Department for Education

Trends in International Mathematics and Science Study (TIMSS) 2023: National report for England Volume 2

Research report

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Government Social Research

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About the research team

The Principal Investigators are based at UCL Institute of Education in the Department of Curriculum Pedagogy and Assessment. Dr Mary Richardson, Professor of Educational Assessment and Dr Jennie Golding, Associate Professor of Mathematics Education, oversaw all aspects of the research analysis, reporting and dissemination.

David Wilkinson led the statistical analysis for the report, with support from PhD student Robbie Maris. David is a Principal Research Fellow in the Social Research Institute at UCL. Dr Tina Isaacs, Honorary Associate Professor of Educational Assessment, led the drafting of the report with support from Dr Iain Barnes. Christina Swensson provided project management throughout. Iain and Christina are both associates of the UCL Centre for Educational Leadership.

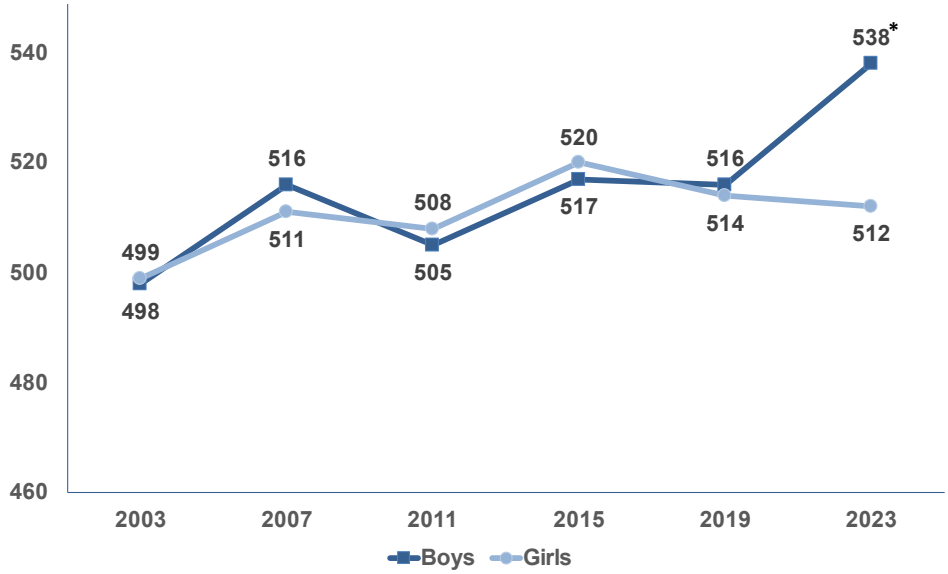
Executive summary

Volume 1 of the *TIMSS 2023 National Report for England*[1] analysed the TIMSS 2023 performance of a sample of year 5 and year 9 pupils in mathematics and science in England. This second volume of the *TIMSS 2023 National Report for England* focuses on performance in England analysed by pupil characteristics[2] and participating pupils' experiences of mathematics and science teaching and learning, as reported by pupils, their teachers and their headteachers in TIMSS questionnaires; it also includes, where appropriate, some international comparisons.

Performance by gender

- In 2023 the average score for year 5 boys (561) was significantly above that for girls (543) in mathematics in England. This was in contrast to 2019 when, although boys' average score was above that for girls, the difference was not significant (560 and 552 respectively).
- In 2023, the year 9 boys' average score (538) was significantly above the year 9 girls' average score (512) in mathematics in England. This performance of pupils in England was in contrast to 2019 when boys' and girls' scores were similar (516 and 514 respectively).

Figure 1: Trends in year 9 performance by gender in mathematics 2003-2023 (England average scores)



Source: TIMSS International Report 2023

Note 1: An average score marked with an asterisk denotes significant difference between boys' and girls' average scores.

[1] See *TIMSS 2023 National Report for England: Volume 1*. Available at: https://assets.publishing.service.gov.uk/media/6749d3f22ac8a6da30723aa2/TIMSS_2023_national_report_for_England.pdf

[2] Characteristics include gender, language spoken at home and socio-economic status, with some analysis drawing on matched National Pupil Database data.

Table 1: Trends in year 9 performance by gender in mathematics 2003-2023 (England average scores)

Year	Boys' average score	Girls' average score
2003	498	499
2007	516	511
2011	505	508
2015	517	520
2019	516	514
2023	538 (significantly different from girls)	512

Source: TIMSS International Report 2023

- The 26 point scale score difference between year 9 boys' and girls' average scores in England was the largest for any of the countries participating in 2023.
- In 2023, the year 5 boys' average score in science (559) was not significantly different from the girls' average score in England (555). This mirrored the 2019 study when their average scores were the same (537).
- In 2023, the average score for year 9 boys in science (538) was significantly above that for girls (524) in England. This performance of pupils was in contrast to 2019 when boys' and girls' scores were not significantly different (515 and 518 respectively).
- The 14 point scale score difference between year 9 boys' and girls' average science scores in England was the largest for any of the countries participating in 2023 where boys' performance exceeded girls'.
- The percentages of year 5 and year 9 boys in England reaching most of the international benchmarks in mathematics were significantly larger than the percentages of girls reaching these.
- Significantly larger percentages of year 9 boys in England reached the advanced and high or above benchmarks in science compared with girls in 2023.
- Bigger gender gaps in favour of boys were the norm across participating countries in TIMSS 2023.

