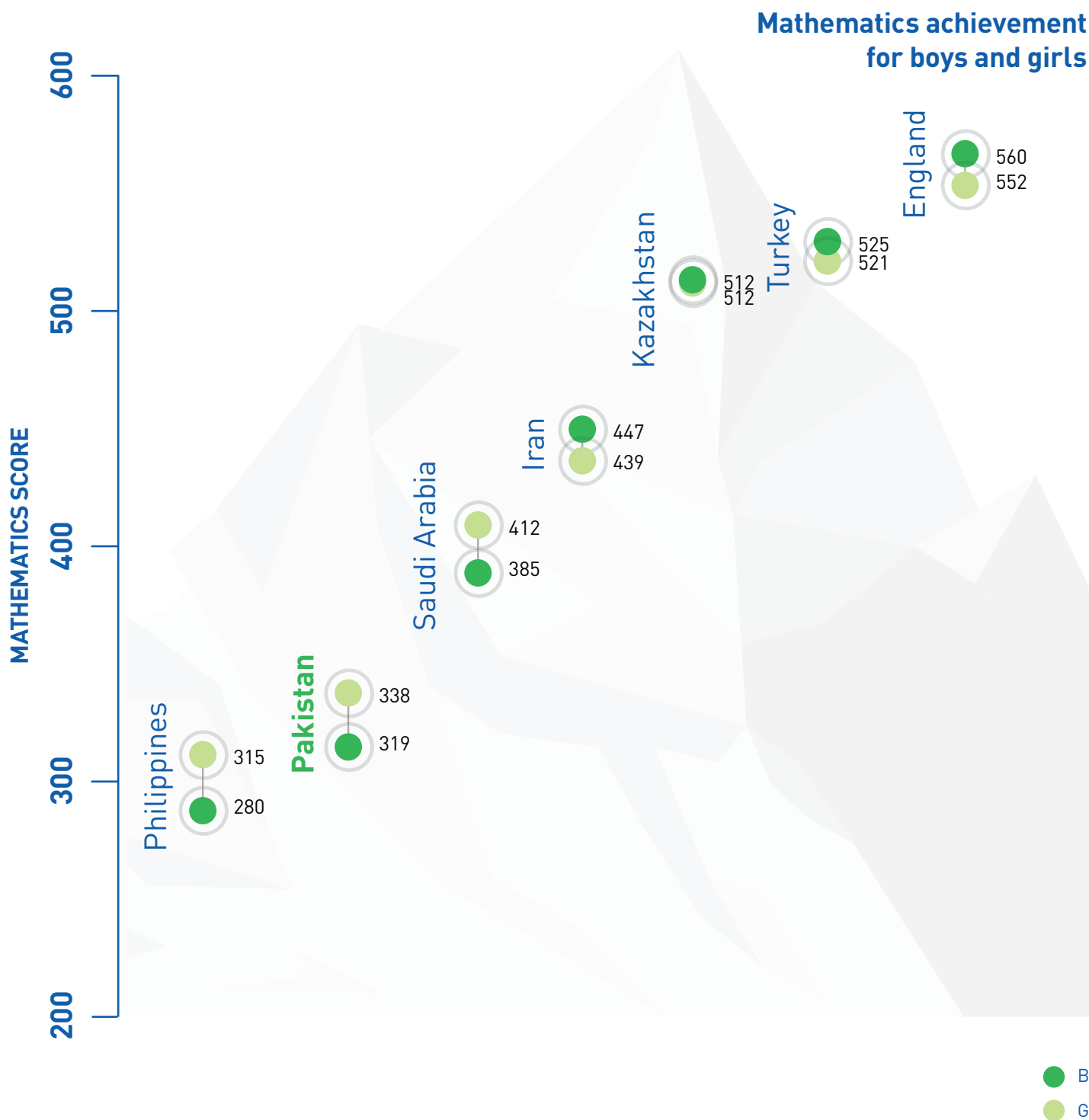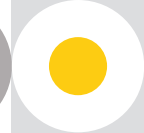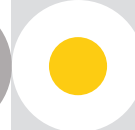
● Boys
● Girls

TIMSS results show that boys and girls had a similar mathematics performance in Pakistan. While girls got 338 score points and boys 319, the difference in scores was not statistically significant. These are good news from an equity stand point.

Pakistan needs to ensure more equitable access to education for both boys and girls. Higher proportions of girls do not attend school in Pakistan and, when they attend, they are more likely to drop out from school. This is reflected in the fact that only 45% of the fourth graders that participated in TIMSS 2019 were girls. Other countries participating in the study had better parity between boys and girls. Pakistan had the lowest proportion of girls participating in the study, compared to all the other participating countries.

ACHIEVEMENT GAP BY URBAN/RURAL

Mathematics achievement of students attending urban and rural schools

MATHEMATICS SCORE

600

500

400

53% **341**

47% **316**

300

200

● Students attending urban schools
● Students attending rural schools
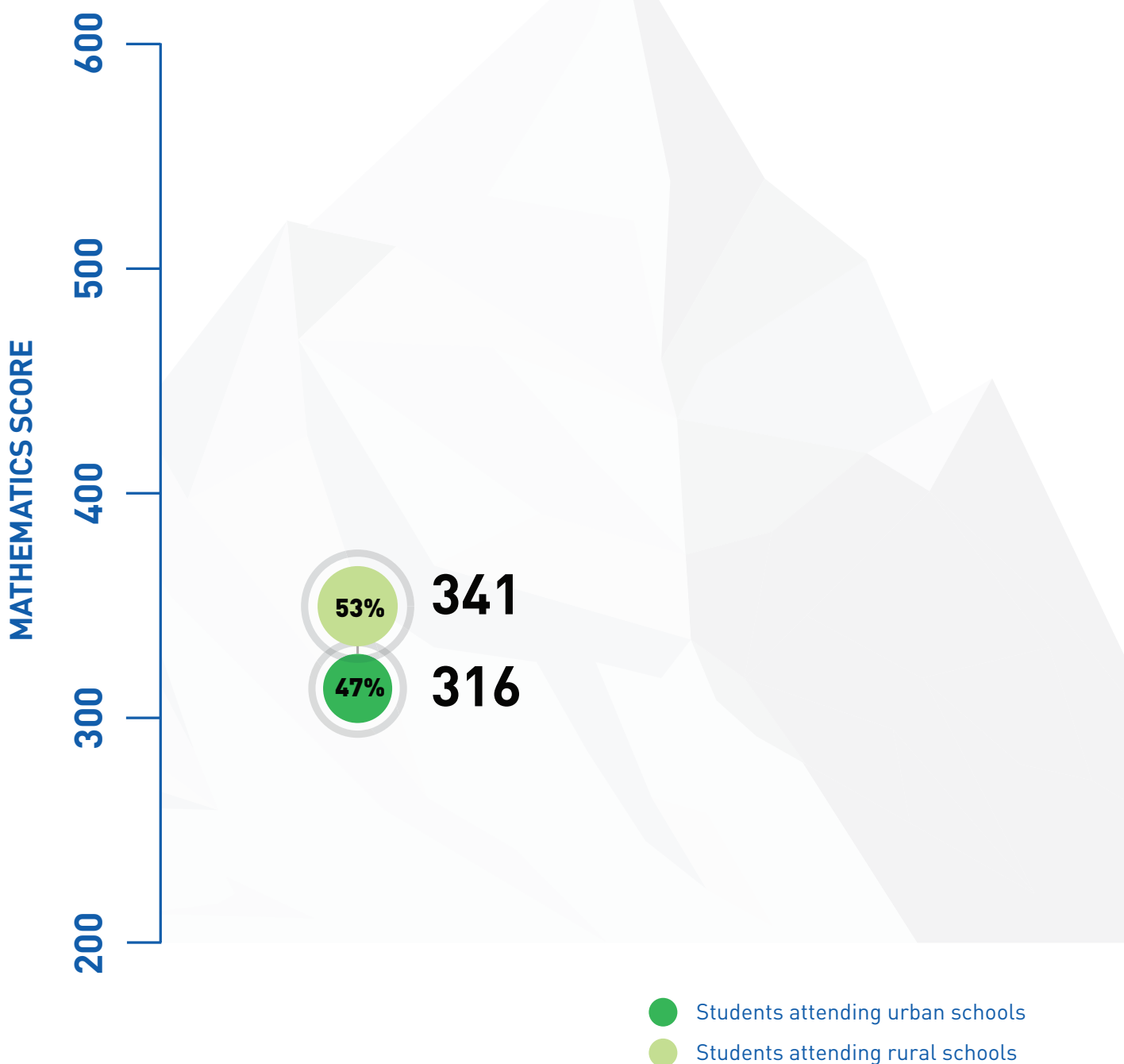
In Pakistan, 47% of the students attended an urban school (i.e., a school located in an urban or suburban area, city or large town), whereas 53% attended a rural school (i.e., a school located in a small town, village or remote rural area).

Students attending both urban and rural schools had similar mathematics performance in Pakistan. While students attending rural schools got 341 score points and students attending urban schools got 316 score points, the difference in score was not statistically significant.

These results are good from an equity perspective. However, they may also reflect the fact that the TIMSS mathematics test was too difficult to many students in Pakistan. This makes it hard to see achievement gaps between different groups of students.

ACHIEVEMENT GAP BY RESOURCES FOR LEARNING AT HOME

Mathematics achievement by amount of resources for learning at home
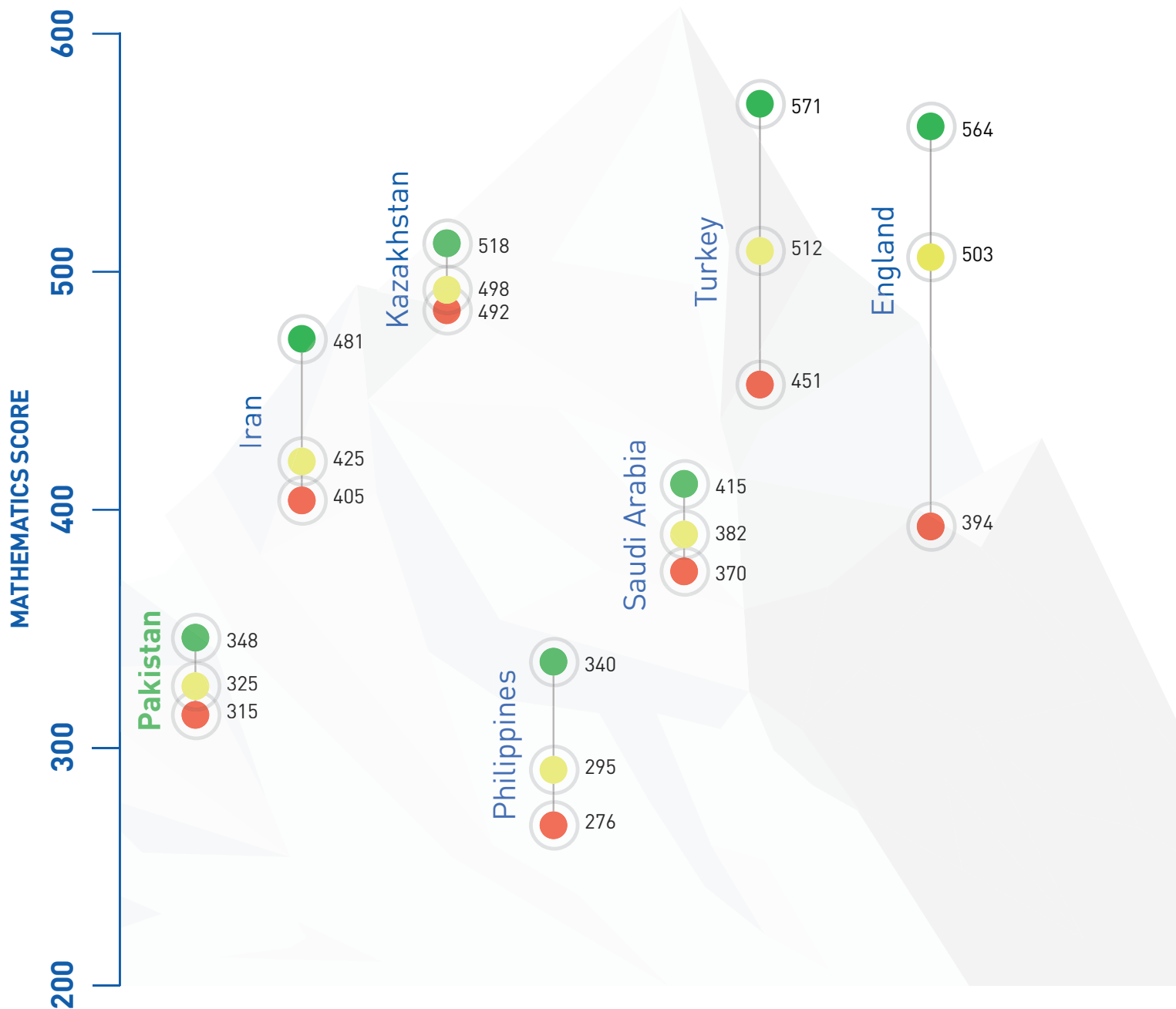
MATHEMATICS SCORE

600
500
400
300
200

Kazakhstan
518
498
492

Iran
481
425
405

Turkey
571
512
451

England
564
503
394

Saudi Arabia
415
382
370

Pakistan
348
325
315

Philippines
340
295
276

● Students with few or more resources
● Students with very few resources
● Students with extremely few resources

Resources for learning at home are important for students to learn at school. In order to analyze the relationship between home resources and mathematics performance, students were classified based on the availability of four resources at home: (a) Number of books, (b) having internet connection and own room, (c) highest level of education of either parent, and (d) highest level of occupation of either parent. Students in the "extremely few resources" had on average less than 2/4 resources; students in the "few or more resources" had 3/4 resources on average; and the rest of the students were classified in the "very few resources".

In Pakistan, 38% of the students had "extremely few resources" to support learning at home. This percentage was much higher than the one in Turkey (23%), Iran (27%), or Saudi Arabia (12%). At the international level, students with fewer resources to support learning at home tend to have lower mathematics scores. While the results for Pakistan confirm this pattern, the differences in mathematics scores among students with more and less resources are not statistically significant. This is probably the effect of the mathematics test being too difficult to many students in Pakistan, and therefore making it hard to see achievement gaps between different groups.

CURRICULUM ALIGNMENT BETWEEN THE PAKISTANI CURRICULUM AND THE TIMSS TEST

CONTENT AREA	TOPIC	Intended curriculum	Implemented curriculum
		Intended to be taught (or not) up to grade 4 according to the Pakistani curriculum	**Percent of grade 4 students already taught the topic before this year or this year**
Number	Concepts of whole numbers, including place value and ordering	**All or almost all the students**	**94%**
	Adding, subtracting, multiplying, and dividing with whole numbers	**All or almost all the students**	**98%**
	Concepts of multiples and factors; odd and even numbers	**All or almost all the students**	**96%**
	Number sentences (finding the missing number, representing problem situations with number sentences)	**All or almost all the students**	**93%**
	Number patterns (extending number patterns and finding missing terms)	**All or almost all the students**	**92%**
	Concepts of fractions, including representing, comparing and ordering, adding and subtracting simple fractions	**All or almost all the students**	**91%**
	Concepts of decimals, including place value and ordering, adding and subtracting with decimals	**All or almost all the students**	**93%**
Measurement and Geometry	Solving problems involving length, including measuring and estimating	**All or almost all the students**	**82%**
	Solving problems involving mass, volume, and time	**All or almost all the students**	**83%**
	Finding and estimating perimeter, area, and volume	**Not included in the curriculum for grade 4**	**76%**
	Parallel and perpendicular lines	**All or almost all the students**	**84%**
	Comparing and drawing angles	**All or almost all the students**	**87%**
	Elementary properties of common geometric shapes	**All or almost all the students**	**79%**
	Three-dimensional shapes, including relationships with their two-dimensional representations	**Not included in the curriculum for grade 4**	**57%**
Data	Reading and representing data from tables, pictographs, bar graphs, line graphs, and pie charts	**All or almost all the students**	**61%**
	Organizing and representing data to help answer questions	**Not included in the curriculum for grade 4**	**77%**
	Drawing conclusions from data displays	**All or almost all the students**	**62%**
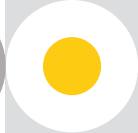
To understand the mathematics performance of Pakistani students, it is important to know to what extent the fourth graders had an opportunity to learn the topics measured in the TIMSS test. Was the mathematics test aligned with the national curriculum? Were students actually taught the mathematics topics measured by the TIMSS test?

The official curriculum in Pakistan (published in 2006) covered most of the topics assessed by TIMSS. All or almost all fourth graders were expected to be taught all the number topics, and the majority of the measurement and geometry, and data topics. These results show therefore a relatively good alignment between the intended Pakistani curriculum and the TIMSS mathematics test.

The level of alignment with the TIMSS test was much lower when analyzing the curriculum that was actually implemented in the classrooms. Teachers reported that the vast majority of their students were actually taught most of the topics tested by TIMSS. This was specially the case in number topics, where over 91% of the students were already taught each topic. However, students had substantially lower opportunities to learn measurement and geometry, and data topics. In some cases, this was so because some topics were not included in the Pakistani curriculum up to grade 4. In others, because teachers did not cover some topics despite the fact that they were part of the national curriculum. This was the case, for instance, in "reading and representing data" and "drawing conclusions from data displays".

These findings show that the intended and implemented curriculum in Pakistan were relatively well aligned to the TIMSS test. However, they also show some level of misalignment between the intended and implemented curriculum. There is substantial room for improvement in the actual implementation of the mathematics curriculum in the early grades of primary education in Pakistan. It is important to ensure that teachers teach all the relevant mathematics topics to all their students.

RESULTS BY CONTENT DOMAIN

MATHEMATICS SCORE

Overall	Numbers	Measurement and Geometry	Data
328	351	286	278
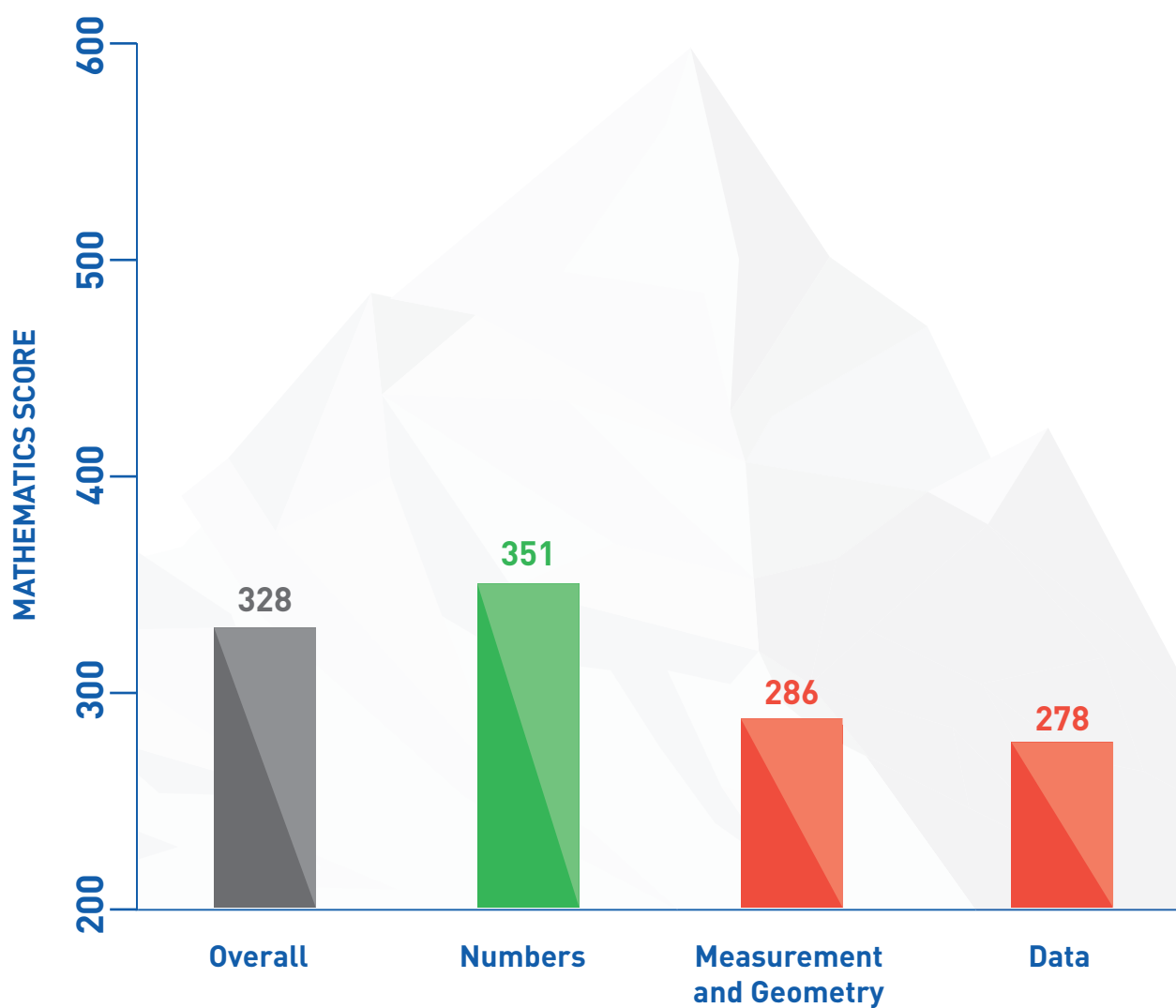
The performance of Pakistani students varied substantially by mathematics content domains. Fourth graders scored relatively higher in number, and lower in measurement and geometry, and data. This pattern is a reflection of the opportunities students had to learn the different topics in each content domain. A higher proportion of students were taught the number topics, and a lower proportion the measurement and geometry, and data topics. Another reason for students performing relatively better in number is that this domain includes the most basic and foundational mathematics topics, compared to the relatively more advanced topics included under the other content domains.