Performance by first language

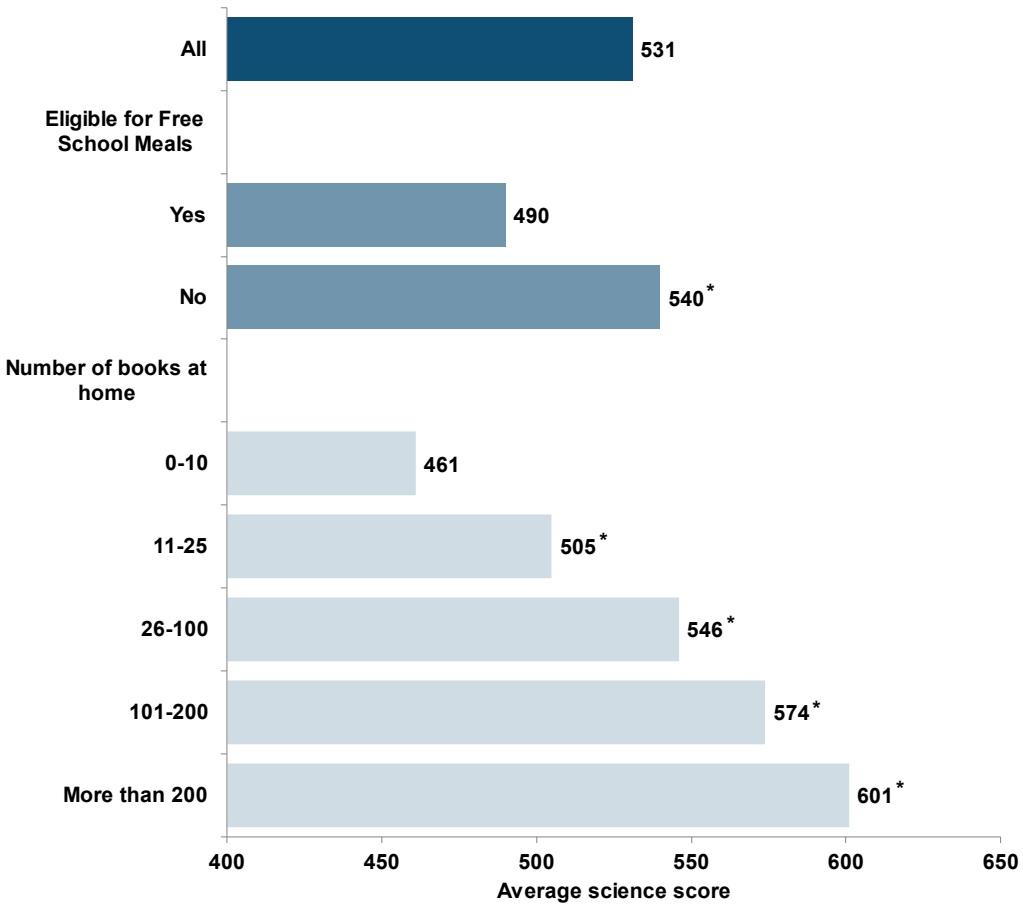
- In science, the average scores for both year 5 and year 9 pupils in England whose first language was English were significantly above the average scores for pupils whose first language was not English.

- Larger percentages of year 5 pupils whose first language was English reached each benchmark in science compared with their peers for whom their first language was not English. The differences between these percentages were not significant.
- Significantly larger percentages of year 9 pupils whose first language was English reached most benchmarks in science.

Performance by socio-economic status

- Pupils who had been eligible for free school meals (FSM) at any time in the previous 6 years performed significantly lower across both year groups and both subjects than their peers who had not been eligible for FSM.

Figure 2: Average scores in year 9 science by eligibility for free school meals and number of books at home (England)



Source: NPD and IEA TIMSS International Report 2023

Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

Table 2: Average scores in year 9 science by eligibility for free school meals and number of books at home (England)

Characteristic	Average score
All pupils	531
Eligible for FSM	490
Not eligible for FSM	540 (significantly different)
0-10 books at home	461
11-25 books at home	505 (significantly different)
26-100 books at home	546 (significantly different)
101-200 books at home	574 (significantly different)
More than 200 books at home	601 (significantly different)

Source: NPD and IEA TIMSS International Report 2023

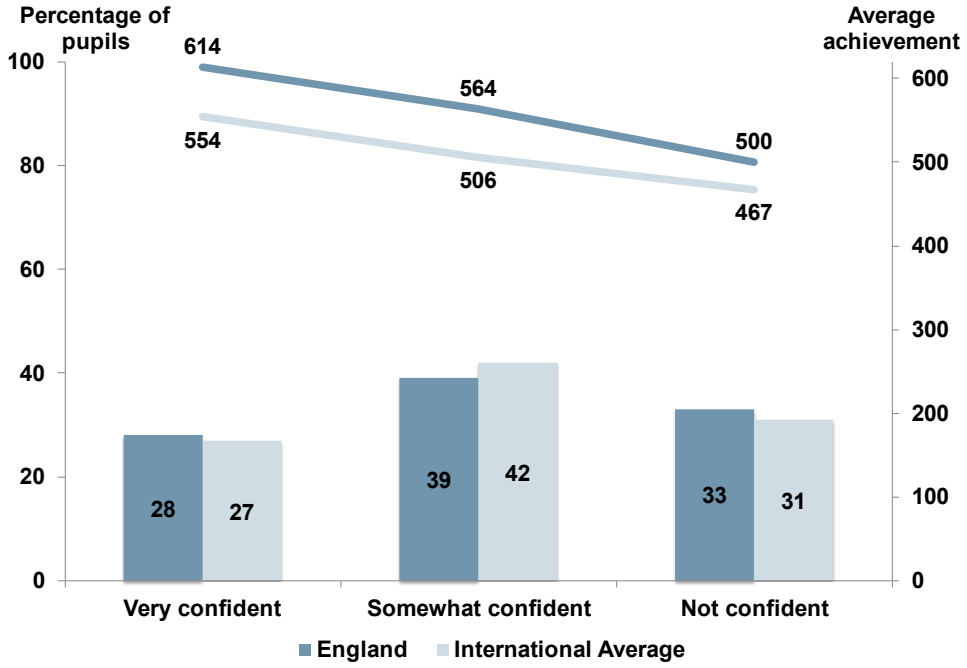
Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

- Significantly smaller percentages of pupils in both year groups and subjects who had been eligible for FSM in the last 6 years reached each benchmark than their peers.