Ensuring that teachers teach all the measurement and geometry, and data topics to all fourth graders may help to boost student's mathematics achievement in Pakistan.

RESULTS BY COGNITIVE DOMAIN

MATHEMATICS SCORE

Overall	328
Knowing	327
Applying	306
Reasoning	354
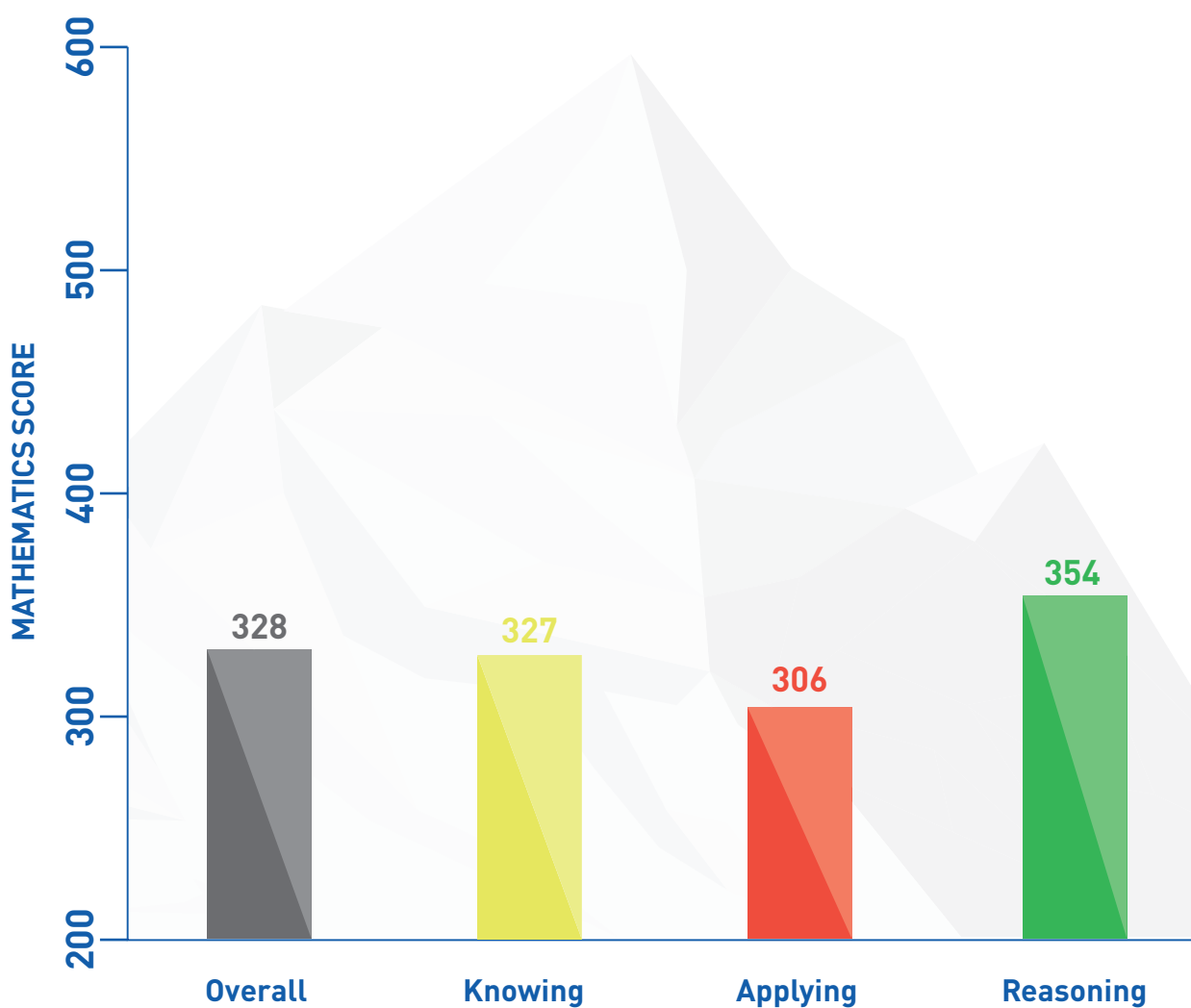
The performance of Pakistani students also varied significantly by mathematics cognitive domain. Fourth graders performed relatively better in reasoning, worse in applying, while their performance in knowing was similar to their overall mathematics performance. It is surprising but encouraging that Pakistani students reached the highest scores in reasoning, given that this is the most sophisticated cognitive skill measured by TIMSS.

The findings suggest that the application of knowledge poses the greatest challenge to students. Ensuring that teachers use activities that require students to apply their knowledge and skills in real life situations may help to boost student's mathematics achievement in Pakistan.

ACHIEVEMENT GAP BY SCHOOL EMPHASIS ON ACADEMIC SUCCESS

Mathematics achievement of students by school emphasis on academic success, as reported by the school principals

MATHEMATICS SCORE

600

500

400

300

200

England 563 534

Turkey 551 498

Kazakhstan 514 512

Iran 454 426

Saudi Arabia 403 379

Pakistan 343 303

Philippines 301 282
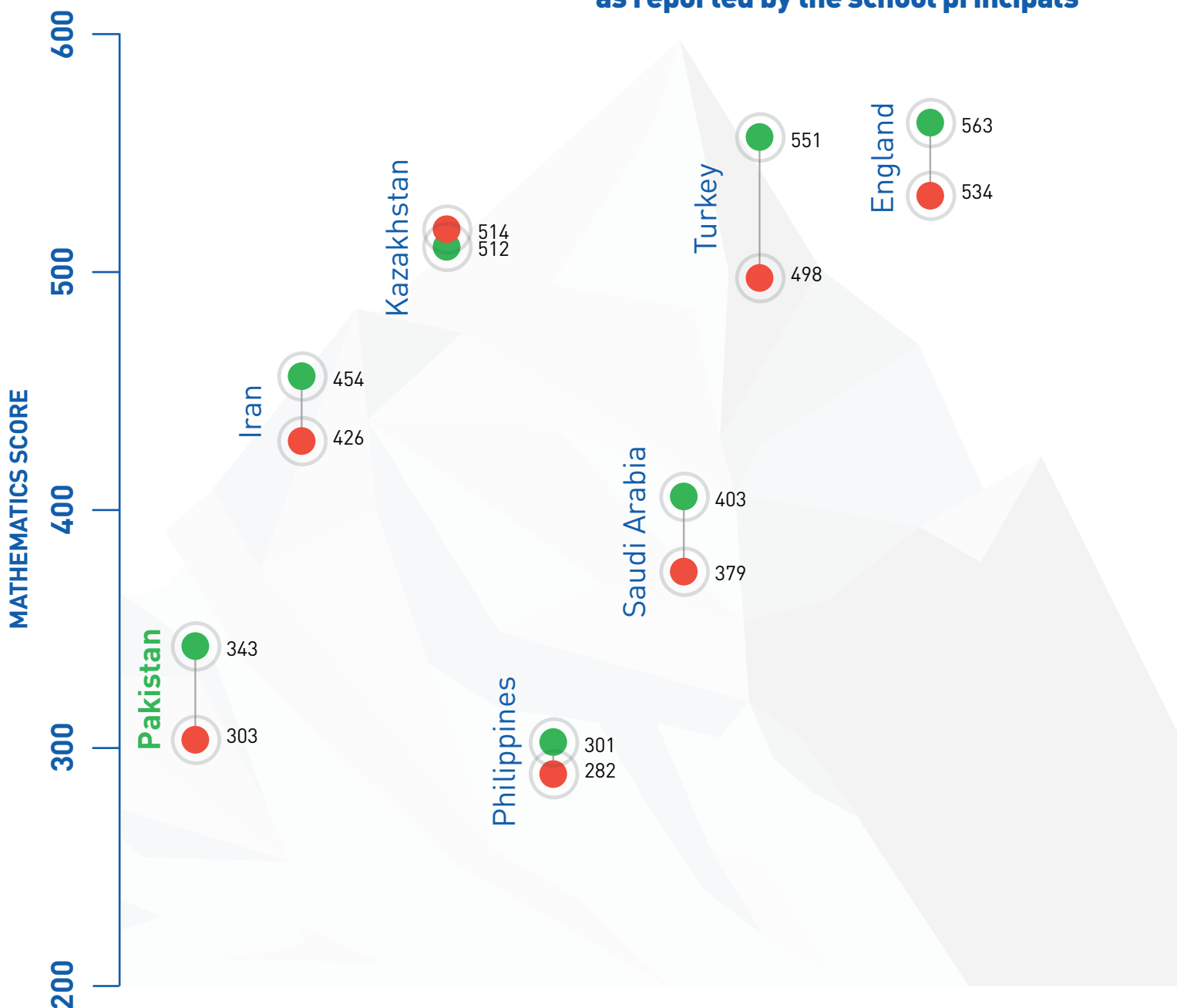
● Students attending schools that place a high or very high emphasis on academic success

● Students attending schools that place a medium emphasis on academic success

Students attending schools that place greater emphasis in academic success attained significantly higher mathematics achievement in Pakistan.

Most of Pakistani students (63%) attended schools where their principals reported a high or very high emphasis on academic success. This percentage was higher in Pakistan compared to most of the other countries participating in TIMSS 2019. This points towards an issue of perceptions and expectations. It is possible that the threshold for a principal to consider that his or her school places a high emphasis on academic success is lower in Pakistan compared to other countries.

It seems important to promote a culture of high expectations and academic performance in all schools in Pakistan. This may in turn improve the motivation to excel, as well as teaching and learning. All these factors are important to boost the mathematics performance of Pakistani students.

SAFE AND ORDERLY SCHOOLS

Percentage of students attending very safe and orderly schools, as reported by their teachers

Country	Percentage
Pakistan	79
Saudi Arabia	79
Kazakhstan	72
Philippines	70
Iran	67
England	55
Turkey	51

PERCENTAGE OF STUDENTS
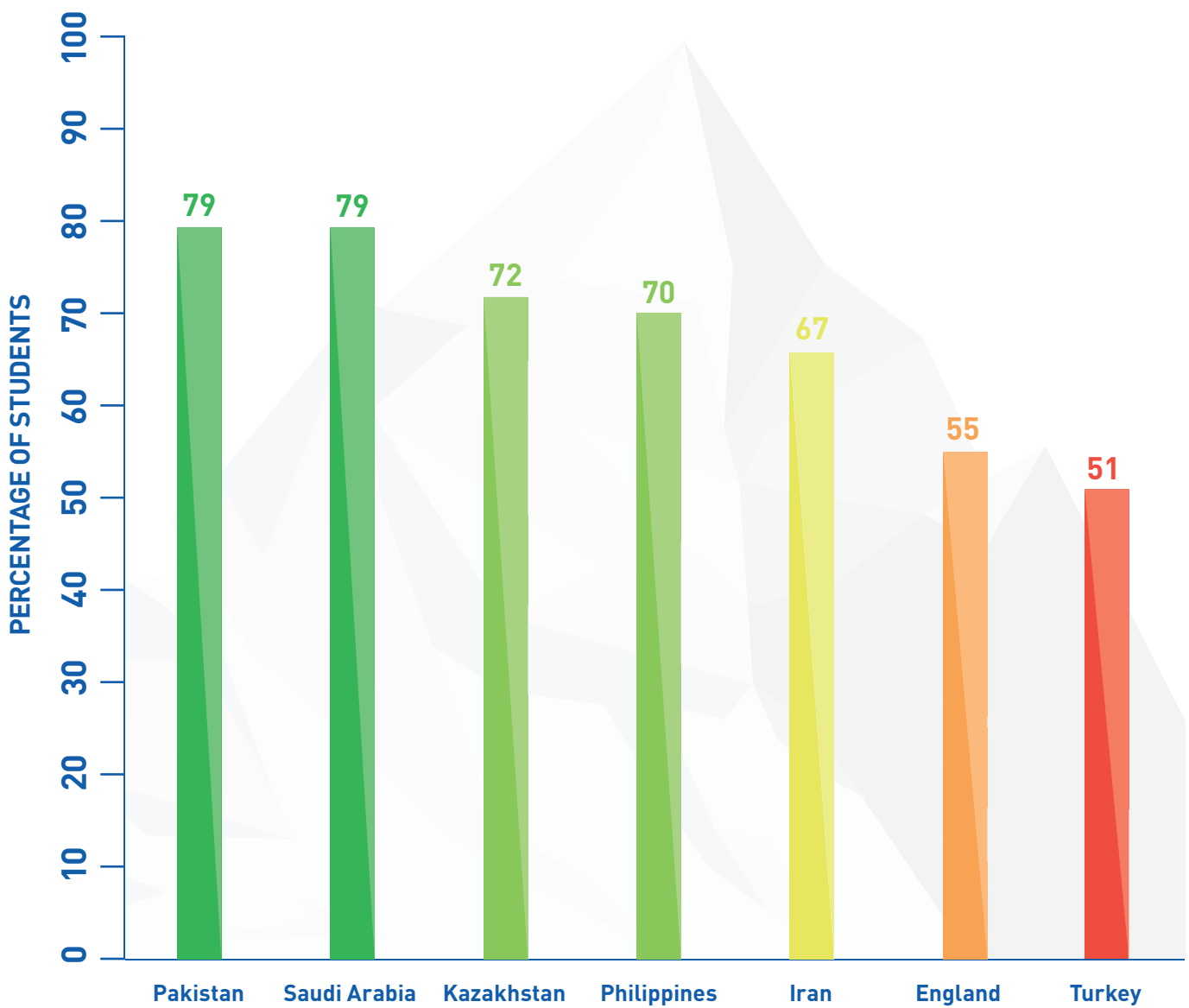
A relatively high percentage of Pakistani students (79%) attended very safe and orderly schools, as reported by their teachers. This percentage was higher than most of the countries participating in TIMSS. These are good news for Pakistan.

However, the differences in school safety across countries may also reflect differences in teachers' perceptions and expectations. It could be that the threshold for a teacher in Pakistan to report that a school is safe is lower than the threshold for teachers in other countries.

ACHIEVEMENT GAP BY STUDENTS' BULLYING

Mathematics achievement by students' bullying

MATHEMATICS SCORE

England
- 559
- 513

Turkey
- 530
- 451

Kazakhstan
- 515
- 486

Iran
- 448
- 405

Saudi Arabia
- 412
- 349

Pakistan
- 336
- 301

Philippines
- 322
- 269

- 🟢 Students being bullied about monthly or less
- 🔴 Students being bullied about weekly
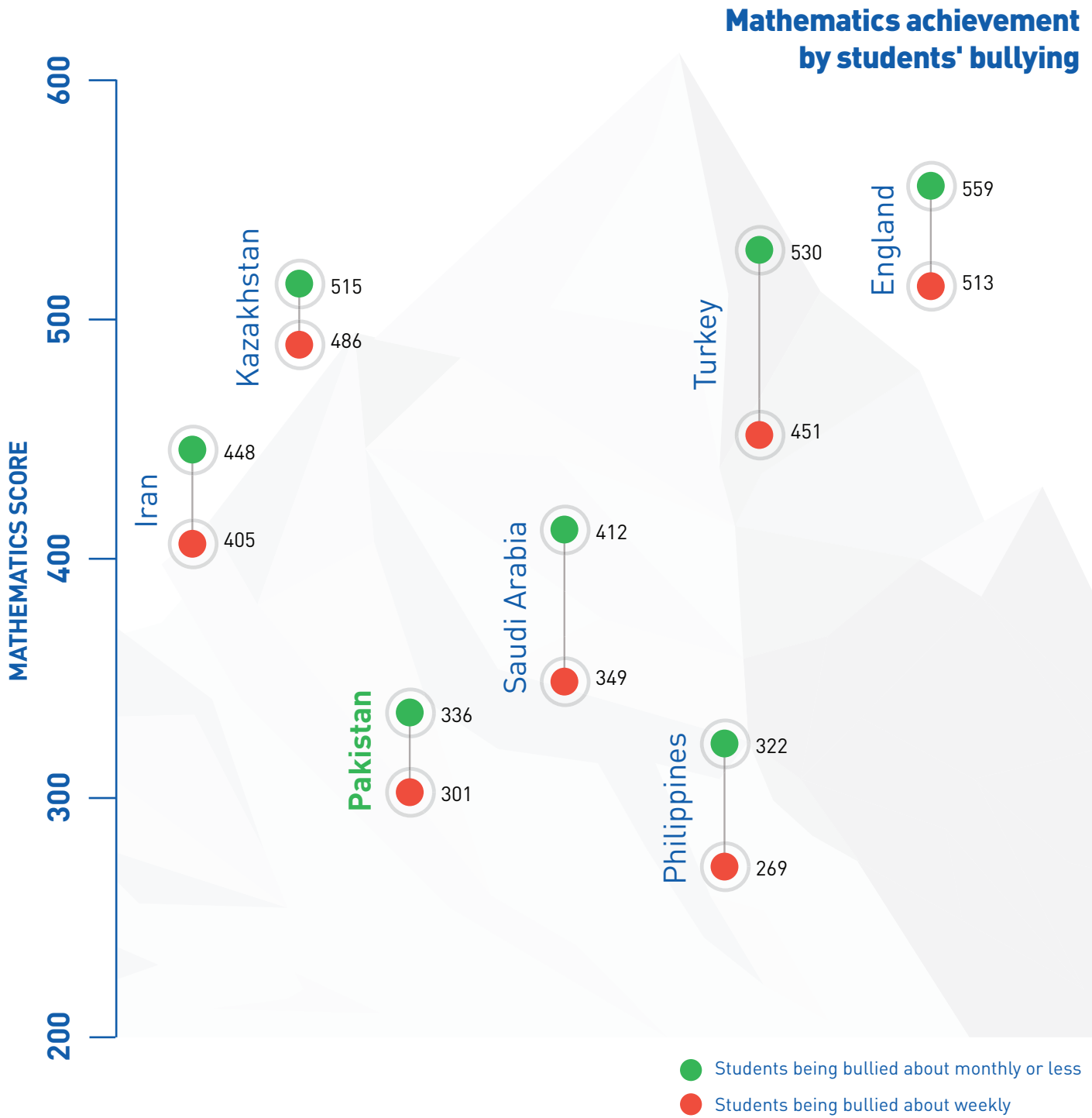
Students were asked how often have other students from their school made fun of them, let them out of their games, spread lies, stole something from them, hit or hurt them, among others. In Pakistan, fourth graders who reported being bullied about weekly have significantly lower mathematics scores than those not reporting that level of bullying.

Near 1 in 5 (19%) Pakistani students report being bullied about weekly, which is somewhat higher compared to students in other countries. Eliminating bullying from schools is important to ensure the wellbeing of all students. It is also important to ensure that there is a school environment that support learning for all.

ACHIEVEMENT GAP BY STUDENTS' SENSE OF BELONGING TO THE SCHOOL

Mathematics achievement by students' sense of belonging to the school

MATHEMATICS SCORE

England 565 / 545

Kazakhstan 517 / 506

Turkey 533 / 499

Iran 452 / 439

Saudi Arabia 409 / 390

Pakistan 333 / 320

Philippines 320 / 283

- 🟢 Students having high sense of belonging
- 🔴 Students having some or little sense of belonging

70
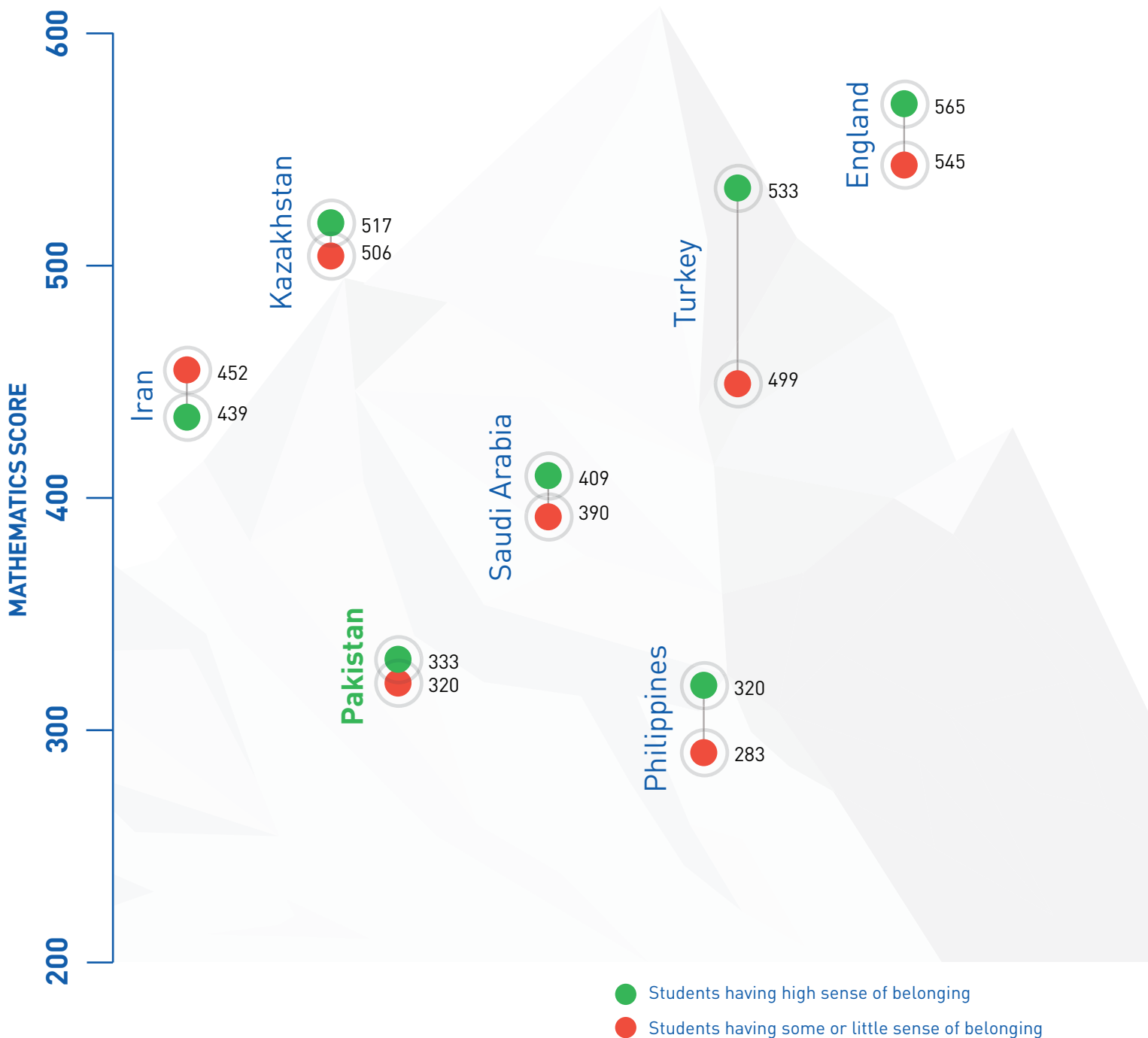
Students in Pakistan have a relatively high sense of belonging to their schools, as compared to their counterparts in other countries. Near 3 out of 4 (74%) students reported that they like being at school, felt safe at school, and thought that their teachers were fair to them, among others. All this is important for the wellbeing of the students.