Performance by attitudinal factors (Instructional clarity, pupils' confidence in their ability in a subject, valuing the subject and liking the subject)

- Across all attitudinal factors (instructional clarity, pupils' confidence in their ability in a subject, valuing the subject and liking the subject) pupils' confidence in their ability was most strongly associated with performance.
- There was a positive and significant association between the extent to which England's year 5 and year 9 pupils reported that their lessons provided instructional clarity and their mathematics and science performance.
- There was a positive and significant association between confidence in mathematical ability and average scores in both years 5 and 9. Pupils in both year groups who were very confident in mathematics scored over 100 scale points higher, on average, compared to their peers who were not confident, as did pupils in year 9 science. The same associations were evident in year 5 science, although the scale point differences were not as high.

Figure 3: The percentage of year 5 pupils reporting the extent to which they were confident in their mathematical ability and their average score in 2023 (England and international average)



Source: IEA TIMSS International Report 2023

Table 3: The percentage of year 5 pupils reporting the extent to which they were confident in their mathematical ability and their average score in 2023 (England and international average)

Confidence in mathematical ability	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very confident	614	554	28	27
Somewhat confident	564	506	39	42
Not confident	500	467	33	31

Source: IEA TIMSS International Report 2023

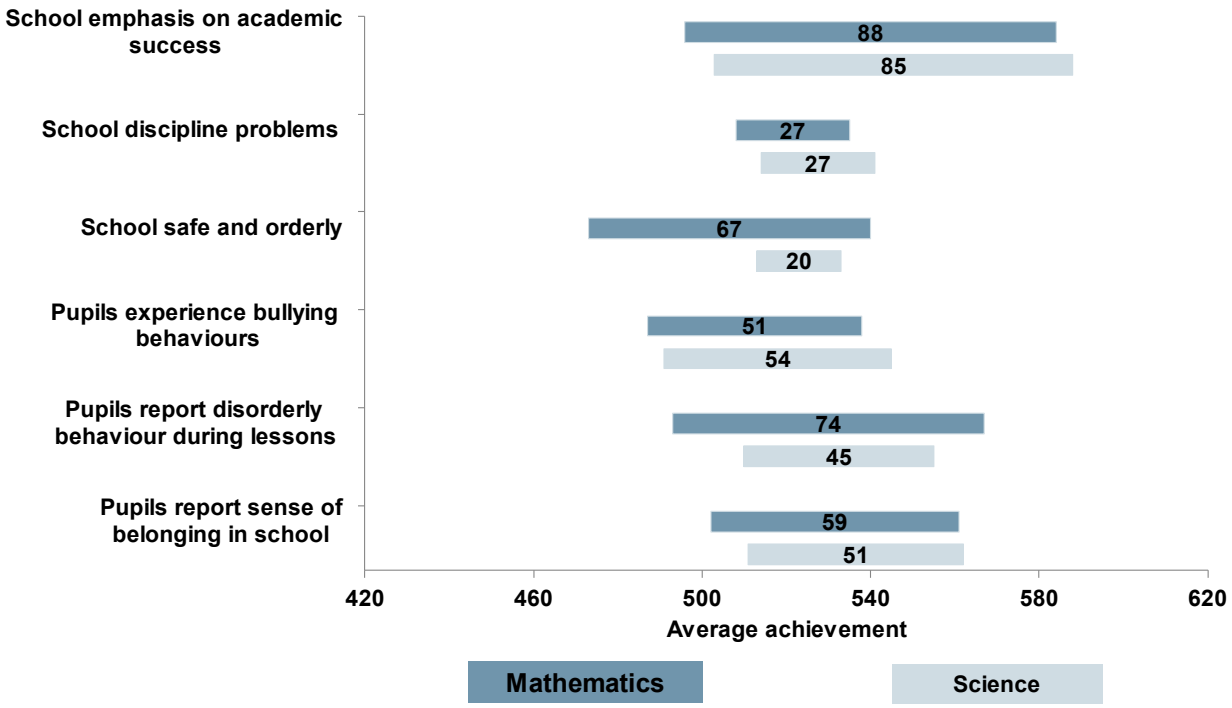
- Year 9 pupils who strongly valued mathematics and science had significantly higher average scores compared with their peers who did not value these subjects.
- Both year 5 and year 9 pupils who very much liked learning mathematics and science had significantly higher average scores compared with their peers who did not like learning these subjects.

- Across both year groups in mathematics and in year 9 science, significantly larger percentages of boys were very confident and significantly larger percentages of girls were not confident. The same findings applied to the percentages of boys who very much liked learning the subjects and of girls who did not like learning the subjects.
- Pupils in England overall showed that they were knowledgeable about the environment in both years 5 and 9. Their knowledge corresponded well with their overall science average score.

Performance by school environment

- As shown in Figure 4 and Table 4 below, there were 3 factors most strongly associated with pupils' performance at both years 5 and 9 in England. These were the same as in 2019:
    - headteachers reporting that their schools placed an emphasis on academic success (a significantly positive association with performance)
    - pupils reporting disorderly behaviour in school (a significantly negative association with performance)
    - pupils reporting experiencing bullying behaviour in schools (a significantly negative association with performance)
- In mathematics and science in both years 5 and 9, there was a positive and significant association between a reported emphasis on academic success and average scores.
- Across all reported aspects of discipline, disorderly behaviour and bullying, there was a negative and significant association with pupils' performance in both year groups and subjects: the less that pupils were adversely impacted, the higher their performance.

Figure 4: Differences in pupil and school characteristics and average score in mathematics and science (England, year 9)



Source: IEA TIMSS International Report 2023

Table 4: Differences in pupil and school characteristics and average score in mathematics and science (England, year 9)

Factor	Range in mathematics (average score)	Range in science (average score)
School emphasis on academic success	88	85
School discipline problems	27	27
Schools safe and orderly	67	20
Pupils experience bullying behaviours	51	54
Pupils report disorderly behaviour in class	74	45
Pupils report a sense of belonging	59	51

Source: IEA TIMSS International Report 2023

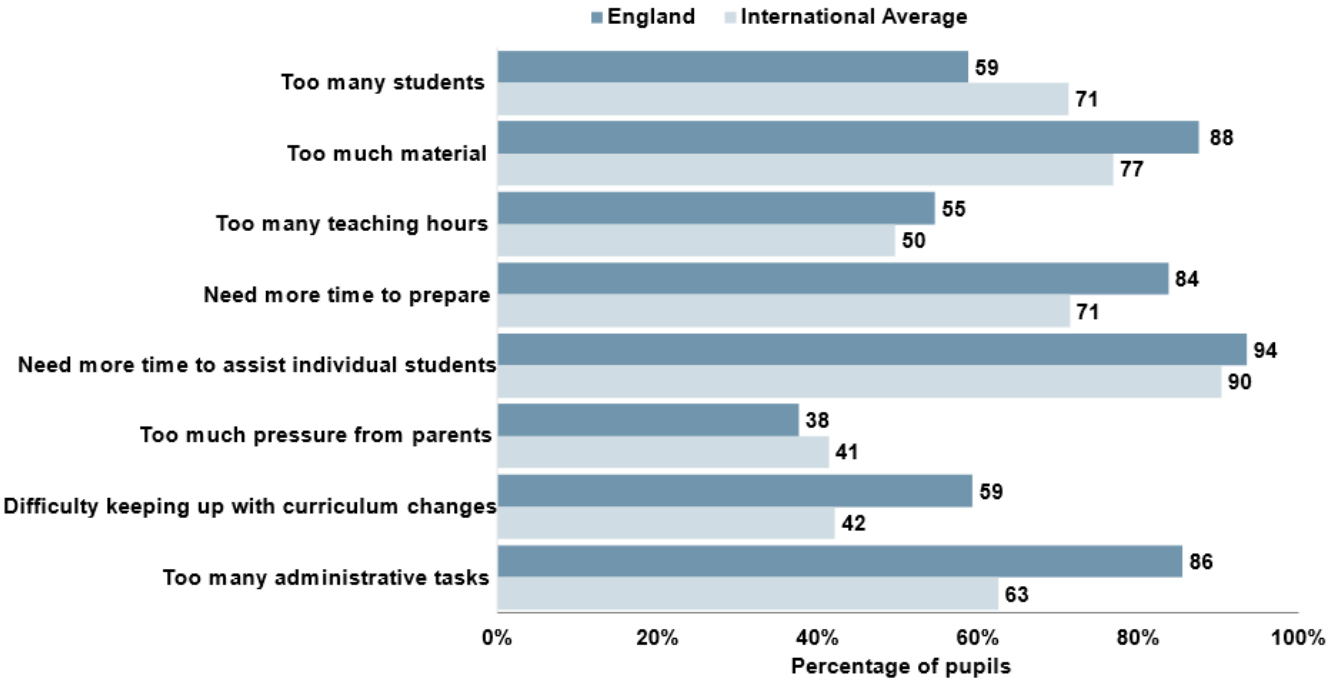
- There was a significant positive association between pupils agreeing that they felt a greater sense of school belonging and higher average mathematics and science scores in both year 5 and year 9.

Performance by teachers and teaching

- In year 5, 45% of England's pupils were taught mathematics by teachers with fewer than 10 years' experience, above the international average. The percentage of pupils in England taught by teachers with more than 20 years' experience was below the international average. The same findings applied to year 5 science. However, there was no significant difference in average mathematics and science performance for different levels of teacher experience.
- The largest percentage of year 9 pupils were taught mathematics by teachers with at least 10 but fewer than 20 years' experience; 19% were taught by teachers with 20 or more years' experience. There was no significant difference between the average score for pupils taught by teachers with 20 or more years' experience compared with those taught by teachers with fewer than 5 years' experience, in contrast to 2019 when pupils taught by teachers with 20 or more years' experience had an average score 55 scale points above those taught by teachers with fewer than 5 years' experience.
- Year 5 and year 9 pupils were taught mathematics and science by teachers who considered their professional development needs to be primarily improving pupils' critical thinking or problem solving skills and integrating technology into mathematics or science instruction. The third area of need in science represented the introduction of a new category for 2023: integrating environmentalism into science instruction.
- In year 5, 39% of pupils were taught mathematics by teachers who were very satisfied with their jobs; 11% were taught by teachers who were less than satisfied with their jobs, compared with 1% in 2019. There were no significant differences between pupils' average scores taught by teachers in the different categories.
- In year 9, 48% of pupils were taught mathematics by teachers who were very satisfied with their job; 13% were taught by teachers who were less than satisfied with their job, compared with 6% in 2019.
- The average score for year 9 pupils taught mathematics by teachers who were very satisfied with their job was significantly above the score for pupils taught by teachers who were less than satisfied with their job.
- In year 9, 41% of pupils were taught science by teachers who were very satisfied with their job; 19% were taught by teachers who were less than satisfied with their job. There were no significant differences between pupils' average scores taught by teachers in the different categories.
- More than 80% of year 5 pupils were taught by teachers who reported they were affected either a lot or a little by: needing more time to assist individual pupils; too

much material to cover in class; needing more time to prepare for class; and having too many administrative tasks.