However, results showed that in Pakistan there was not a clear association between students' sense of belonging to the school and their mathematics performance. The differences in scores between students with higher and lower sense of belonging were not statistically significant. These results should be interpreted with caution. They may reflect the fact that the TIMSS mathematics test was too difficult to many students in Pakistan. This makes it hard to see achievement gaps between different groups of students.

It is important for the wellbeing of the students to feel that they belong to their schools. Policymakers and practitioners should foster an ethos where students and communities consider themselves connected to their schools. This can be done by opening more spaces of participation among schools' administrators, parents, and community members at large. It can also be done by enabling spaces where students can better express themselves at school.
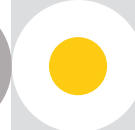
ACHIEVEMENT GAP BY PARENTS' SATISFACTION WITH THE SCHOOLS

Mathematics achievement of students by parents' satisfaction with the school

MATHEMATICS SCORE

Kazakhstan 513 512

Turkey 527 522

Iran 447 437

Saudi Arabia 404 391

Pakistan 340 298

Philippines 308 269

● Students whose parents are very satisfied with the school
● Students whose parents are somewhat satisfied or less with the school
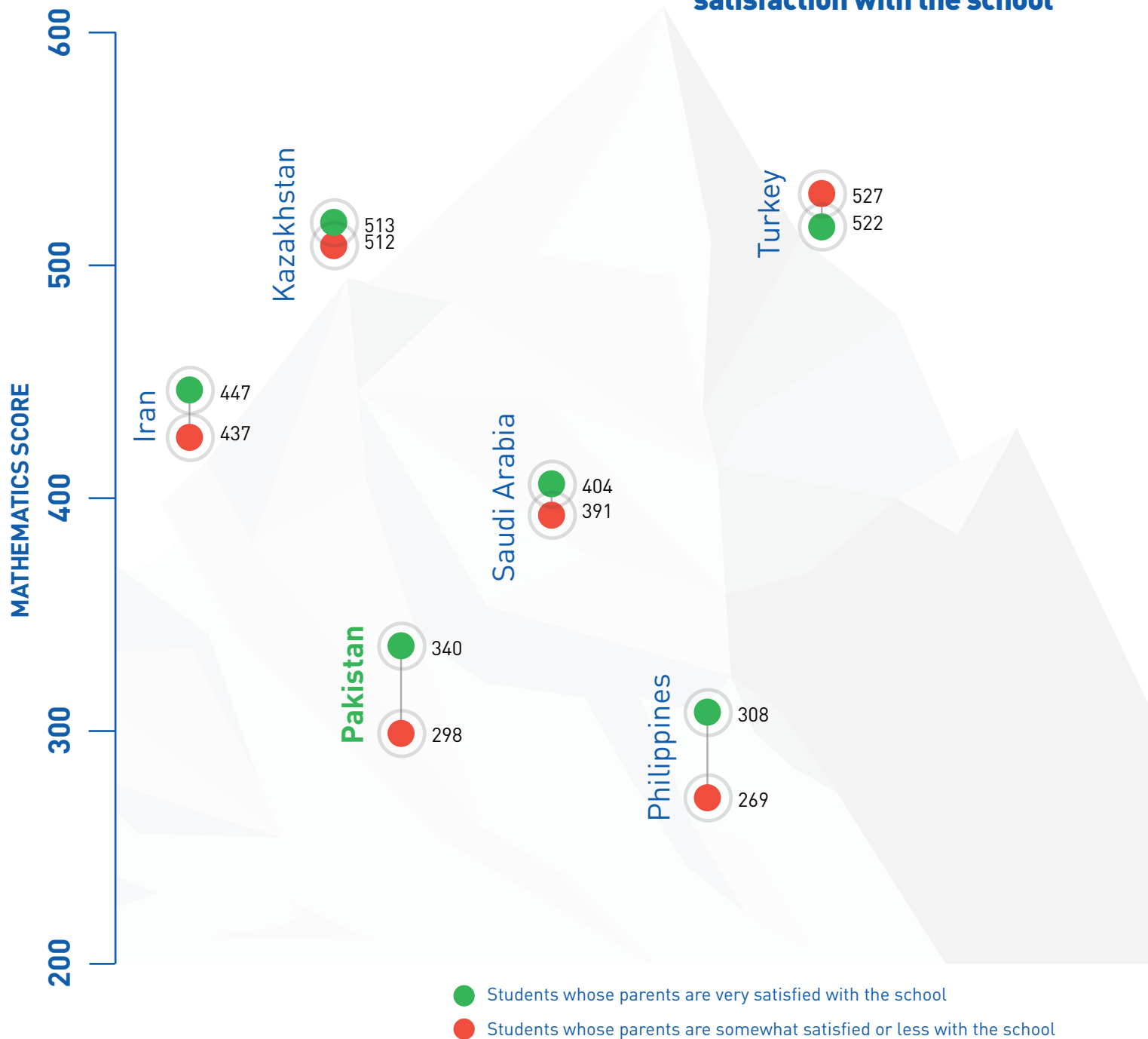
IN SOME COUNTRIES, ALL STUDENTS ARE IN THE SAME GROUP
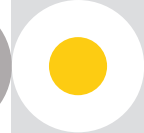
When parents are satisfied with their school, students tend to perform better. In Pakistan, students whose parents were very satisfied with their schools scored significantly higher in the mathematics test than students whose parents were less satisfied.

Pakistan had a relatively high rate of parent satisfaction compared to other countries. Around 3 in 4 (76%) students had a parent who was very satisfied with their child's school. These parents tended to agree with statements such as "My child's school does a good job including me in my child's education", "My child's school provides a safe environment", and "My child's school cares about my child's progress in school", among others.

These findings show how important it is for policymakers and practitioners to know to what extent parents are satisfied with their child's school. Parents surveys inquiring about school resources, leadership, pedagogy, safety and other features can be used for this purpose. Addressing the issues pointed by parents may lead to higher levels of satisfaction with the schools, and also help in promoting higher academic achievement among students.

ACHIEVEMENT GAP BY
SCHOOL PRINCIPALS' QUALIFICATIONS

Mathematics achievement of students
by principals' qualifications

MATHEMATICS SCORE

England 558

Kazakhstan 512 493

Turkey 523 506

Iran 444 427

Saudi Arabia 398 396

Pakistan 337 298

Philippines 297 250

● Students whose principals have at least a bachelor degree

● Students whose principals do not have a bachelor degree
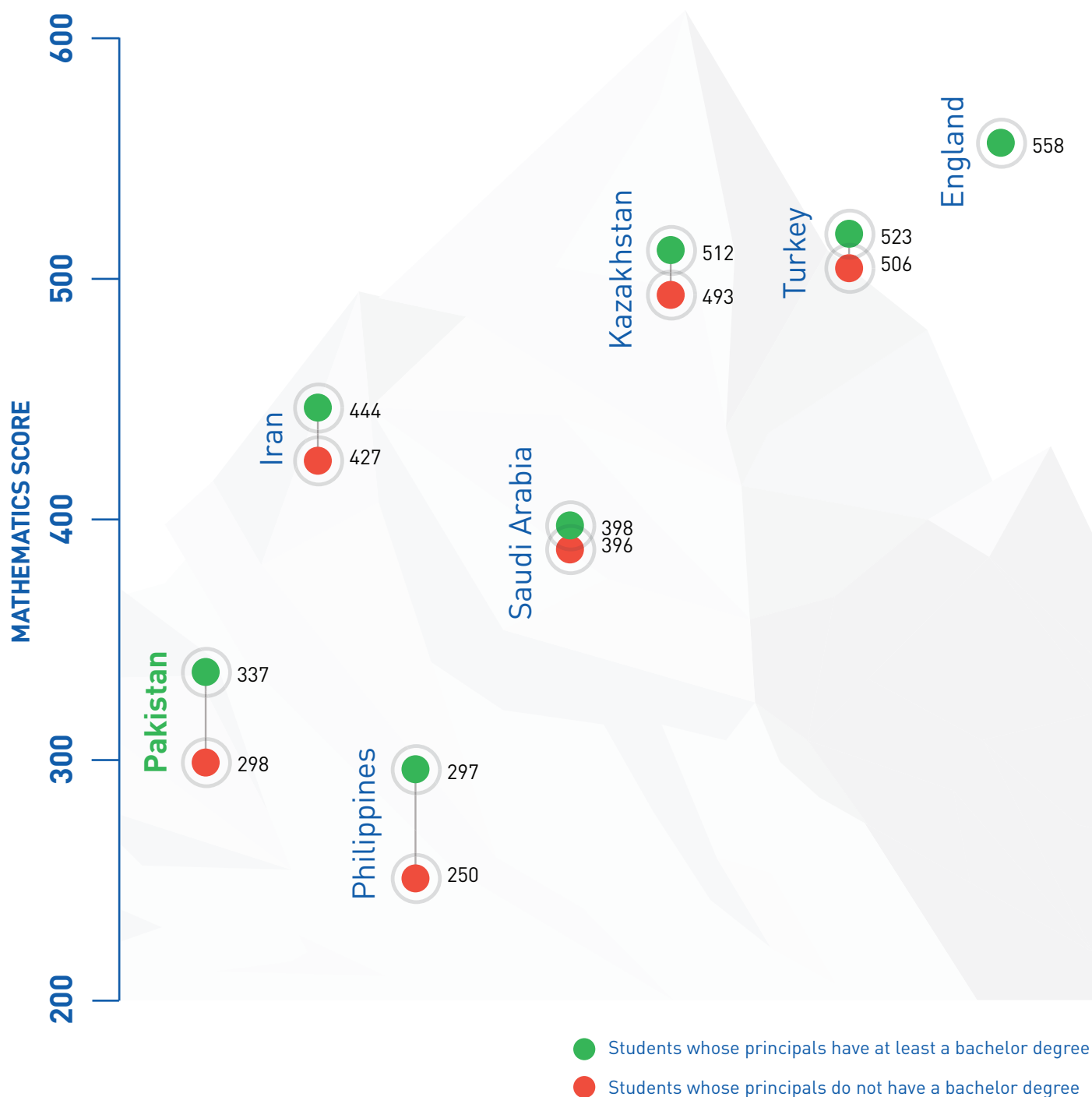
IN SOME COUNTRIES, ALL STUDENTS ARE IN THE SAME GROUP
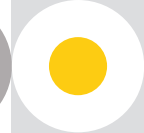
In Pakistan, school principals are generally required to be graduates (complete a bachelor's degree) in order to be a principal in a government or public school. At the primary level, generally the most senior teachers are promoted to the post of principal, and there are no specific requirements beyond the ones for being a regular teacher for being a principal.

These qualification requirements do not extend to principals in the private sector. Low-cost private schools are burgeoning in Pakistan. They mostly function by employing principals and teachers with basic qualifications for lower salaries than the public sector.

Seventeen percent of Pakistani fourth graders had a principal who did not even complete a bachelor degree (considering principals from both public and private schools). This was much higher than the percentage reported in other countries. For instance, less than 5% of the students had a principal without a bachelor degree in Iran, Kazakhstan, the Philippines, and Turkey. No student had a principal without a bachelor degree in England.

Against expectations, results show that in Pakistan there were no clear differences in mathematics scores between students with or without a qualified principal. However, this should be interpreted with caution. This is probably the consequence of the TIMSS test being too hard to too many Pakistani students, and therefore making it hard to see any differences in performance between different groups of students.

TEACHERS' QUALIFICATIONS

Mathematics achievement of students by teachers' qualifications

MATHEMATICS SCORE

600

England 558

Kazakhstan 514
499

Turkey 522

500

Iran 444
435

Saudi Arabia 450
395

400

Pakistan 340
330

300

Philippines 297
287

200

● Students whose teachers have at least a bachelor degree

● Students whose teachers do not have a bachelor degree
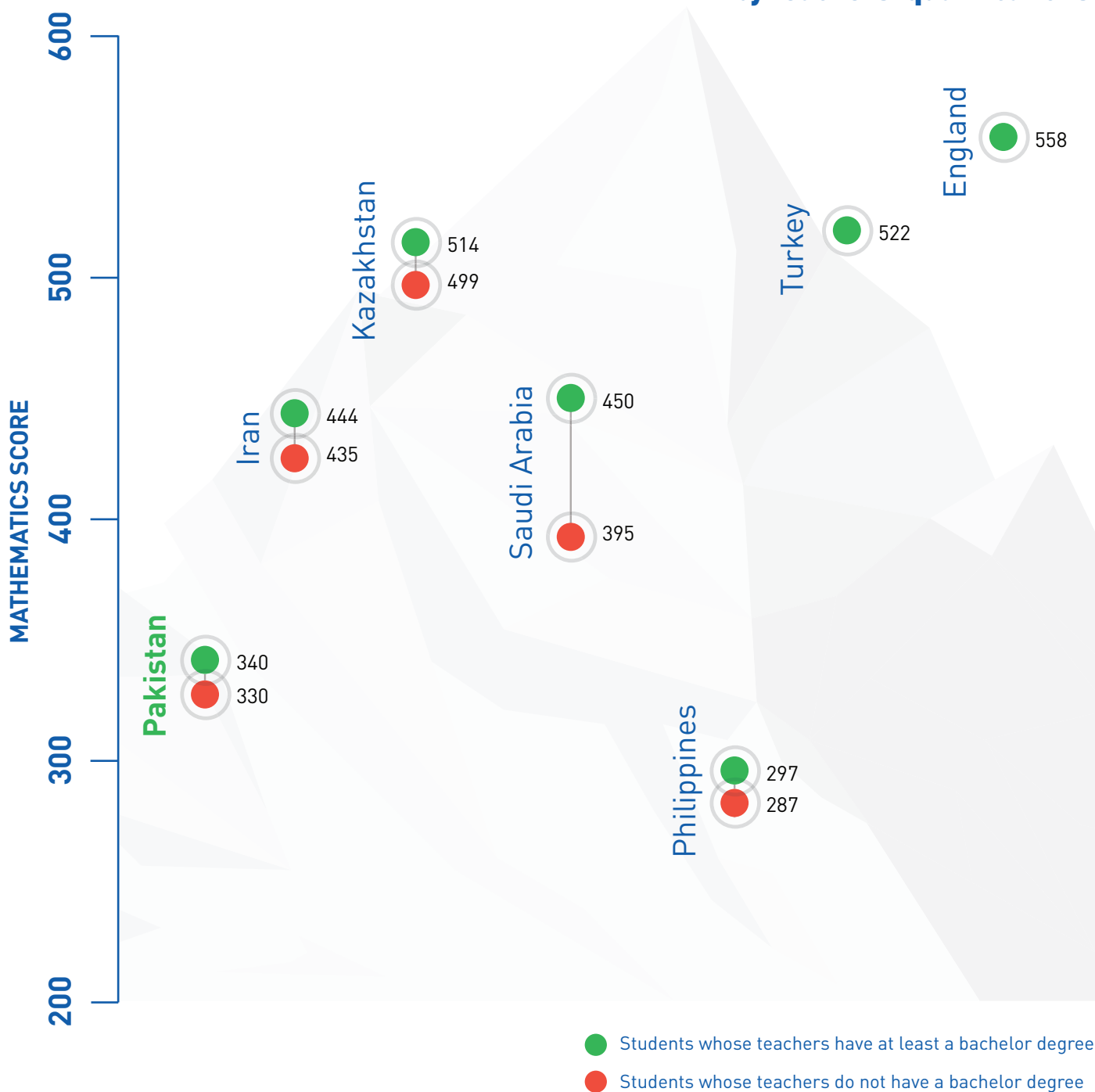
IN SOME COUNTRIES, ALL STUDENTS ARE IN THE SAME GROUP

Pakistani teachers are required to be graduates (complete a bachelor's degree) in order to teach in government or public schools. There is no such a requirement for teachers in private schools. Teacher qualifications were lower in Pakistan compared to other countries. Two-thirds of Pakistani students (66%) were taught by a teacher who did not have a bachelor degree (considering teachers from both public and private schools). This percentage was much lower in Iran (13%), Kazakhstan (8%), and the Philippines (14%). No student had a teacher without a bachelor degree in England or Turkey.

The data shows no clear association between teacher qualifications and students mathematics scores. A note of caution is in order. This is probably the effect of the math test being too difficult to many students in Pakistan, and therefore making it hard to see clear differences in performance between different groups of students. From a policy perspective, it is always important to ensure that all students are taught by qualified teachers who received high quality pre-service teacher training.

TEACHERS' YEARS OF EXPERIENCE

Percentage of students taught by teachers with less than 5 years of experience

PERCENTAGE OF STUDENTS

Saudi Arabia	Kazakhstan	Philippines	England	Iran	Turkey	Pakistan
11	11	14	25	26	35	40
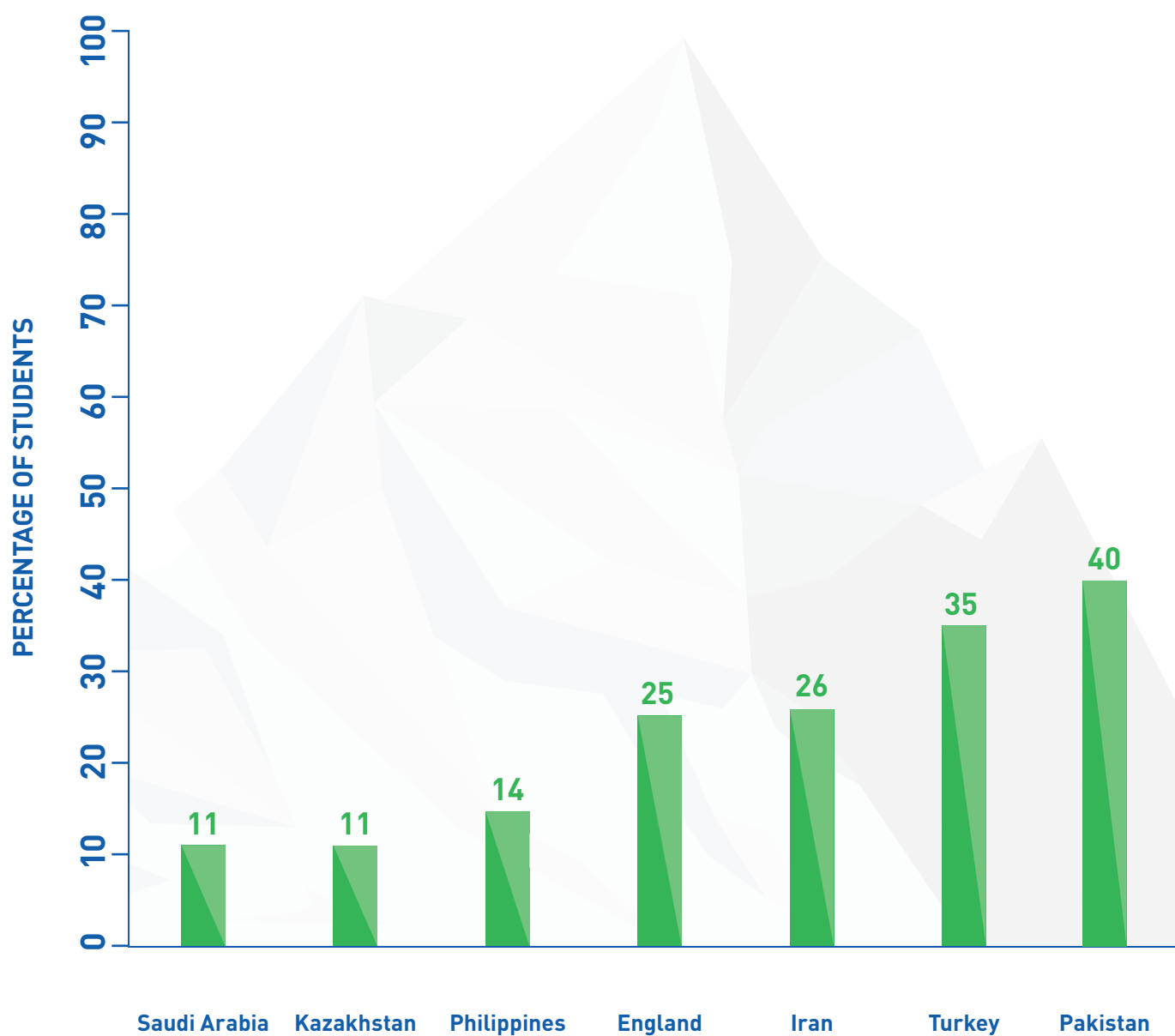
Beyond pre-service and in-service professional development, years of experience on the job is also needed for effective teaching.