Figure 5: Percentages of year 5 pupils whose teachers reported they were affected by certain factors either a lot or a little (England and international average – mathematics and science combined)



Source: IEA TIMSS International Report 2023

Table 5: Percentages of year 5 pupils whose teachers reported they were affected by certain factors either a lot or a little (England and international average – mathematics and science combined)

Factor	England	International average
There are too many students in the classes	59	71
I have too much material to cover in class	88	77
I have too many teaching hours	55	50
I need more time to prepare for class	84	71
I need more time to assist individual students	94	90
I feel too much pressure from parents	38	41
I have difficulty keeping up with all of the changes to the curriculum	59	42
I have too many administrative tasks	86	63

Source: IEA TIMSS International Report 2023

- More than 80% of year 9 pupils were taught mathematics by teachers who reported they were affected either a lot or a little by: needing more time to assist individual pupils and having too many administrative tasks.
- More than 80% of year 9 pupils were taught science by teachers who reported they were affected either a lot or a little by: needing more time to assist individual pupils; having too many students in class; having too much material to cover in class; having too many administrative tasks; or needing more time to prepare for class.

Performance by resources and GCSE provision

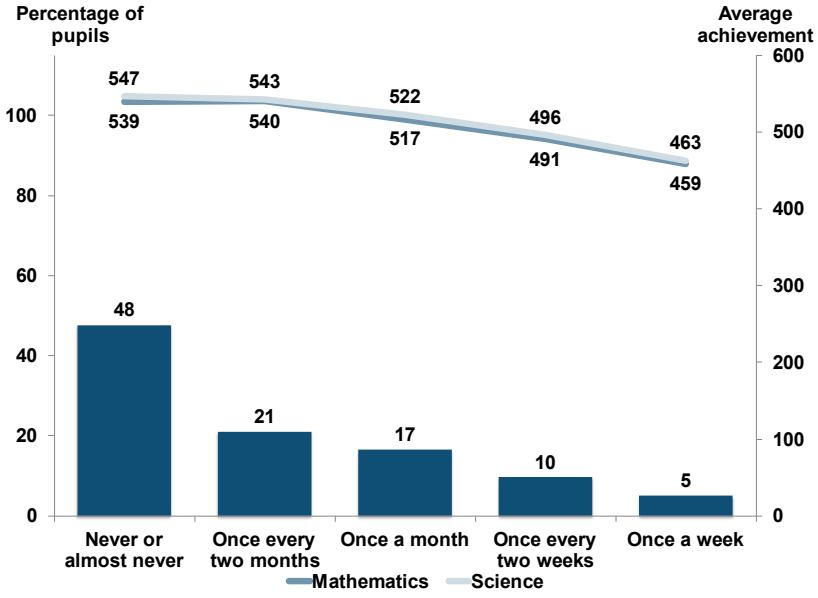
- In years 5 and 9 mathematics and year 9 science, the percentages of pupils who had access to digital devices (computers, tablets or smartphones) in lessons were below the international averages. In year 5 science, pupils' access to devices was above the international average.
- Lack of access to devices was the main barrier faced by teachers of year 5 and year 9 pupils that prevented them from incorporating devices to support learning in mathematics and science.
- Smaller percentages of year 5 and year 9 pupils were asked to conduct science experiments at least once a week than the international averages, although the percentage who were asked to do so once or twice a month was above the international average.
- In year 9, 41% of pupils were taught mathematics in schools that started GCSE provision in year 9. Their average score was 555, significantly higher than the average score for pupils in schools that did not start such provision in year 9 (510).
- In year 9, 59% of pupils were taught science in schools that started GCSE provision in year 9. Their average score was 541, not significantly different from the average score for pupils in schools that did not start such provision (528).

Performance by home environment (Including resources, attendance, behaviour and readiness for learning)

- For year 9 pupils in England, there was a significant positive association between having more resources at home and higher average mathematics scores in 2023. The difference between the average scores for pupils with many and few resources was 116 scale points.

- The same associations were found in year 9 science, however the scale point difference between the average scores for pupils with many resources and few resources was larger (123).
- Smaller percentages of year 5 and 9 pupils in England reported that they were never or almost never absent from school in 2023 (65% and 48%) compared with 2019 (68% and 59% respectively). However, both 2023 percentages were above the international averages (55% and 46%).
- There was some evidence of a significant positive association between lower absence rates and higher performance in both mathematics and science for year 5 and year 9 pupils. Pupils who were absent once a week had significantly lower average mathematics scores than their peers who were absent less frequently.
- The difference between the average mathematics score between year 5 pupils in England who were never or almost never absent and those who were absent once a week was 108 scale points, larger than in 2019 (93).
- In science, this difference for year 5 pupils was 101 scale points in 2023, above that recorded in 2019 (83).
- The difference between the average mathematics score between year 9 pupils who were never or almost never absent and those who were absent once a week was 80 scale points, similar to that recorded in 2019.
- In science, the difference in the average score of pupils who were never or almost never absent and those who were absent once a week was 84 scale points, smaller than in 2019 (92).