Surprisingly, a much higher proportion of Pakistani students were taught by relatively inexperienced teachers, as compared to other countries. While 40% of the fourth graders were taught by teachers with less than five years of experience in Pakistan, 25% or less were taught by this type of teachers in Saudi Arabia, Kazakhstan, the Philippines, and England.

The fact that relatively inexperienced teachers are teaching in the earlier grades of primary education in Pakistan should be a cause of concern. This is probably the consequence of the promotion system operating in the country, where teachers are assigned classes in the upper grades as they accrue years of experience. This practice runs the risk of leaving behind students in the earlier grades. It may be worthy to revisit teachers' promotion practices in Pakistan to ensure that teachers with different levels of experience are more evenly distributed across school grades.

ACHIEVEMENT GAP BY TEACHERS' PROFESSIONAL DEVELOPMENT

Mathematics achievement of students by teachers' participation in professional development

MATHEMATICS SCORE

England
● 560
● 542

Turkey
● 527
● 516

Kazakhstan
● 516
● 512

Iran
● 441
● 437

Saudi Arabia
● 401
● 379

Pakistan
● 331
● 327

Philippines
● 296
● 295
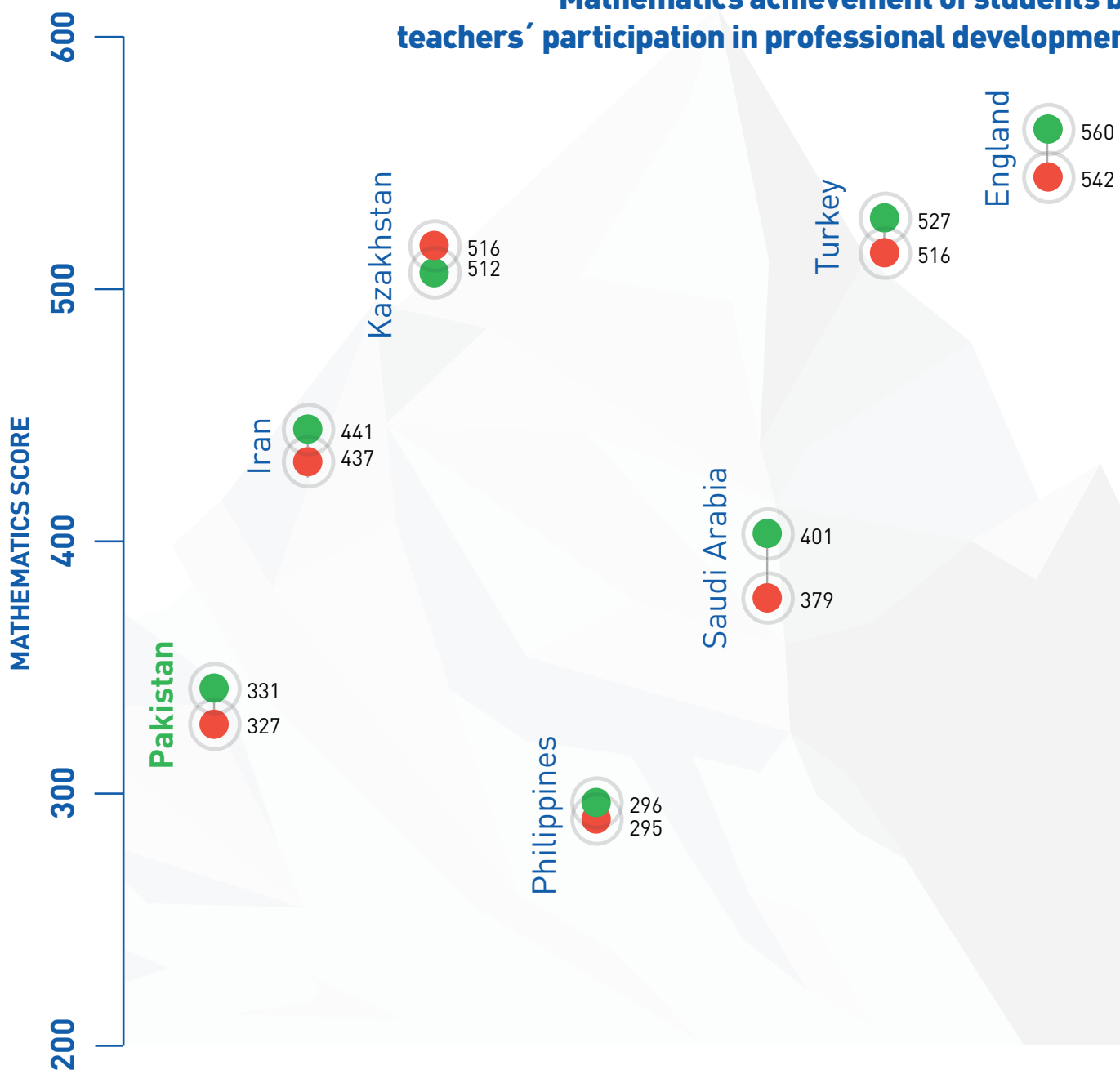
● Students taught by teachers who participated in professional development in last 2 years

● Students taught by teachers who did not participate in professional development in last 2 years

Regular access to quality in-service teacher professional development is important to improve teaching and learning. The vast majority of Pakistani fourth graders (87%) were taught by teachers who have attended professional development in mathematics in the last two years. These are good news.

Unfortunately, teachers' attendance to in-service professional development was not associated to higher student performance in Pakistan. The difference in scores between students who attended or not professional development in the last two years was not statistically significant.

These findings suggest that access to professional development in not an issue in Pakistan, but the quality of such programs may be weak. There may be a need for policymakers to regulate the contents covered in those programs. Programs that have a more practical, hands-on approach, with peers' support and supervision in the classroom, may be more effective.
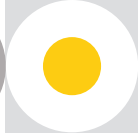
TEACHERS' JOB SATISFACTION

Mathematics achievement of students by level of job satisfaction of their teachers

MATHEMATICS SCORE

England
566
553

Turkey
526
517

Kazakhstan
512
512

Iran
444
436

Saudi Arabia
405
374

Pakistan
333
318

Philippines
308
294

600
500
400
300
200
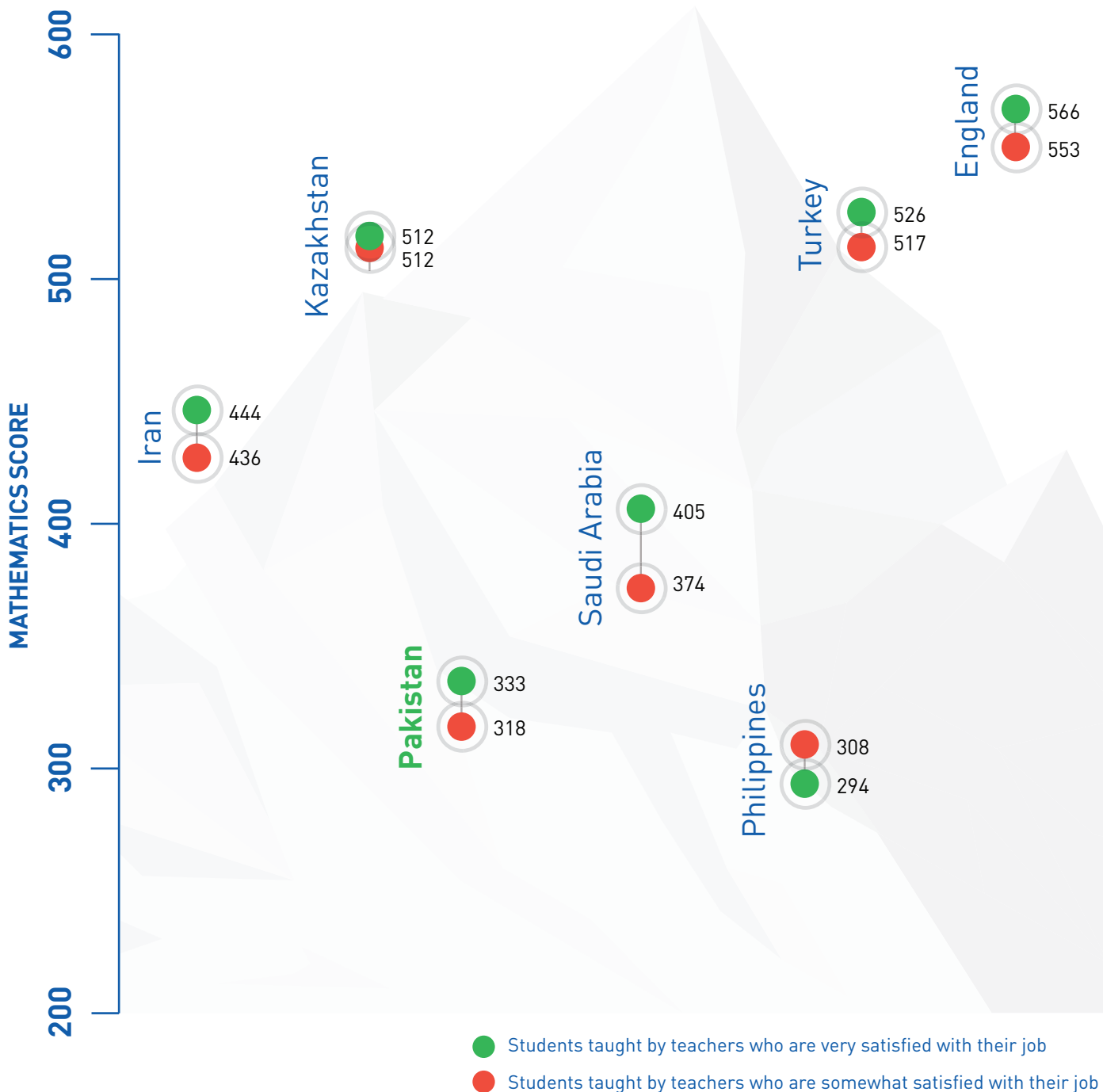
● Students taught by teachers who are very satisfied with their job
● Students taught by teachers who are somewhat satisfied with their job

IN SOME COUNTRIES, ALL STUDENTS ARE IN THE SAME GROUP
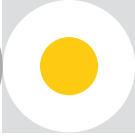
Are fourth grade teachers satisfied with their job? In Pakistan, most of the students (79%) were taught by teachers who were very satisfied with their jobs. These teachers reported feeling very often enthusiastic, content and proud about their work, among other positive feelings. The percentage of students taught by very satisfied teachers was relatively higher in Pakistan as compared to other countries participating in TIMSS: Kazakhstan (68%), Turkey (64%), and England (41%). These are good news for Pakistan.

There was no clear association between teachers' job satisfaction and students' mathematics performance in Pakistan. Nevertheless, job satisfaction is very important to attract the best candidates to the teaching profession, to keep them in teaching in the classrooms, and to keep them motivated to excel.

PREPRIMARY EDUCATION

Percentage of students who did not attend preprimary education, as reported by their parents

PERCENTAGE OF STUDENTS

Country	Value
England	(no data)
Philippines	2
Kazakhstan	20
Iran	26
Turkey	28
Saudi Arabia	30
Pakistan	63
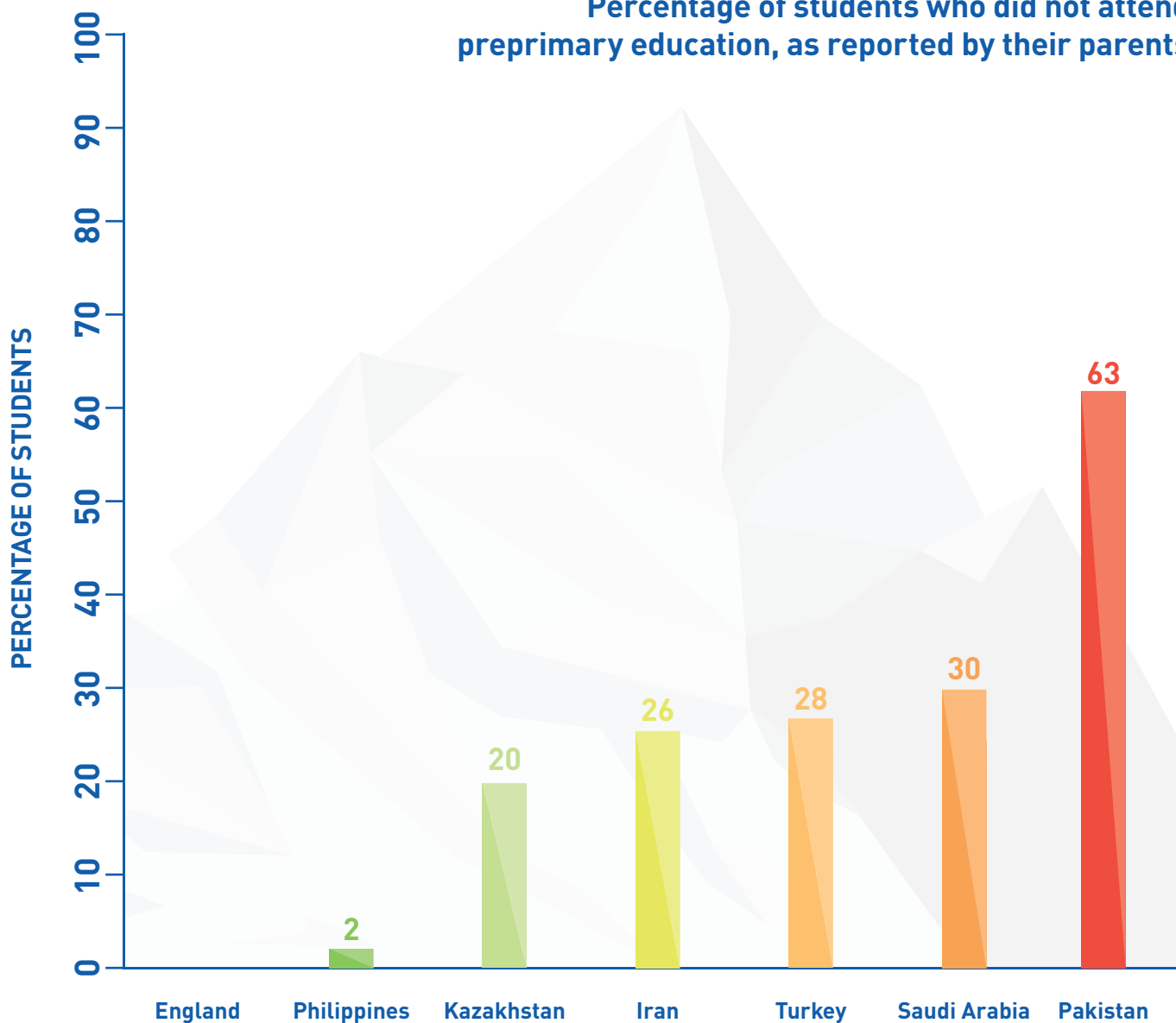
DATA NOT AVAILABLE FOR ENGLAND

Attending preprimary education is important for children and their families. Here children learn socio-emotional, language and mathematics skills that are critical later on in school. Children may access food and health care services through preprimary education, while allowing their parents to work and make a living.

Despite all these benefits, Pakistan is the country with the highest proportion of fourth graders (63%) that did not attend preprimary education, as compared to all other countries participating in TIMSS 2019. For example, 30% or less of the students did not attend preprimary education in Saudi Arabia, Turkey, Iran, Kazakhstan, the Philippines and England. Ensuring universal access to high quality preprimary education should be a priority for Pakistan.

ABSENTEEISM

Percentage of students absent once a week, as reported by the students

PERCENTAGE OF STUDENTS

England	Turkey	Iran	Kazakhstan	Pakistan	Saudi Arabia	Philippines
4	10	15	21	26	28	32
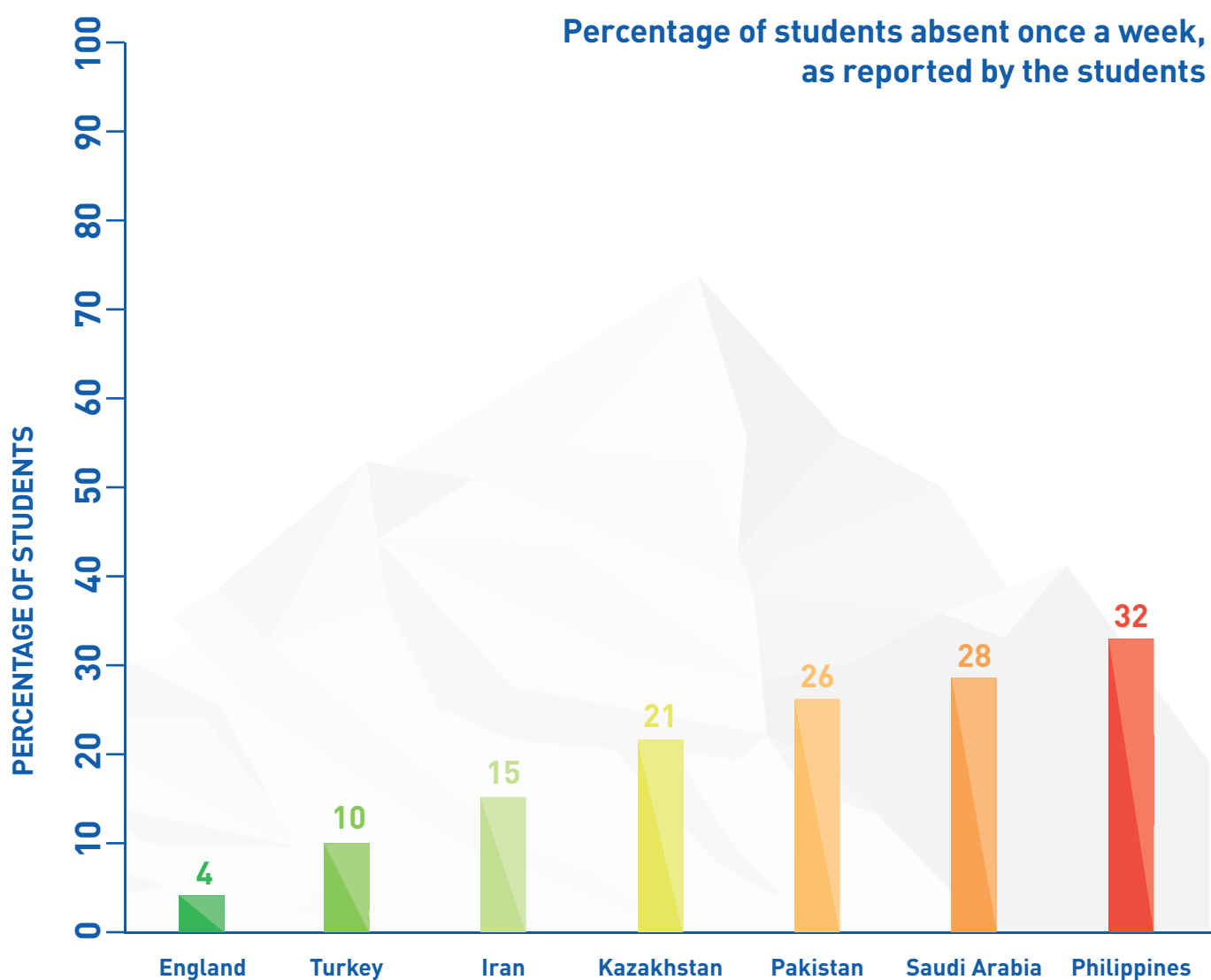
For students to learn, it is important that they attend regularly to school. Fourth grade students in Pakistan seems to be absent from school more often than their counterparts in most other countries participating in TIMSS 2019. For instance, while 26% of the Pakistani students reported being absent once a week, 10% reported being absent in Turkey, and only 4% in England.

Despite these findings, Pakistani teachers do not perceive that absenteeism is a limitation for teaching and learning. In fact, 24% of the Pakistani students have a teacher for whom absenteeism is not at all a problem.
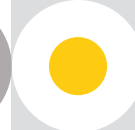
ACHIEVEMENT GAP BY STUDENTS' LEVEL OF UNDERSTANDING OF THE LANGUAGE OF INSTRUCTION

Mathematics achievement of students facing different levels of difficulty understanding the language of instruction, as reported by the teachers
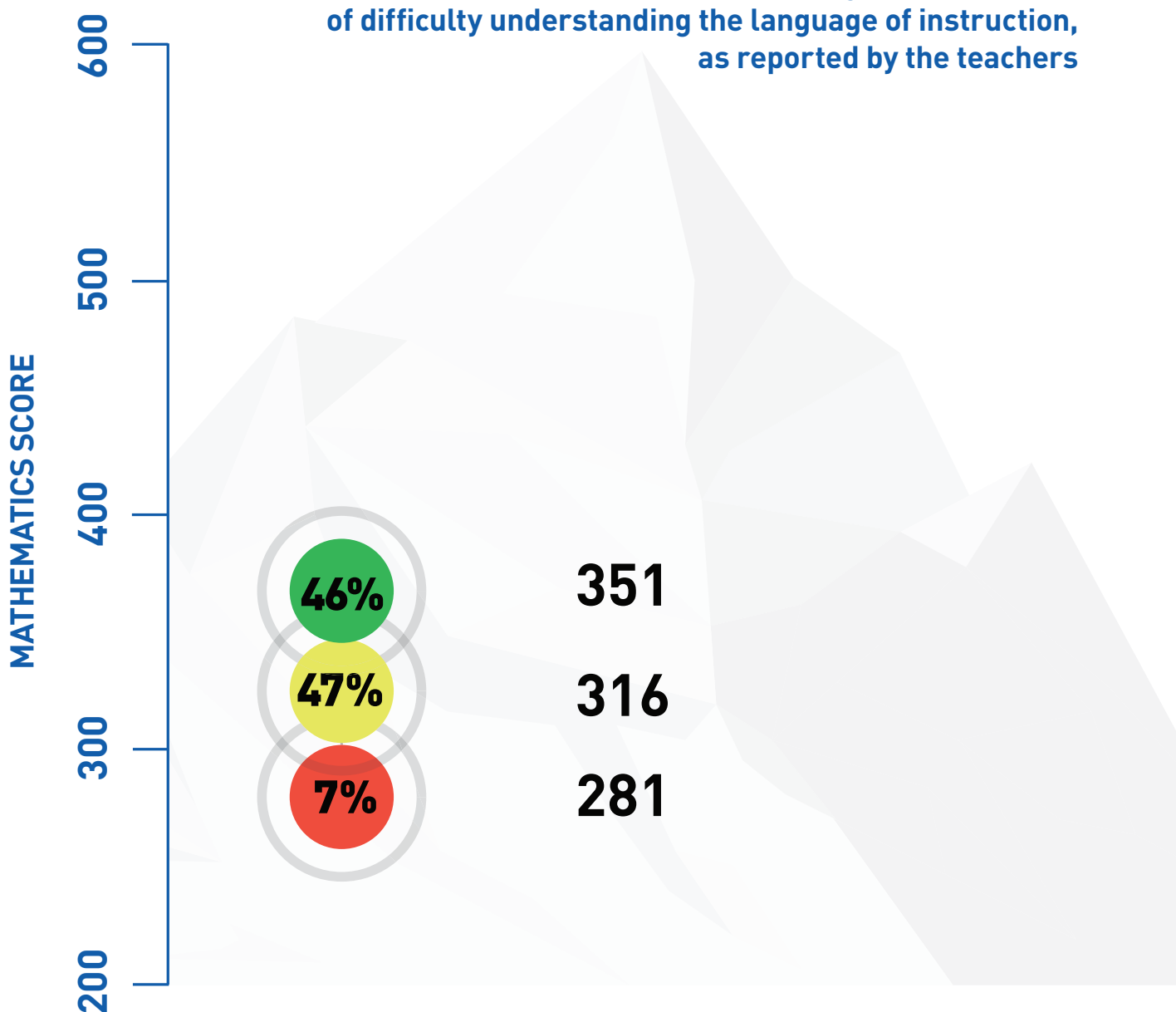
MATHEMATICS SCORE

46% 351

47% 316

7% 281

● Students facing no difficulty in understanding the language of instruction

● Students facing some difficulty in understanding the language of instruction

● Students facing a lot of difficulty in understanding the language of inst

Pakistan is a multilingual country, with schools using different languages of instruction in different regions. Accordingly, the TIMSS mathematics test was administered in three different languages in order to match the language of instruction: English (46% of the students), Urdu (45% of the students), and Sindhi (9% of the students).

For most of the Pakistani students, the language of the test was the same than the language spoken at home. Nevertheless, the language of the test was never spoken at home by more than a third (36%) of the Pakistani students at grade 4. This was the highest percentage reported by any country participating in TIMSS 2019.

In Pakistan, more than half (54%) of the fourth graders were taught by teachers reporting that students with difficulties understanding the language of instruction limited their teaching. Students facing a lot of difficulties understanding the language of instruction scored significantly lower than their peers facing no difficulties. Therefore, it is important to bear in mind the effect of the language of the test in understanding the low mathematics performance of Pakistani students.
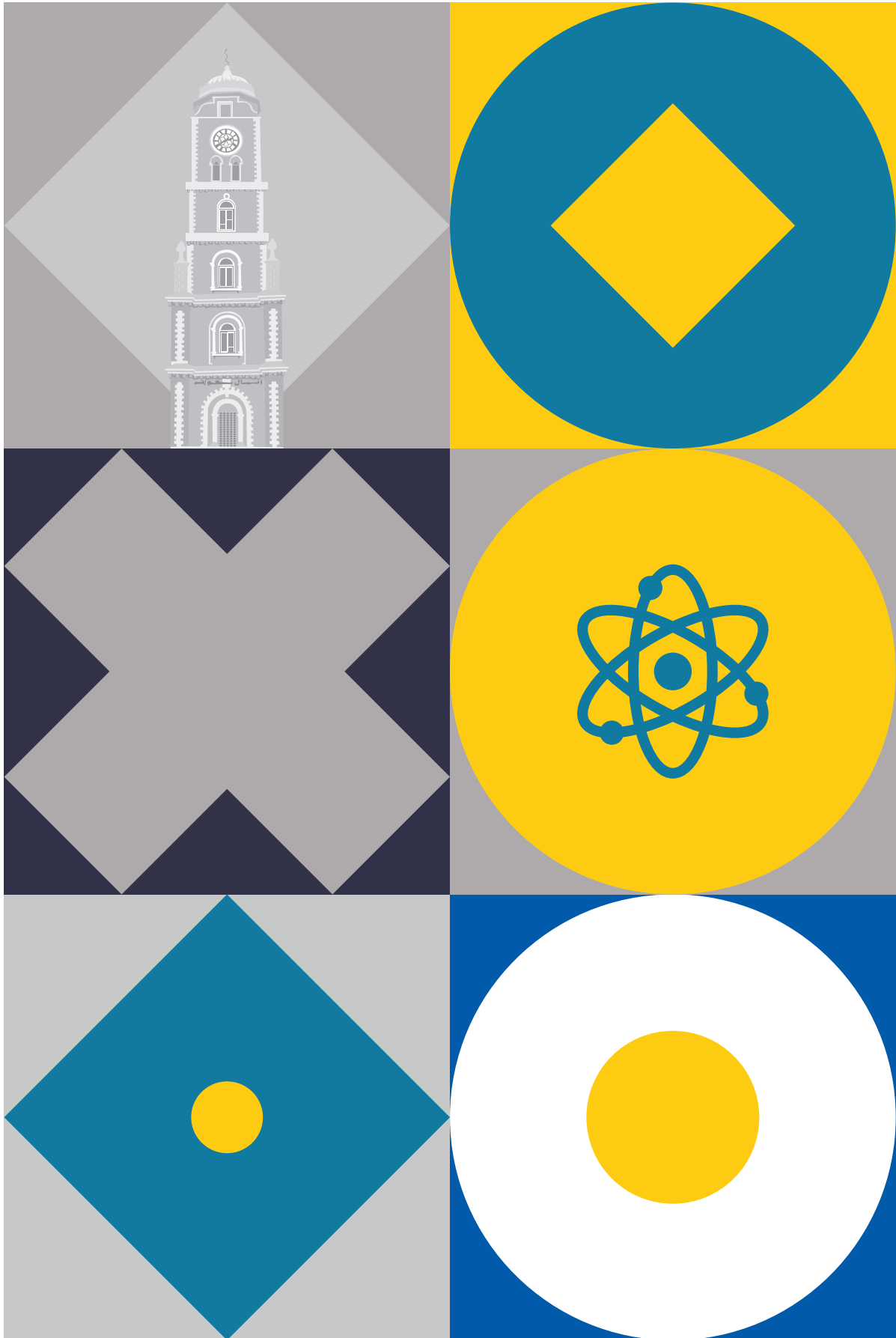
CHAPTER 3
SCIENCE RESULTS
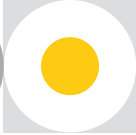
RANKING OF COUNTRIES BY SCIENCE ACHIEVEMENT

SCIENCE SCORE

700

595
Singapore

600

526
Turkey

537
England

494
Kazakhstan

500

441
Iran

402
Saudi Arabia

400

290
Pakistan

300

249
Philippines

200

SCIENCE ACHIEVEMENT BY WEALTH OF COUNTRIES

WEALTH OF THE COUNTRIES (GDP PER CAPITA, PPP, USD)

GDP PER CAPITA, PPP, USD (GROSS DOMESTIC PRODUCT USING PURCHASING POWER PARITY)

INTERNATIONAL BENCHMARKS OF SCIENCE ACHIEVEMENT

SCIENCE SCORE

625
550
475
400

ADVANCED
>625

Students communicate their understanding of life, physical, and Earth sciences and demonstrate some knowledge of the process of scientific inquiry. Students demonstrate knowledge of characteristics and life processes of a variety of organisms. They can communicate understanding of relationships in ecosystems and interactions between organisms and their environment. They communicate understanding of properties and states of matter and physical and chemical changes. Students communicate understanding of Earth's physical characteristics, processes, and history and show knowledge of Earth's revolution and rotation.

HIGH
550-625

Students communicate and apply knowledge of life, physical, and Earth sciences. Students communicate knowledge of characteristics of plants, animals, and their life cycles, and apply knowledge of ecosystems and of humans' and organisms' interactions with their environment. Students demonstrate knowledge of states and properties of matter and of energy transfer in practical contexts, and show some understanding of forces and motion. Students know various facts about the Earth's physical characteristics and show basic understanding of the Earth-Moon-Sun system.

INTERMEDIATE
475-550

Students show knowledge and understanding of some aspects of science. Students demonstrate some basic knowledge of plants and animals. They demonstrate knowledge about some properties of matter and some facts related to electricity, and can apply elementary knowledge of forces and motion. They show some understanding of Earth's physical characteristics.

LOW
400-475

Students show limited understanding of scientific concepts and limited knowledge of foundational science facts.

BELOW LOW
<400

Students do not systematically demonstrate the knowledge and skills of the "Low" benchmark

PERCENTAGES OF PAKISTANI STUDENTS REACHING INTERNATIONAL BENCHMARKS OF SCIENCE ACHIEVEMENT

0% PERCENTAGE OF STUDENTS REACHING ADVANCED BENCHMARK

1% PERCENTAGE OF STUDENTS REACHING HIGH BENCHMARK

6% PERCENTAGE OF STUDENTS REACHING INTERMEDIATE BENCHMARK

14% PERCENTAGE OF STUDENTS REACHING LOW BENCHMARK

79% PERCENTAGE OF STUDENTS NOT REACHING THE LOW BENCHMARK

0   10   20   30   40   50   60   70   80   90   100

PERCENTAGE OF STUDENTS

SOURCE: IEA'S TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY TIMSS 2019

RESULTS MAY NOT ADD UP TO 100%
BECAUSE THEY WERE ROUNDED TO THE NEAREST WHOLE NUMBER.
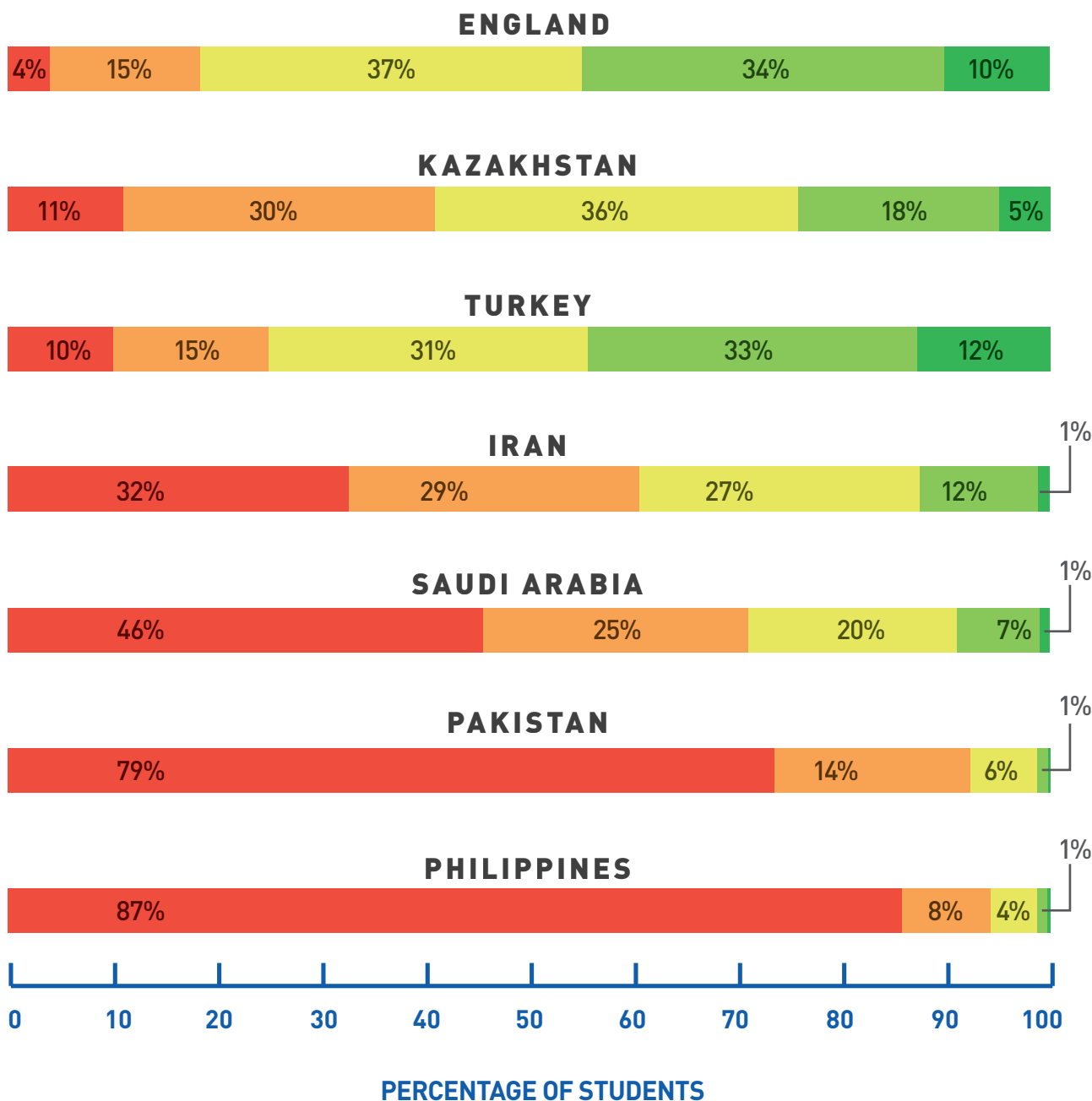
PERCENTAGES OF STUDENTS REACHING INTERNATIONAL BENCHMARKS OF SCIENCE ACHIEVEMENT IN PAKISTAN AND OTHER COUNTRIES

ENGLAND
4% | 15% | 37% | 34% | 10%

KAZAKHSTAN
11% | 30% | 36% | 18% | 5%

TURKEY
10% | 15% | 31% | 33% | 12%

IRAN
32% | 29% | 27% | 12% | 1%

SAUDI ARABIA
46% | 25% | 20% | 7% | 1%

PAKISTAN
79% | 14% | 6% | 1%

PHILIPPINES
87% | 8% | 4% | 1%

0 10 20 30 40 50 60 70 80 90 100

PERCENTAGE OF STUDENTS

- ● Students reaching advanced benchmark
- ● Students reaching high benchmark
- ● Students reaching intermediate benchmark
- ● Students reaching low benchmark
- ● Students not reaching the low benchmark

RESULTS MAY NOT ADD UP TO 100%
BECAUSE THEY WERE ROUNDED TO THE NEAREST WHOLE NUMBER.

EXAMPLE
SCIENCE ITEMS

This section presents example items from the Science test. In the table under each item, the results of Pakistani students are compared with the results of students from other countries. The countries in the table are the ones that administered the "Less Difficult" Science items from the TIMSS tests. Countries have the option to administer the "Less Difficult" items in order to better measure the performance of their students. Not all the countries administered the "Less difficult" items.

Science performance of Pakistani students was very low. On average, 4th grade students got only 21% of correct responses. This is even less to what would be expected by answering by chance, given that the students had to select one out of four options for the correct response. [Source: Appendix F.2, G.2. Pending to add similar comment in math].

LOW INTERNATIONAL BENCHMARK

Summary description

Students show limited understanding of scientific concepts and limited knowledge of foundational science facts.

Full description

Students at this level can recognize that some animals have backbones, that some materials conduct heat better than others, and that water and soil are natural resources.

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

EXAMPLE ITEM 1

INTERNATIONAL BENCHMARK	LOW
CONTENT DOMAIN	LIFE SCIENCE
TOPIC AREA	CHARACTERISTICS AND LIFE PROCESSES OF ORGANISMS
COGNITIVE DOMAIN	KNOWING
DESCRIPTION	RECOGNIZES AN ANIMAL THAT HAS A BACKBONE

Country	Percentage correct responses
Philippines	56
South Africa	58
Saudi Arabia	61
Pakistan	**61**
Kuwait	61
International Average	70
Kosovo	74
Morocco	74
Montenegro	75
North Macedonia	81
Bosnia and Herzegovina	81
Albania	86

INTERMEDIATE INTERNATIONAL BENCHMARK

Summary description

Students show knowledge and understanding of some aspects of science. Students demonstrate some basic knowledge of plants and animals. They demonstrate knowledge about some properties of matter and some facts related to electricity, and can apply elementary knowledge of forces and motion. They show some understanding of Earth's physical characteristics.

Full description

Students show basic knowledge of what plants and animals need to survive as well as some knowledge of the characteristics of animals. Students can recognize different properties of matter, demonstrate understanding of simple electrical circuits, and apply elementary knowledge of forces and motion, such as the force between a magnet and different materials. Students show some understanding of Earth's physical characteristics. Students can relate information in diagrams to some basic science concepts.

EXAMPLE ITEM 2

INTERNATIONAL BENCHMARK	INTERMEDIATE
CONTENT DOMAIN	PHYSICAL SCIENCE
TOPIC AREA	CLASSIFICATION AND PROPERTIES OF MATTER AND CHANGES IN MATTER
COGNITIVE DOMAIN	KNOWING
DESCRIPTION	RECOGNIZES THE STATES OF MATTER OF THREE DIFFERENT MATERIALS

	Percentage correct responses			
Country	All	Oxygen	Oil	Table salt
Albania	75	88	89	80
Bosnia and Herzegovina	58	73	83	66
Kosovo	52	74	79	59
Kuwait	51	63	67	59
Montenegro	64	81	74	75
Morocco	61	74	78	70
North Macedonia	59	76	77	68
Pakistan	**32**	**45**	**50**	**47**
Philippines	37	50	54	54
Saudi Arabia	59	71	75	67
South Africa	39	54	56	51
International Average	**53**	**68**	**71**	**63**

SOURCE: IEA's Trends in International
Mathematics and Science Study TIMSS 2019
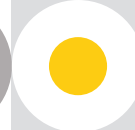
EXAMPLE ITEM 3

INTERNATIONAL BENCHMARK	INTERMEDIATE
CONTENT DOMAIN	PHYSICAL SCIENCE
TOPIC AREA	FORCES AND MOTION
COGNITIVE DOMAIN	APPLYING
DESCRIPTION	RECOGNIZES THE BEST EXPLANATION FOR WHY A BOX ON A CART IS EASIER TO PULL THAN A BOX RESTING DIRECTLY ON THE FLOOR

SP02_1D

45 Aliya and Razia need to move identical heavy boxes. Aliya has to pull harder on her box to move it than Razia does.

Aliya   Razia

Why is it easier for Razia to move her box?

Ⓐ Gravity acting on Aliya's box is much stronger.

Ⓑ Air resistance acting on Aliya's box is much greater.

Ⓒ The cart increases the magnetic force acting on Razia's box.

● The cart's wheels decrease the force needed to move Razia's box.

SP71147

Country	Percentage correct responses
Philippines	36
Pakistan	**39**
Morocco	41
Kuwait	45
South Africa	47
International Average	**49**
Saudi Arabia	49
North Macedonia	51
Montenegro	53
Kosovo	54
Bosnia and Herzegovina	58
Albania	64

HIGH INTERNATIONAL BENCHMARK

Summary description

Students communicate and apply knowledge of life, physical, and Earth sciences. Students communicate knowledge of characteristics of plants, animals, and their life cycles, and apply knowledge of ecosystems and of humans' and organisms' interactions with their environment. Students demonstrate knowledge of states and properties of matter and of energy transfer in practical contexts, and show some understanding of forces and motion. Students know various facts about the Earth's physical characteristics and show basic understanding of the Earth-Moon-Sun system.