Figure 6: The percentage of year 9 pupils reporting school absence and their average achievement in mathematics and science (England)



Source: IEA TIMSS International Report 2023

Table 6: The percentage of year 9 pupils reporting school absence and their average achievement in mathematics and science (England)

Frequency of absence	Average mathematics score	Average science score
Never or almost never	539	547
Once every 2 months	540	543
Once a month	517	522
Once every 2 weeks	491	496
Once a week	459	463

Source: IEA TIMSS International Report 2023

- Year 5 and year 9 pupils taught mathematics and science in classrooms where teaching was limited to a very little extent by other pupils not ready for instruction had significantly higher average scores than their peers taught in classrooms where teaching was limited to some extent.
- In year 5 mathematics, 55% of pupils in England felt tired when they arrived at school almost every day or every day. The average score for pupils who felt tired every day was significantly below the average scores for their peers in each of the other categories[3]. The same association was found for year 5 science.
- In year 5 mathematics, 42% of pupils felt hungry when they arrived at school almost every day or every day. The average score for pupils who felt hungry every day was significantly below the average scores for their peers in each of the other categories. The average score for pupils in England who felt hungry almost every day was also significantly below the average scores for their peers who never or sometimes felt hungry. The same association was found for year 5 science.
- In year 9 mathematics, 3% of pupils reported that they never felt tired when they arrived at school; 68% of pupils felt tired almost every day or every day. The average score for pupils in England who felt tired every day was significantly below the average scores for their peers who felt tired sometimes or almost every day, but not those who reported never being tired.
- The same associations were found for year 9 science with one exception. The average scores for pupils who sometimes felt tired as well as those who felt tired almost every day were significantly above the average score for their peers who never felt tired.

[3] The response options were: every day; almost every day; sometimes; never.

- In year 9 mathematics 25% of pupils reported that they never felt hungry when they arrived at school; 30% felt hungry almost every day or every day. Pupils who felt hungry every day had a significantly lower average score than their peers in each of the other categories. Pupils who felt hungry almost every day had a significantly lower average score than their peers who sometimes or never felt this, while pupils who sometimes felt hungry had a significantly lower average score than their peers who never felt this.
- In science, the same associations were evident with one exception. While pupils who felt hungry almost every day had a significantly lower average score than their peers who never felt this, their average score was not significantly different from that of their peers who sometimes felt this.

Overall, the 2023 TIMSS results saw a stable or improving average performance in both subjects in both year 5 and year 9. Given the challenges of the past five years, the teachers and pupils are to be commended for their results in the assessments. However, Volume 2 demonstrates that within the details of the data are findings that indicate the need for more granular research to be conducted into gender-differential performance and attitudes and aspirations, particularly in mathematics. Disadvantage due to socio-economic status (SES) was a recurring theme in the data from this TIMSS cycle in England and requires continued attention, as do differences due to first language, to help ensure educational equity for all pupils. In addition, staff in schools in England are committed and highly experienced individuals who are challenged by complex needs in their classrooms and who would benefit from fewer administrative tasks and more time to prepare for teaching.

Introduction

Volume 1 of the *TIMSS 2023 National Report for England*[4] was published on 4 December 2024, and includes details of the TIMSS 2023 performance of a sample of year 5 and year 9 pupils in mathematics and science in England. It demonstrates the robustness of the achieved samples, analyses pupils' attainment in both subjects and also draws conclusions about their performance in relation to that of their peers in 3 sets of comparator countries. These comprise 5 East Asian countries whose pupils were generally the highest-performing across all of those participating; all 5 participating English-speaking countries; and 4 European countries. The rationale for the selection of these comparator countries is set out in Section 1.5 of Volume 1 of the *TIMSS 2023 National Report for England*, but they are also listed in Appendix A of this volume.

Headline measures of performance show improvement compared to 2019, in both year groups and across both mathematics and science. In 2023, pupils in England performed, on average, significantly[5] above the TIMSS centrepoint (500) in mathematics and science in both years 5 and 9. They also performed significantly above the 2023 international mean in both subjects and both year groups. Comparing England's pupils' overall performance in 2023 with 2019, year 5 pupils' performance remained stable in mathematics and improved significantly in science. Year 9 pupils' performance in mathematics improved but not significantly; in science it improved significantly, following a significant decrease in performance in 2019. England's pupils' performance in 2023 placed them in the second group of countries – those below the highest-performers.

Volume 1 noted that the maintained or improved levels of average performance did not apply to all groups of pupils equally, with some stagnation at the lowest levels of performance and demonstrated by some greater spread of scale scores between the highest and lowest achieving pupils. This volume explores those issues more fully. This second volume of the *TIMSS 2023 National Report for England* focuses on performance in England analysed by pupil characteristics[6] and participating pupils' experiences of mathematics and science teaching and learning, as reported by pupils, their teachers and their headteachers in TIMSS questionnaires. It also includes some international

[4] See *TIMSS 2023 National Report for England: Volume 1*. Available at: https://assets.publishing.service.gov.uk/media/6749d3f22ac8a6da30723aa2/TIMSS_2023_national_report_for_England.pdf

[5] Throughout both volumes of the TIMSS report, explanations are presented about data collection, methodology used and how to interpret data. Where the terms 'significant' or 'not significant' are given, these mean that the finding referred to is either statistically significant or not statistically significant at the 5% level. Significance levels will depend on the averages but also on the standard deviations. Both averages and standard deviations are used to calculate a T-statistic, which is then compared to the critical values in T-tables.

[6] Characteristics include gender, language spoken at home and socio-economic status, with some analysis drawing on matched National Pupil Database data.

comparisons. The *TIMSS International Report 2023* offers comparisons across all participating countries[7].