Full description

Students communicate knowledge of characteristics of plants and animals. For example, they can distinguish living things from nonliving things and demonstrate some knowledge of life cycles of plants and animals. Students can apply knowledge of ecosystems and of organisms' interactions with their environment. They can complete food chains and recognize some plant and animal features that provide advantages in a given environment. Students demonstrate an understanding of how germs spread. Students demonstrate knowledge of states and properties of matter. They understand basic properties of magnets, including the forces between two magnets. Students show some elementary knowledge about how shadows are formed. They apply knowledge of energy transfer in practical contexts and show some understanding of forces and motion, including gravity and air resistance. Students know various facts about the Earth's physical characteristics and climates, and show basic understanding of the Earth-Moon-Sun system. Students can make simple inferences using models, tables, and diagrams.
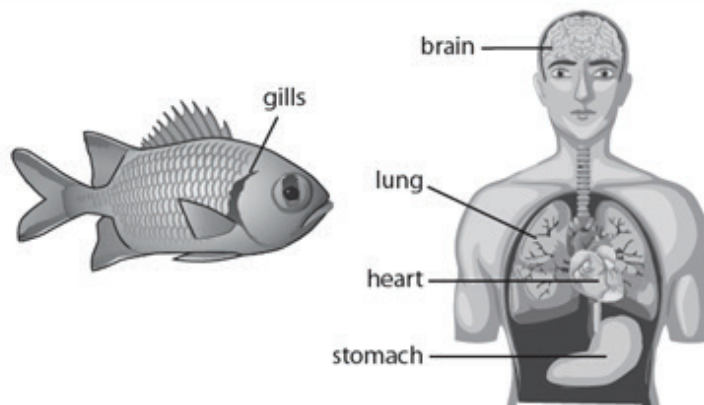
EXAMPLE ITEM 4

INTERNATIONAL BENCHMARK	HIGH
CONTENT DOMAIN	LIFE SCIENCE
TOPIC AREA	CHARACTERISTICS AND LIFE PROCESSES OF ORGANISMS
COGNITIVE DOMAIN	APPLYING
DESCRIPTION	IDENTIFIES THE HUMAN ORGAN WITH THE SAME FUNCTION AS A FISH'S GILLS

37

SP02_02

brain

gills

lung

heart

stomach

Which organ in humans has the same function as gills in fish?

(A) brain

● lung

(C) heart

(D) stomach

SP71402

Country	Percentage correct responses
South Africa	27
Philippines	28
Kosovo	31
North Macedonia	35
Morocco	37
International Average	**45**
Pakistan	**47**
Saudi Arabia	53
Kuwait	56
Albania	56
Montenegro	61
Bosnia and Herzegovina	66
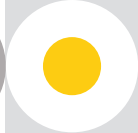
EXAMPLE ITEM 5

INTERNATIONAL BENCHMARK	HIGH
CONTENT DOMAIN	EARTH SCIENCE
TOPIC AREA	EARTH'S WEATHER AND CLIMATES
COGNITIVE DOMAIN	APPLYING
DESCRIPTION	INTERPRETS INFORMATION FROM A GRAPH TO RECOGNIZE WHICH CROPS WILL GROW BEST IN AN AREA WITH GIVEN PRECIPITATION

SP06_10

10

The amount of rainfall needed by different crops is shown in the graph below.

Rainfall Needed by Different Crops
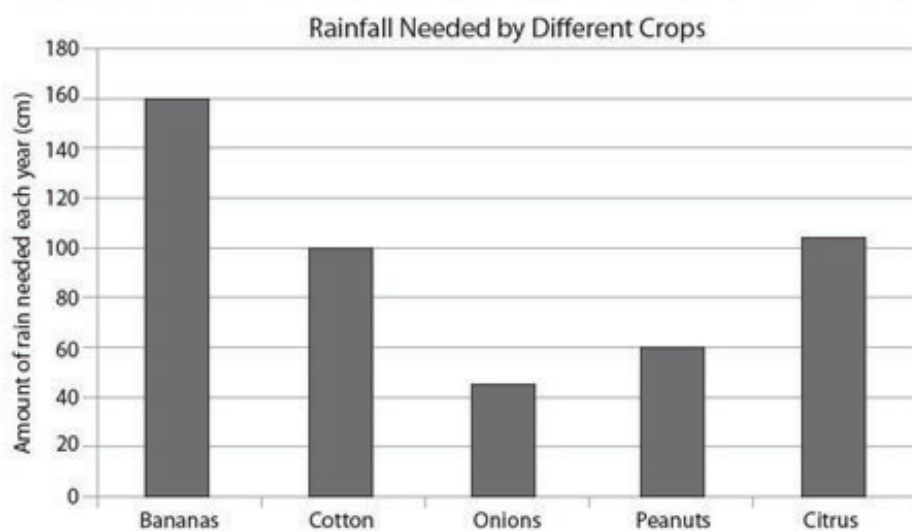
A. A farmer wants to plant crops in an area that gets about 60 cm of rain each year. Which crops will probably grow best in this area?

Ⓐ onions only

● onions and peanuts

Ⓒ cotton and citrus

Ⓓ bananas, citrus, and cotton

SQ61115_1
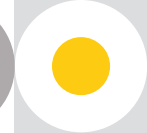
Country	Percentage correct responses
Saudi Arabia	16
Pakistan	**22**
South Africa	23
Philippines	28
North Macedonia	30
International Average	30
Kosovo	31
Bosnia and Herzegovina	34
Montenegro	37
Morocco	37
Albania	38
Kuwait	39

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

ADVANCED INTERNATIONAL BENCHMARK

Summary description

Students communicate their understanding of life, physical, and Earth sciences and demonstrate some knowledge of the process of scientific inquiry. Students demonstrate knowledge of characteristics and life processes of a variety of organisms. They can communicate understanding of relationships in ecosystems and interactions between organisms and their environment. They communicate understanding of properties and states of matter and physical and chemical changes. Students communicate understanding of Earth's physical characteristics, processes, and history and show knowledge of Earth's revolution and rotation.

Full description

Students demonstrate knowledge of characteristics and life processes of a variety of organisms. Students communicate understanding of relationships in ecosystems and interactions between organisms and their environment, such as explaining adaptations and identifying animals that compete for food. They can evaluate experimental designs to test how light and water affect the growth of plants. Students communicate understanding of properties and states of matter and of physical and chemical changes. In the context of investigations, students can explain what makes a solid dissolve faster in water, can evaluate methods for separating mixtures of solids, and understand what is important when designing a fair test. Students communicate understanding of Earth's physical characteristics, processes, and history. For example, they can relate two different environments to the weathering of rocks and recognize how fish fossils are formed. Students show knowledge of Earth's revolution and can describe how the Earth's rotation causes day and night. Students demonstrate basic knowledge and skills related to scientific inquiry and can recognize how to set up a simple experiment. They can draw conclusions from descriptions and diagrams and from results of experiments.

EXAMPLE ITEM 6

INTERNATIONAL BENCHMARK	ADVANCED
CONTENT DOMAIN	EARTH SCIENCE
TOPIC AREA	EARTH IN THE SOLAR SYSTEM
COGNITIVE DOMAIN	APPLYING
DESCRIPTION	PLACES THE EARTH IN A MODEL TO SHOW ITS POSITION RELATIVE TO THE SUN WHEN A LABELED CITY IS EXPERIENCING SUMMER

SP02_12

47 Earth's seasons are caused by the tilt of its axis.

It is summer in City A. In what position is the Earth when it is summer in City A?
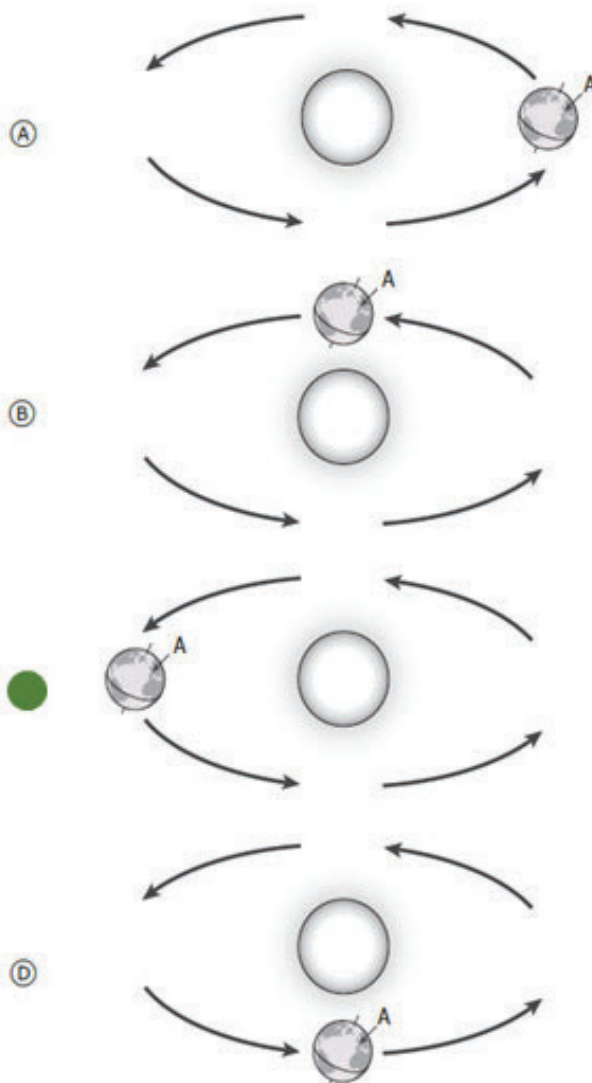
Country	Percentage correct responses
Montenegro	18
Philippines	21
North Macedonia	21
Pakistan	**22**
Kosovo	23
International Average	**24**
Morocco	24
South Africa	26
Bosnia and Herzegovina	26
Kuwait	26
Saudi Arabia	27
Albania	27
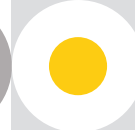
ACHIEVEMENT GAP BETWEEN TOP AND BOTTOM PERFORMING STUDENTS

Science achievement of top, average, and bottom performing students
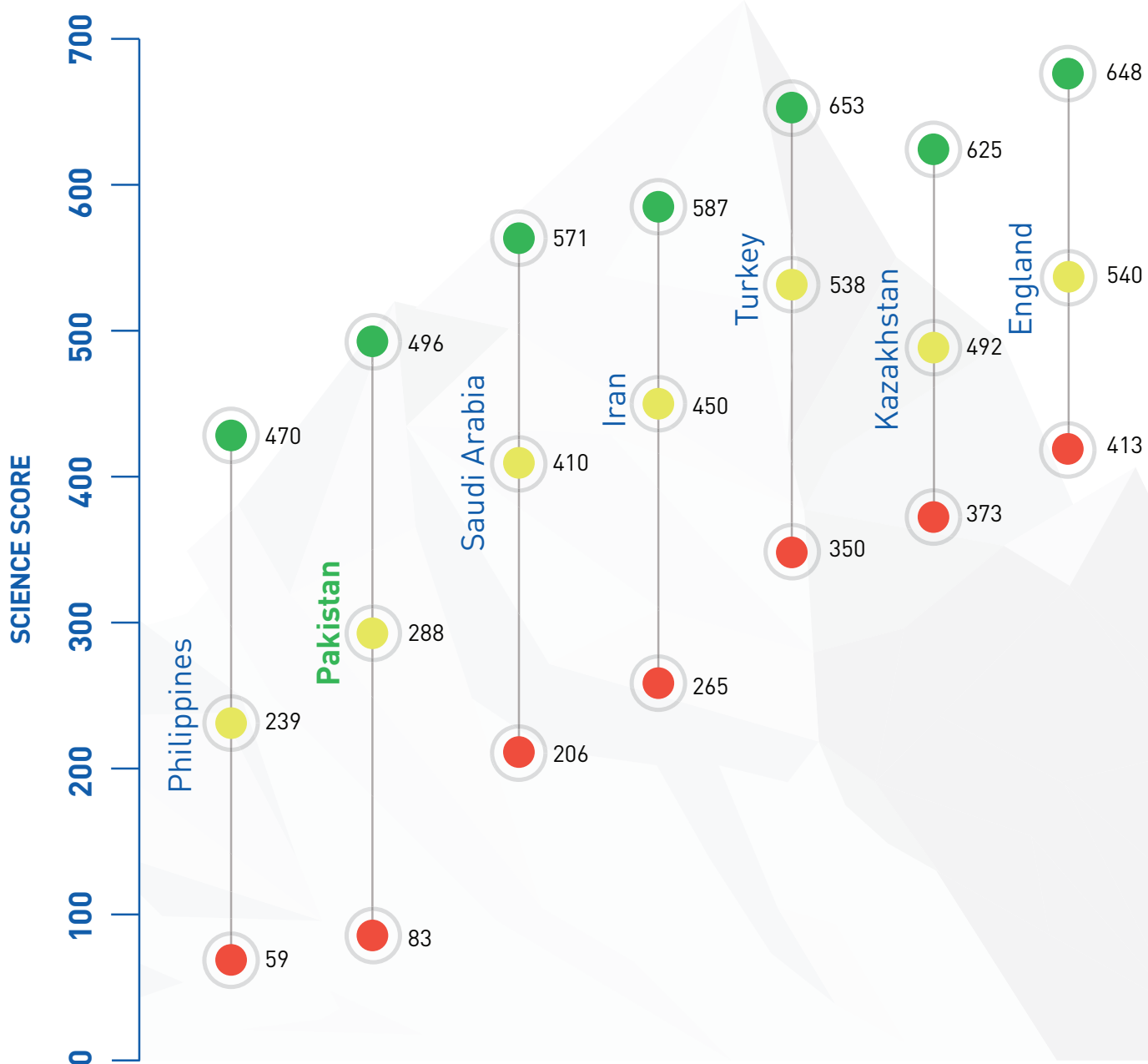
SCIENCE SCORE

Philippines: 470, 239, 59
Pakistan: 496, 288, 83
Saudi Arabia: 571, 410, 206
Iran: 587, 450, 265
Turkey: 653, 538, 350
Kazakhstan: 625, 492, 373
England: 648, 540, 413

● Top performing students (95th percentile)
● Average performing students (50th percentile)
● Low performing students (5th percentile)

ACHIEVEMENT GAP
FOR BOYS AND GIRLS

**Science achievement
for boys and girls**

SCIENCE SCORE

England
537
537

Kazakhstan
497
491

Turkey
529
524

Iran
442
440

Saudi Arabia
434
373

Pakistan
311
273

Philippines
261
238
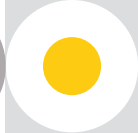
● Boys
● Girls
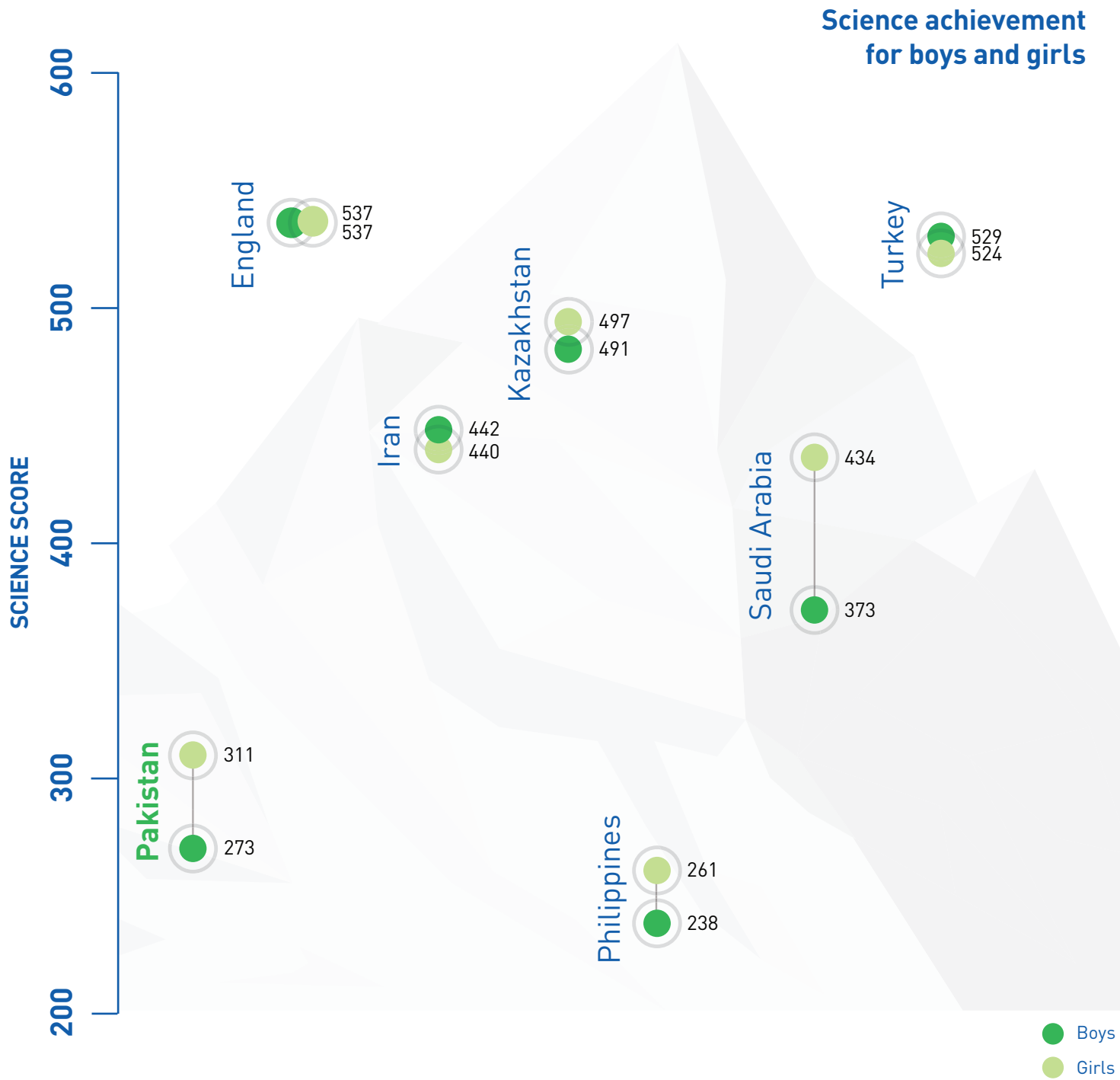
ACHIEVEMENT GAP BY URBAN/RURAL

Science achievement of students attending urban and rural schools

SCIENCE SCORE

600
500
400
300
200

53% **294**
47% **289**

● Students attending urban schools
● Students attending rural schools
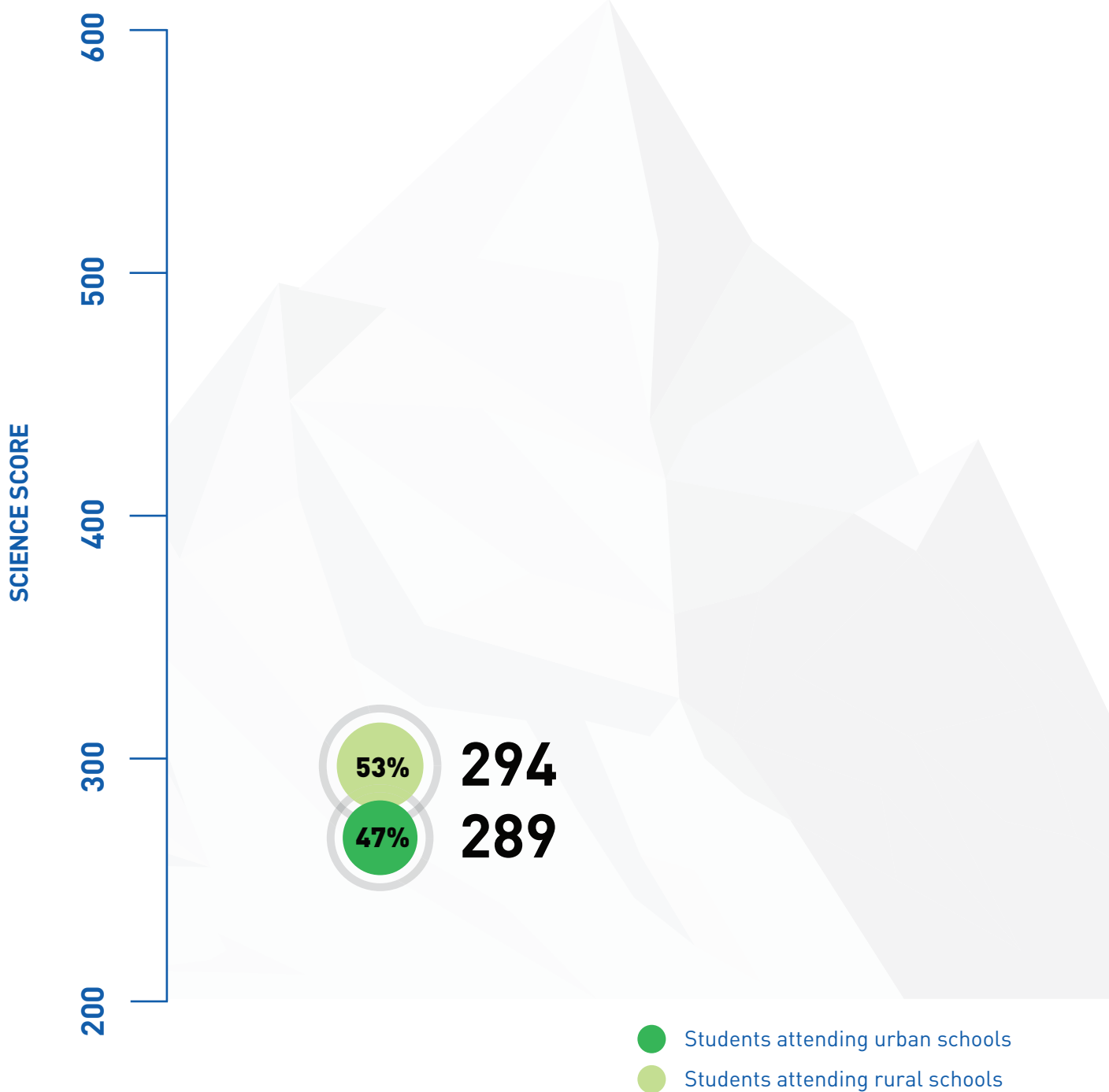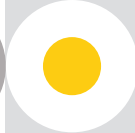
ACHIEVEMENT GAP BY RESOURCES FOR LEARNING AT HOME

Science achievement by amount of resources for learning at home

SCIENCE SCORE

600

500

400

300

200

Iran
- 482
- 423
- 396

Kazakhstan
- 500
- 479
- 472

Turkey
- 569
- 517
- 461

England
- 546
- 487
- 383

Saudi Arabia
- 422
- 384
- 368

Pakistan
- 310
- 285
- 279

Philippines
- 306
- 246
- 221

- 🟢 Students with few or more resources
- 🟡 Students with very few resources
- 🔴 Students with extremely few resources

CURRICULUM ALIGNMENT BETWEEN THE PAKISTANI CURRICULUM AND THE TIMSS TEST

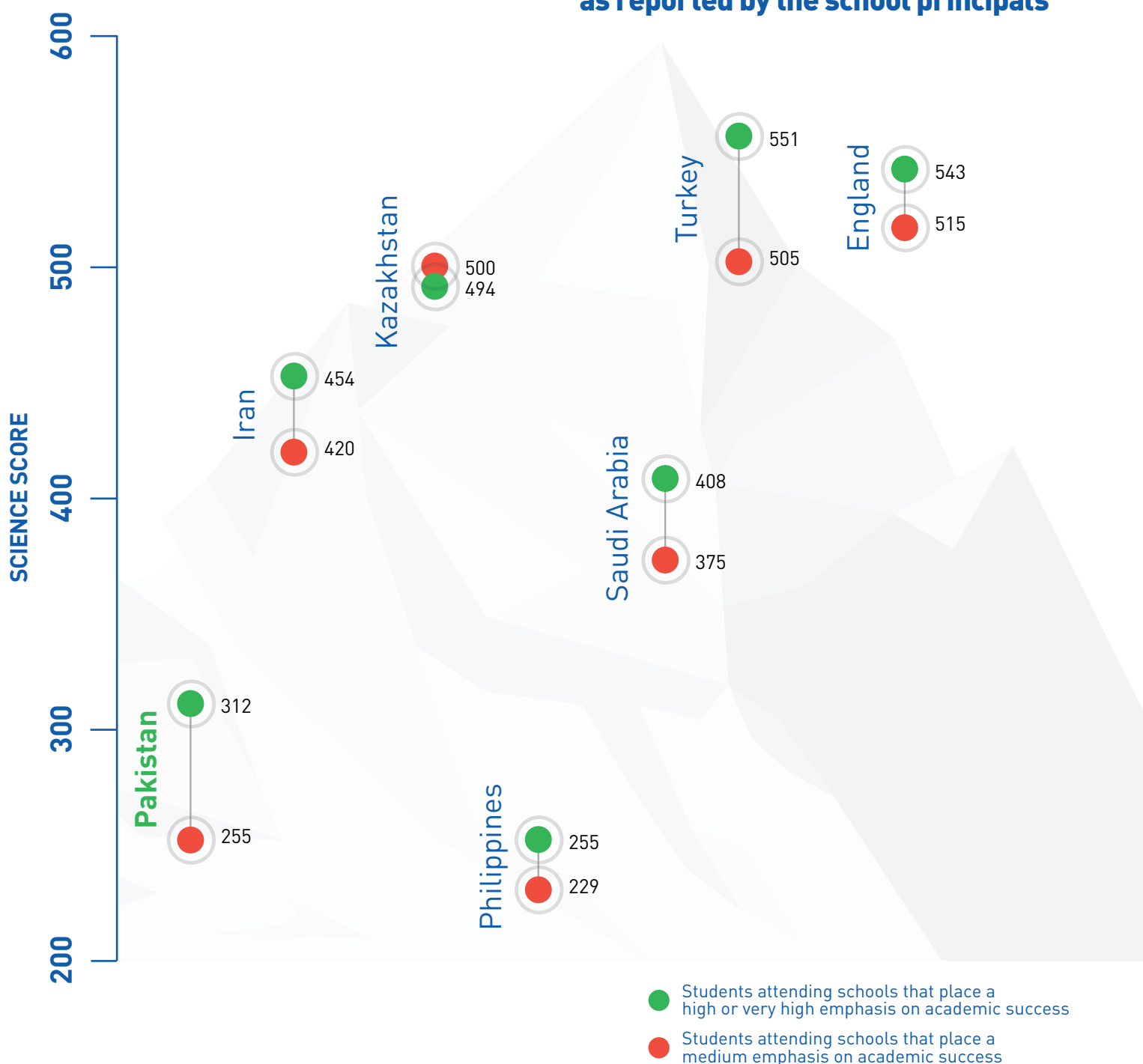| CONTENT AREA	TOPIC	Intended curriculum Intended to be taught (or not) up to grade 4 according to the Pakistani curriculum	Implemented curriculum Percent of grade 4 students already taught the topic before this year or this year
Life Sciences	Physical and behavioral characteristics of living things and major groups of living things (e.g., mammals, birds, insects, flowering plants)	**All or almost all the students**	84%
	Major body structures and their functions in humans, other animals, and plants	**All or almost all the students**	97%
	Life cycles of common plants and animals (e.g., flowering plants, butterflies, frogs)	**All or almost all the students**	79%
	Characteristics of plants and animals that are inherited	**All or almost all the students**	90%
	Interactions between organisms and their environments (e.g., physical features and behaviors that help living things survive in their environments)	**All or almost all the students**	87%
	Relationships in ecosystems (e.g., simple food chains, predator-prey relationships, competition)	**All or almost all the students**	89%
	Human health (transmission and prevention of diseases, everyday behaviors that promote good health)	**All or almost all the students**	81%
Physical Sciences	States of matter (solid, liquid, gas) and their properties (volume, shape)	**All or almost all the students**	95%
	Classifying materials based on physical properties (e.g., weight/mass, volume, state of matter, conductivity of heat or electricity)	**All or almost all the students**	70%
	Mixtures, including methods for separating a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet	**All or almost all the students**	80%
	Properties of magnets (e.g., like poles repel and opposite poles attract, magnets can attract some objects)	**All or almost all the students**	85%
	Physical changes in everyday life (e.g., changes of state, dissolving)	**All or almost all the students**	79%
	Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	**All or almost all the students**	70%
	Common sources of energy (e.g., the Sun, wind, oil) and uses of energy (heating and cooling homes, providing light)	**All or almost all the students**	80%

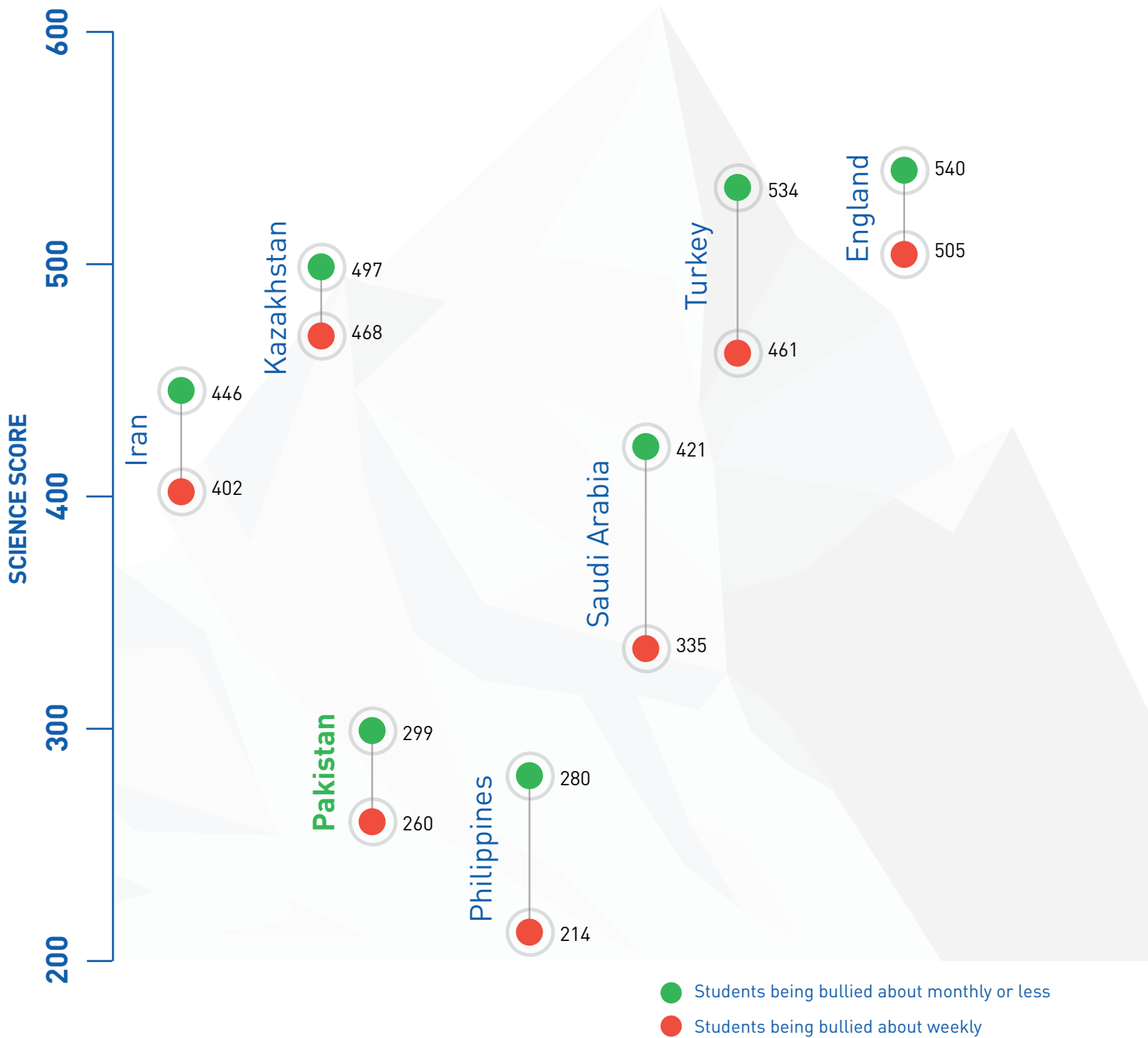| CONTENT AREA	TOPIC	Intended curriculum	Implemented curriculum
		Intended to be taught (or not) up to grade 4 according to the Pakistani curriculum	**Percent of grade 4 students already taught the topic before this year or this year**
Physical Sciences	Light and sound in everyday life (e.g., shadows and reflections, vibrating objects make sound)	All or almost all the students	80%
	Heat transfer (e.g., energy flows from a hot object to a colder object)	All or almost all the students	83%
	Electricity and simple electrical circuits (e.g., a circuit must be complete to work correctly)	All or almost all the students	73%
	Forces that cause objects to move (e.g., gravity, pushing/pulling) or change their motion (e.g., friction)	All or almost all the students	84%
	Simple machines (e.g., levers, pulleys, wheels, ramps) that help make motion easier	All or almost all the students	81%
Earth Science	Physical makeup of Earth's surface (e.g., land and water in unequal proportions, sources of fresh and salt water)	All or almost all the students	49%
	Earth's resources used in everyday life (e.g., water, wind, soil, forests, oil, natural gas, minerals)	All or almost all the students	79%
	Changes in Earth's surface over time (e.g., mountain building, weathering, erosion)	All or almost all the students	39%
	Fossils and what they can tell us about past conditions on Earth	All or almost all the students	54%
	Weather and climate (e.g., daily, seasonal, and locational variations versus long term trends)	All or almost all the students	51%
	Objects in the Solar System (the Sun, the Earth, the Moon, and other planets) and their movements	All or almost all the students	75%
	Earth's motion and related patterns observed on Earth (e.g., day and night, seasons)	All or almost all the students	91%
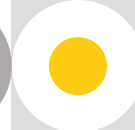
ACHIEVEMENT GAP BY SCHOOL EMPHASIS ON ACADEMIC SUCCESS

Science achievement of students by school emphasis on academic success, as reported by the school principals

SCIENCE SCORE

Turkey 551 / 505

England 543 / 515

Kazakhstan 500 / 494

Iran 454 / 420

Saudi Arabia 408 / 375

Pakistan 312 / 255

Philippines 255 / 229

● Students attending schools that place a high or very high emphasis on academic success

● Students attending schools that place a medium emphasis on academic success

ACHIEVEMENT GAP BY STUDENTS' BULLYING

Science achievement by students' bullying

SCIENCE SCORE

600

Iran
446
402

Kazakhstan
497
468

Saudi Arabia
421
335

Turkey
534
461

England
540
505

500

400

Pakistan
299
260

Philippines
280
214

300

200

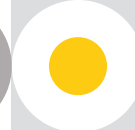● Students being bullied about monthly or less
● Students being bullied about weekly
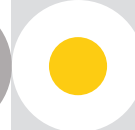
ACHIEVEMENT GAP BY STUDENTS' SENSE OF BELONGING TO THE SCHOOL

Science achievement by students' sense of belonging to the school

SCIENCE SCORE

England 544 530

Turkey 536 507

Kazakhstan 501 484

Iran 451 436

Saudi Arabia 416 392

Pakistan 294 287

Philippines 272 235

600
500
400
300
200

- Students having high sense of belonging
- Students having some or little sense of belonging
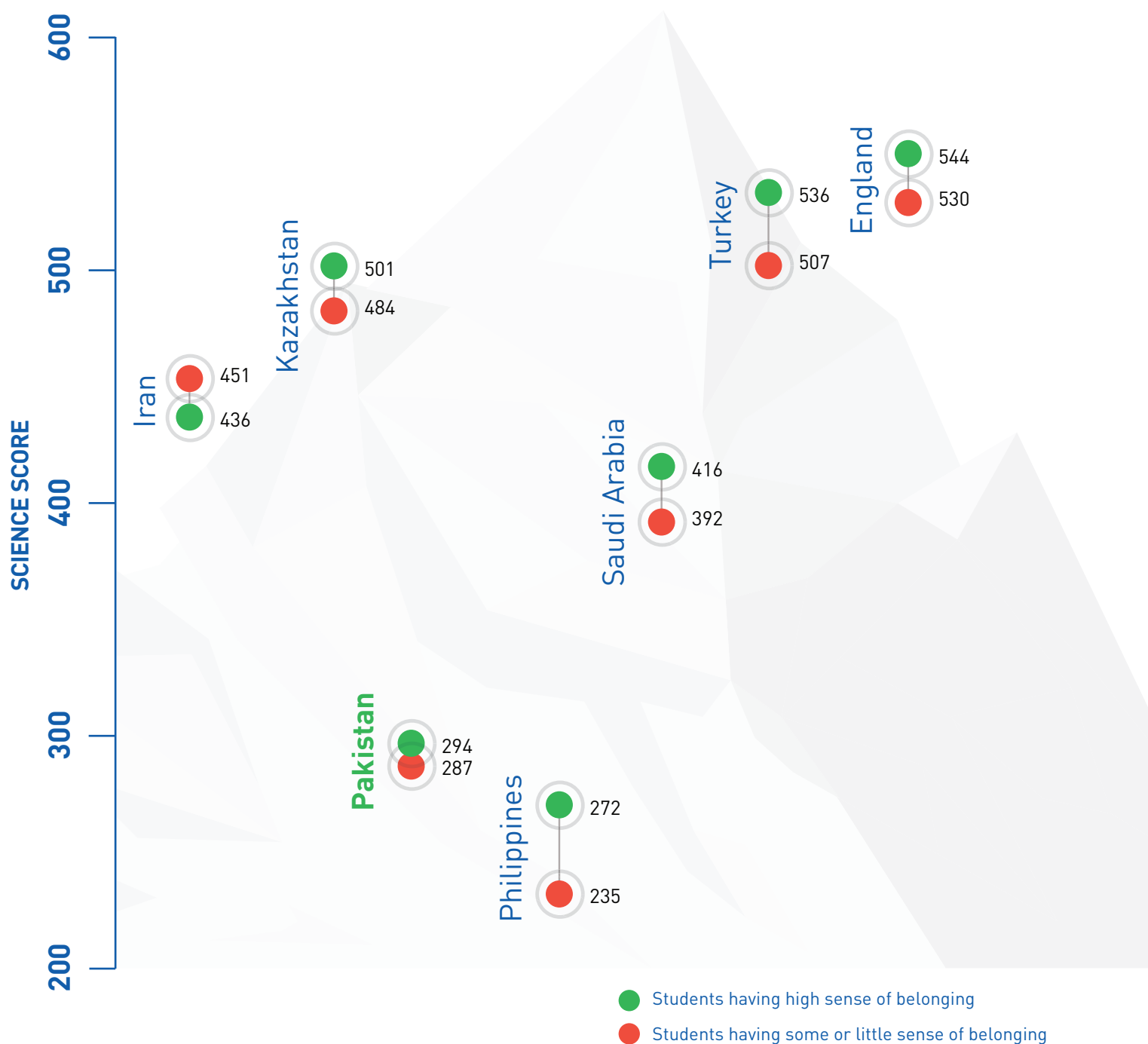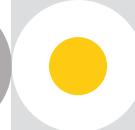
ACHIEVEMENT GAP BY PARENTS' SATISFACTION WITH THE SCHOOLS

Science achievement of students by parents' satisfaction with the school

SCIENCE SCORE

Turkey
- 532
- 524

Kazakhstan
- 501
- 494

Iran
- 443
- 437

Saudi Arabia
- 410
- 388

Pakistan
- 304
- 255

Philippines
- 261
- 215

● Students whose parents are very satisfied with the school

● Students whose parents are somewhat satisfied or less with the school
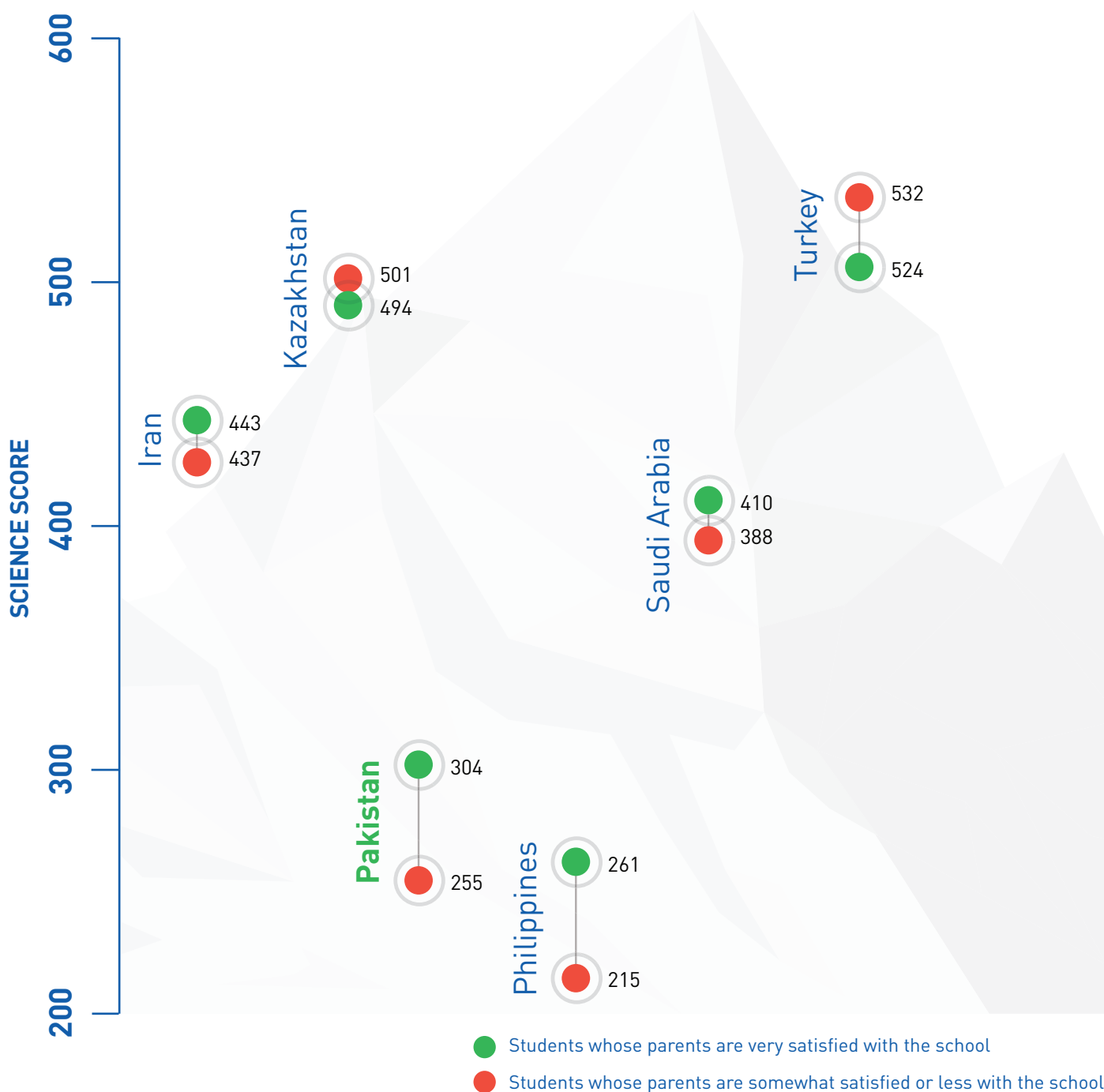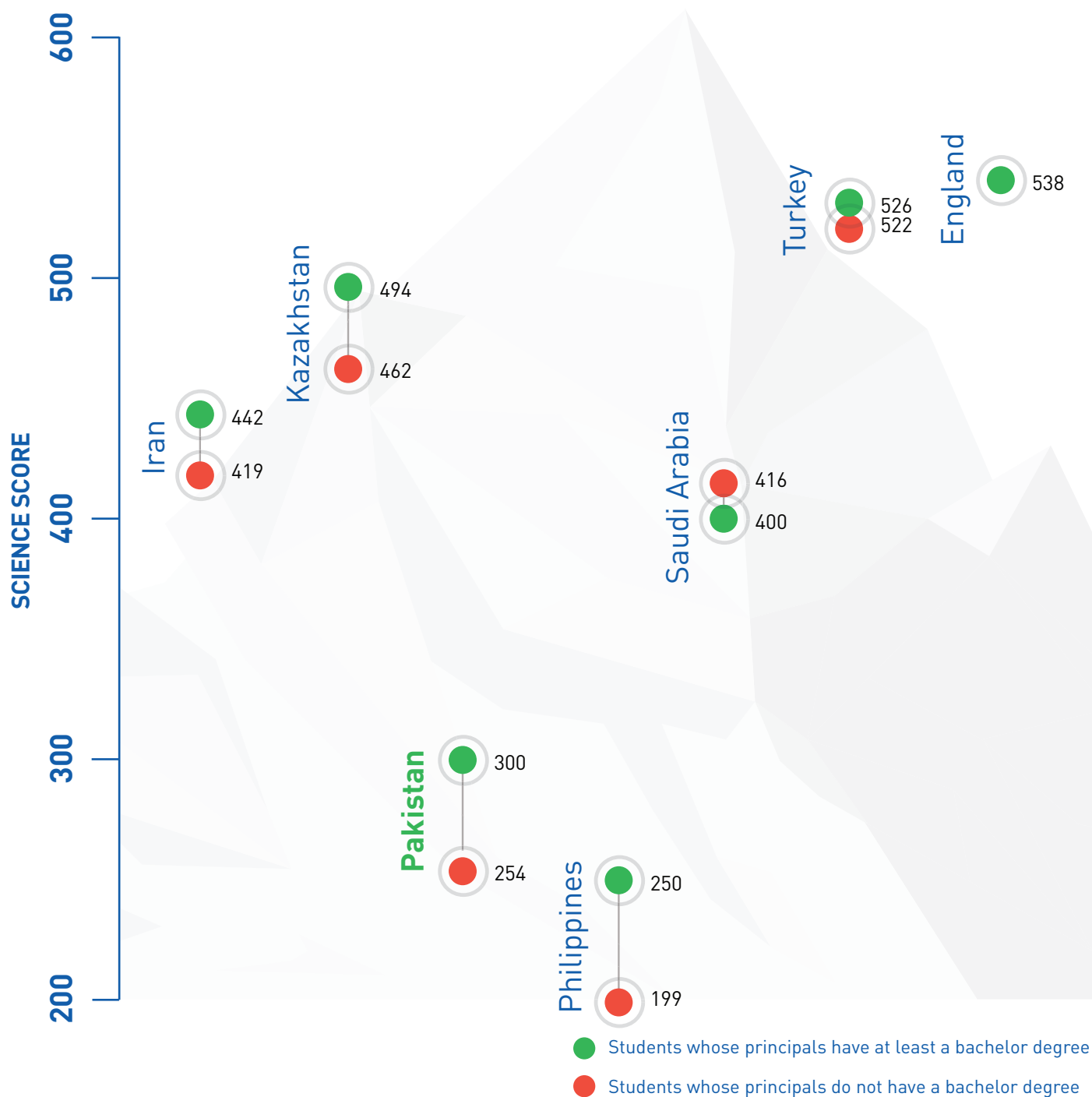
DATA NOT AVAILABLE FOR ENGLAND