Chapter 7 reports on performance by pupil characteristics (gender, first language and socio-economic status); chapter 8 analyses pupil attitudes and aspirations in relation to mathematics and science; chapter 9 reports on school environment and resources; chapter 10 summarises findings from headteacher, teacher and pupil questionnaires on aspects of teaching and learning; and chapter 11 reports on participating pupils' home background and resources. Finally, chapter 12 discusses the main findings from across both volumes and suggests some implications for policy, practice and further research.

Some parts of Volume 2 analyse performance across different pupil characteristics, or by different reported experiences. Throughout, it is important to note that any resulting relationships show associations rather than demonstrating any causality. Much of the data in Volume 2 is drawn from responses to questionnaires and these are often subjective (for example, teachers' self-reported levels of knowledge and skills to teach and assess the national curriculum, or the extent to which pupils reported enjoying learning mathematics). Therefore, such data should be interpreted with care, as should any international comparisons, where responses may be influenced by cultural or contextual expectations.

As in Volume 1, all analysis of data should be interpreted in the light of limitations to its robustness: for example, all pupil characteristic data derived from the National Pupil Database excludes participating pupils in independent schools (and some others). Where the IEA published exhibits, we use this data in our analysis. Where there are no exhibits, data is based on our own calculations from the wider published dataset. Where response rates were greater than 50% they are included in the analyses. Among the comparator countries, Canada's year 9 pupils did not participate in assessments and questionnaires and minimum participation rates in New Zealand for year 9 were not satisfied in 2023. Participation rates for teachers are measured by the percentage of participant pupils they represent[8]. The international average can vary according to the number of countries responding to each question.

[7] See: von Davier, M.K., Reynolds, A.M., Fishbein, K.A., Khorramdel, B., Aldrich, L., Bookbinder, C.E.A., Ummugal, A., & Liqun , B.Y. (2024) *TIMSS 2023 International Results in Mathematics and Science*
[8] Further details of the participation rates achieved, and the related measures, can be found at https://timssandpirls.bc.edu/timss2023/

Chapter 7. Mathematics and science performance by pupil characteristics

TIMSS data enables comparisons to be drawn between the performance of boys and girls in each subject in their respective year groups and to compare England's gender differences with those of other countries. The comparator countries referred to in this chapter are listed in Volume 1 section 1.5, and also summarised in Appendix A of this volume.

Year 5 and 9 pupils' performance in the TIMSS mathematics and science assessments can also be analysed using 2 key pupil characteristics that are only available from the National Pupil Database (NPD), although it is important to note that not all pupils could be matched to the NPD (for example, pupils in the independent school sector)[9]. The 2 characteristics are:

- first language
- eligibility for free school meals

The following sections present 2 ways of doing this:

1. The average scores by these key characteristics
2. Achievement of key TIMSS benchmark scores by these key characteristics

The primary definition of disadvantage used in England is pupils' past and current eligibility for free school meals (FSM). This measure is not used internationally. TIMSS asks pupils how many books they have at home in order to provide an indication of their socio-economic status, with fewer books being associated with lower socio-economic status.

7.1 Main findings

Gender

- In 2023, the average score for year 5 boys (561) was significantly above that for girls (543) in mathematics in England. This was in contrast to 2019 when, although boys' average score was above that for girls, the difference was not significant (560 and 552 respectively).
- As in England in 2023, in each of the highest-performing countries, year 5 boys' average scores in mathematics were significantly above those for girls. This was

[9] As part of the analysis for this chapter, work was undertaken by the Office for National Statistics (ONS) Secure Research Service using data from the ONS and other owners. Such analysis does not imply the endorsement of the ONS or other data owners.

also the case for most of the English-speaking countries and for each of the European comparator countries.

- In 2023, the year 9 boys' average score (538) was significantly above the year 9 girls' average score (512) in mathematics in England. This performance of pupils in England is in contrast to 2019 when boys' and girls' scores were similar (516 and 514 respectively).
- There were no significant differences between boys' and girls' performances in most of the highest-performing countries in year 9. However, in other English-speaking and most European comparator countries boys' performance was significantly above that for girls.
- The 26 point scale score difference between year 9 boys' and girls' average scores in England was the largest for any of the countries participating in 2023.
- In 2023, the year 5 boys' average score in science (559) was not significantly different from the girls' average score in England (555). This mirrored the 2019 study when their average scores were the same (537).
- In 2023, the average score for year 9 boys in science (538) was significantly above that for girls (524) in England. This performance of pupils in England was in contrast to 2019 when boys' and girls' scores were not significantly different (515 and 518 respectively).
- In most of the highest-performing countries there were no significant differences between boys' and girls' average scores in year 9 science. However, as in England, boys' average scores were significantly above those for girls in the other English-speaking countries. In the European comparator countries, the findings were mixed.
- Bigger gender gaps in favour of boys were the norm across participating countries in TIMSS 2023.
- The 14 point scale score difference between year 9 boys' and girls' average science scores in England was the largest (jointly held) for any of the countries participating in 2023 where boys' performance exceeded girls'[10].

Differences by first language

- In mathematics in England the average score for both year 5 and year 9 pupils whose first language was English was not significantly different from the average score for pupils whose first language was not English.

[10] The scale score differences between girls' and boys' average scores in 7 primarily Middle East and North African countries was higher than 14 scale points, with girls outperforming boys.

- In science, the average score for both year 5 and year 9 pupils in England whose first language was English was significantly above the average score for pupils whose first language was not English.

Socio-economic status

- Pupils who had been eligible for free school meals (FSM) at any time in the previous 6 years performed significantly lower across both year groups and both subjects than their peers who had not been eligible for FSM.
- Using the TIMSS measure of number of books at home, a proxy for socio-economic status, there were wide gaps in performance for both year groups in both subjects between pupils who had very few books at home (fewer than 10) and those who had many (more than 100). Pupils with fewer books at home had lower average scores than pupils with many books at home with performance gaps between the 2 groups ranging from approximately 90 to 140 scale points.