ACHIEVEMENT GAP BY
SCHOOL PRINCIPALS' QUALIFICATIONS

**Science achievement of students
by principals' qualifications**

SCIENCE SCORE

600

Turkey 526
522

England 538

500

Kazakhstan 494

462

Iran 442

419

Saudi Arabia 416

400

400

300

Pakistan 300

254

Philippines 250

199

200

● Students whose principals have at least a bachelor degree

● Students whose principals do not have a bachelor degree

IN SOME COUNTRIES, ALL STUDENTS ARE IN THE SAME GROUP

ACHIEVEMENT GAP BY TEACHERS' QUALIFICATIONS

Science achievement of students by teachers' qualifications

SCIENCE SCORE

Kazakhstan
- 496
- 478

Iran
- 442
- 432

Turkey
- 526

England
- 538

Saudi Arabia
- 422
- 398

Table Average
- 426
- 369

Pakistan
- 313
- 286

Philippines
- 252
- 246

● Students whose teachers have at least a bachelor degree
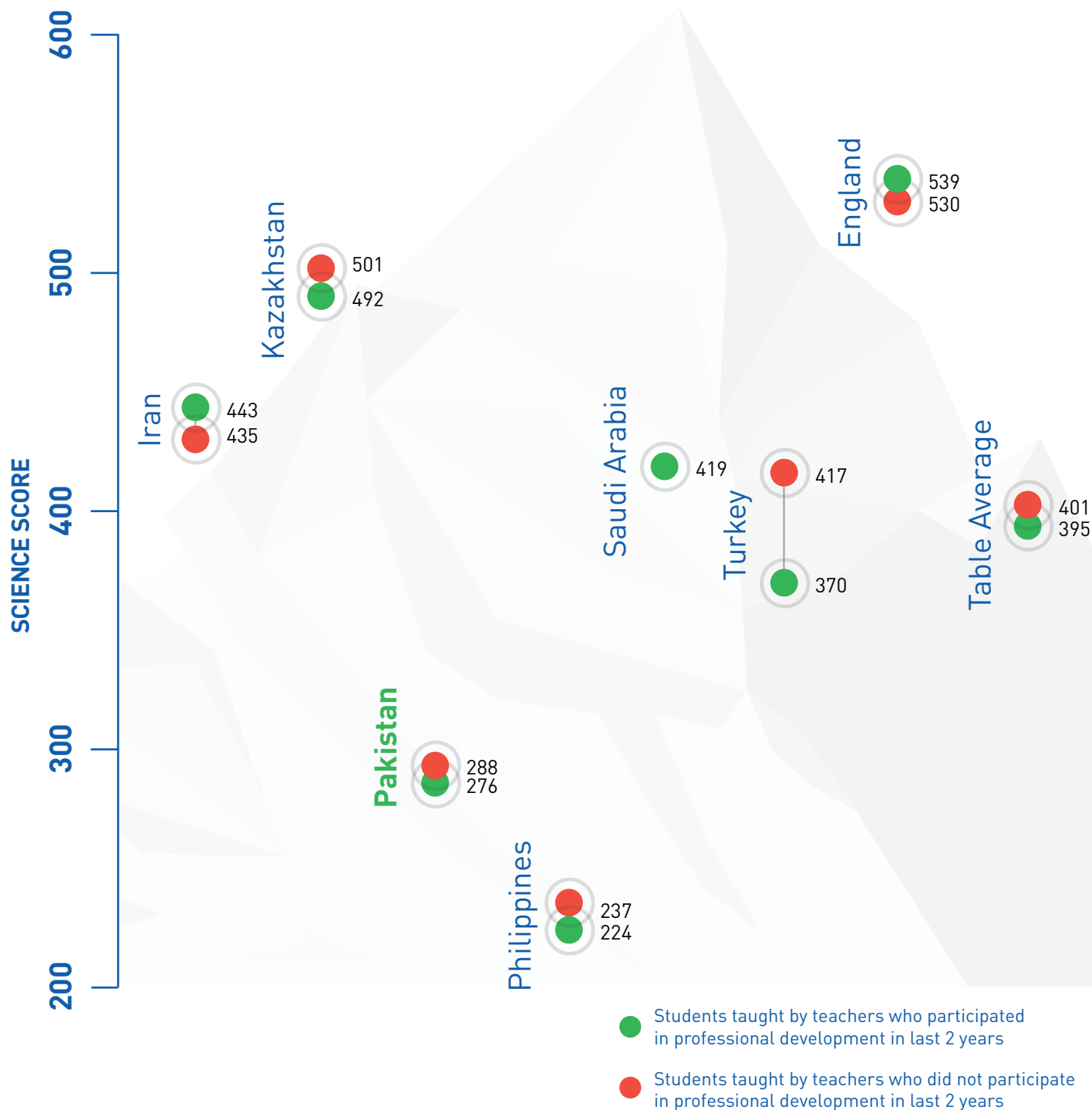● Students whose teachers do not have a bachelor degree
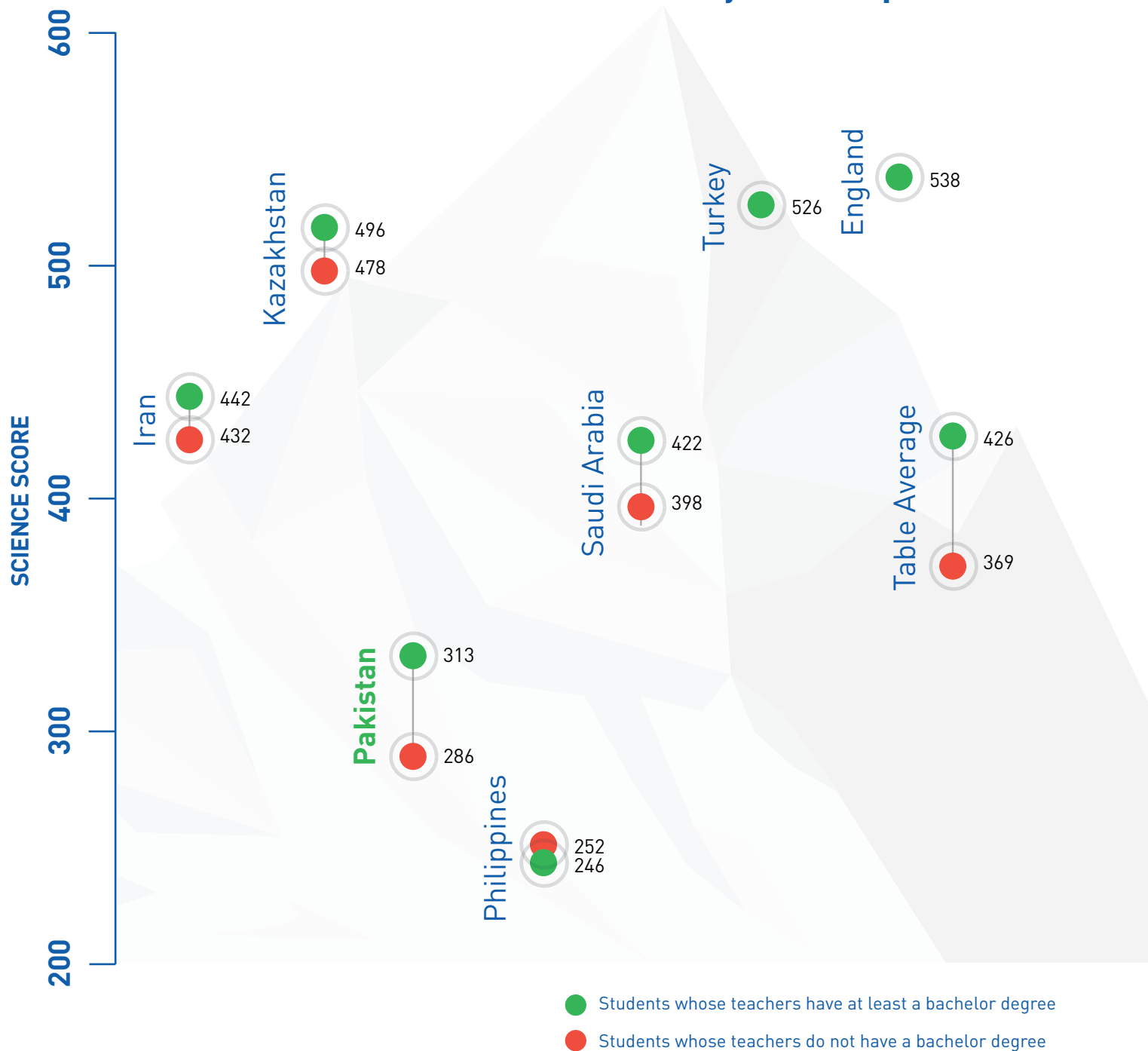
IN SOME COUNTRIES, ALL STUDENTS ARE IN THE SAME GROUP
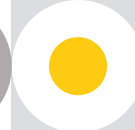
ACHIEVEMENT GAP BY TEACHERS' PROFESSIONAL DEVELOPMENT

Science achievement of students by teachers´ participation in professional development

SCIENCE SCORE

England 539 530

Kazakhstan 501 492

Iran 443 435

Saudi Arabia 419

Turkey 417 370

Table Average 401 395

Pakistan 288 276

Philippines 237 224

● Students taught by teachers who participated in professional development in last 2 years

● Students taught by teachers who did not participate in professional development in last 2 years
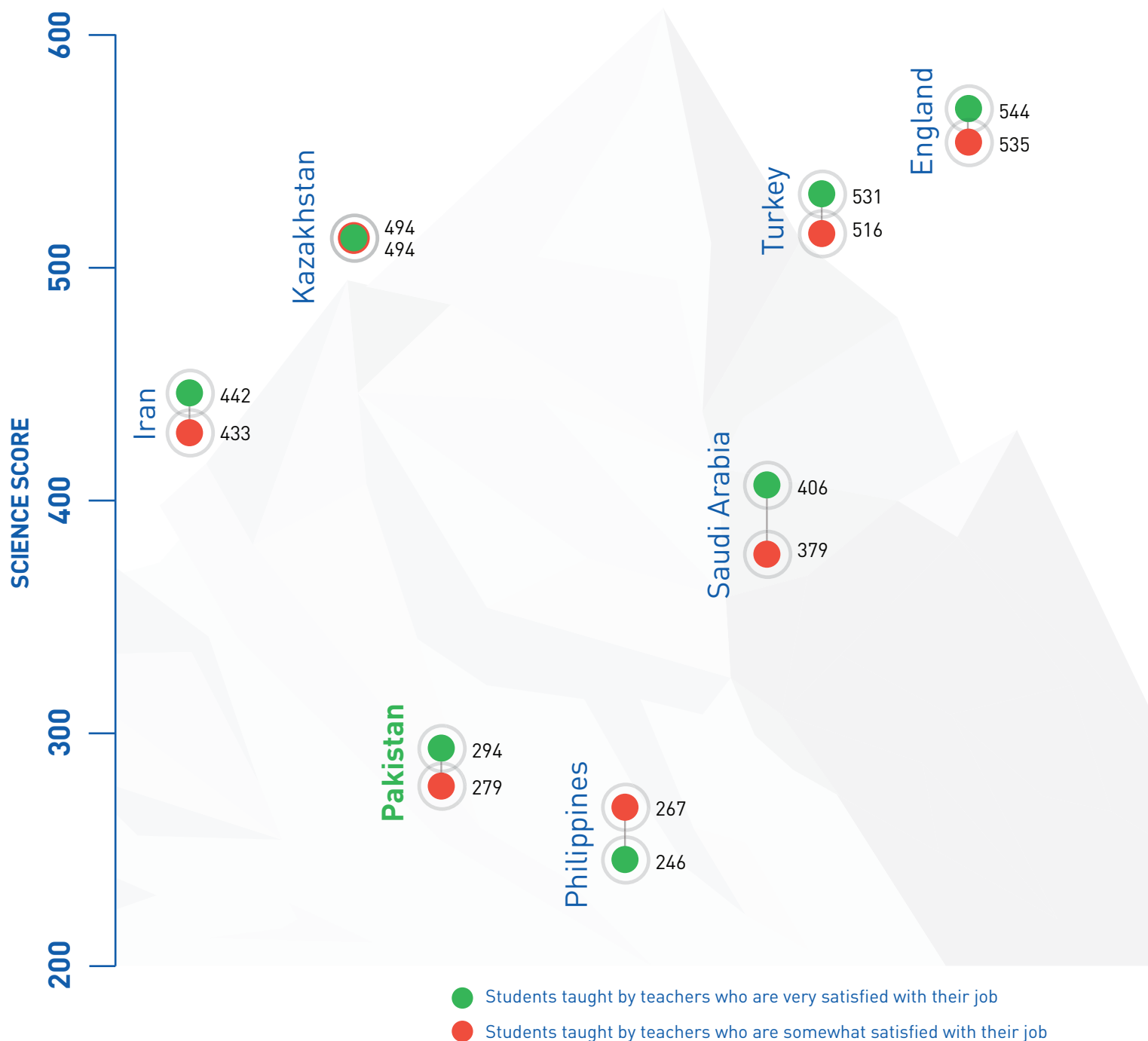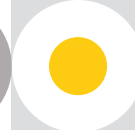
IN SOME COUNTRIES, ALL STUDENTS ARE IN THE SAME GROUP
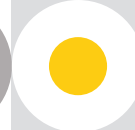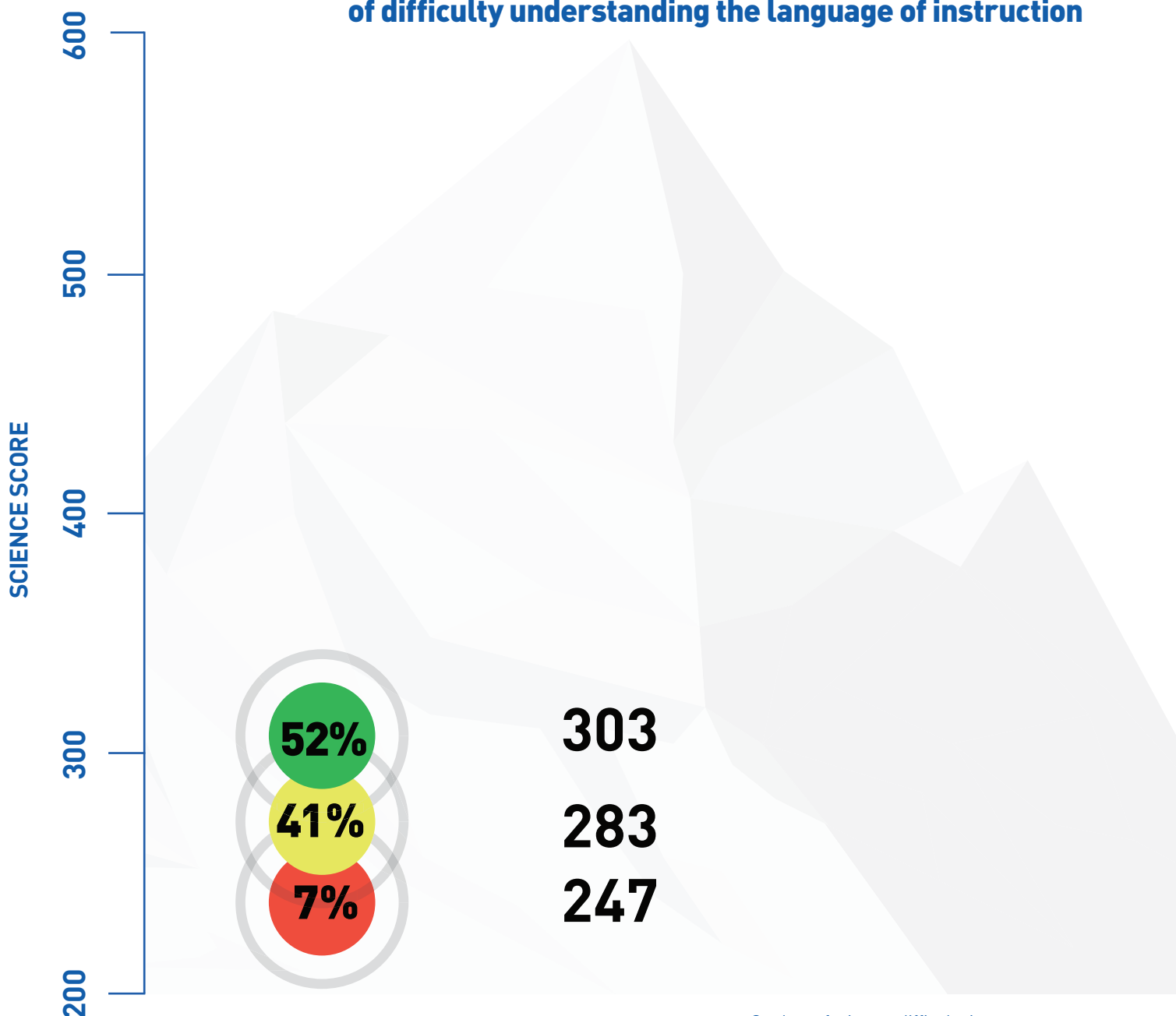
ACHIEVEMENT GAP BY TEACHERS' JOB SATISFACTION

Science achievement of students by level of job satisfaction of their teachers

SCIENCE SCORE

England
544
535

Kazakhstan
494
494

Turkey
531
516

Iran
442
433

Saudi Arabia
406
379

Pakistan
294
279

Philippines
267
246

● Students taught by teachers who are very satisfied with their job

● Students taught by teachers who are somewhat satisfied with their job

ACHIEVEMENT GAP BY STUDENTS' LEVEL OF UNDERSTANDING OF THE LANGUAGE OF INSTRUCTION

Science achievement of students facing different levels of difficulty understanding the language of instruction

SCIENCE SCORE

600

500

400

300

200

52%   303

41%   283

7%   247

● Students facing no difficulty in understanding the language of instruction

● Students facing some difficulty in understanding the language of instruction

● Students facing a lot of difficulty in understanding the language of inst