Performance at the international benchmarks by pupil characteristics

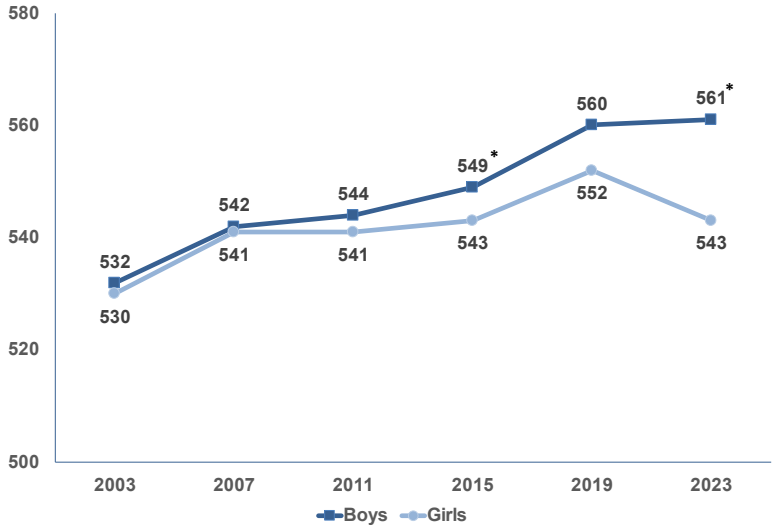
- The percentages of year 5 boys reaching most benchmarks in mathematics, were significantly higher than the percentages of year 5 girls.
- There were almost no significant differences in the percentage of year 5 pupils achieving each of the TIMSS benchmarks by first language.
- The percentages of year 9 boys reaching each of the benchmarks in mathematics in 2023 were significantly higher than the percentages for girls.
- There were no significant differences in the percentage of year 9 pupils achieving each of the TIMSS benchmarks by first language.
- In 2023, there were no significant differences between the percentages of year 5 boys and girls reaching each benchmark in science.
- Larger percentages of year 5 pupils whose first language was English reached each benchmark in science compared with their peers for whom their first language was not English. The differences between these percentages were not significant.
- Significantly larger percentages of year 9 boys reached the advanced and high or above benchmarks in science compared with girls in 2023.
- Significantly larger percentages of year 9 pupils whose first language was English reached most benchmarks in science.

- For pupils who had been eligible for FSM in the last 6 years a significantly lower percentage reached each benchmark, for both year groups and both subjects, compared with their peers.

7.2 Does performance over time differ by gender?

As Figure 7 and Table 7 below show, since 2007 the differences between average mathematics scores for year 5 boys and girls in England have increased with each successive TIMSS cycle. However, although boys' average scores have been consistently above those for girls, only in 2015 and 2023 have these differences been significant.

Figure 7: Trends in year 5 performance by gender in mathematics 2003-2023 (England average scores)



Source: TIMSS International Report 2023

Note 1: An average score marked with an asterisk denotes significant difference between boys' and girls' average scores.

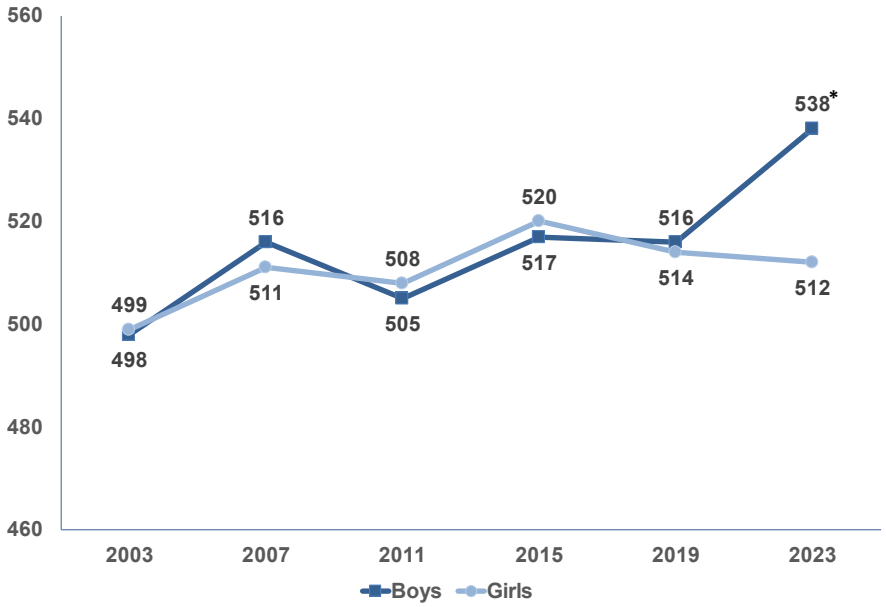
Table 7: Trends in year 5 performance by gender in mathematics 2003-2023 (England average scores)

Year	Boys' average score	Girls' average score
2003	532	530
2007	542	541
2011	544	541
2015	549 (significantly different from girls')	543
2019	560	552
2023	561 (significantly different from girls')	543

Source: TIMSS International Report 2023

As Figure 8 and Table 8 below show, between 2003 and 2023, the differences between average mathematics scores for year 9 boys and girls in England has fluctuated across TIMSS cycles. However, in 2023, for the first time, the difference was significant with the average score for boys 26 scale points above that for girls.

Figure 8: Trends in year 9 performance by gender in mathematics 2003-2023 (England average scores)



Source: TIMSS International Report 2023

Note 1: An average score marked with an asterisk denotes significant difference between boys' and girls' average scores.

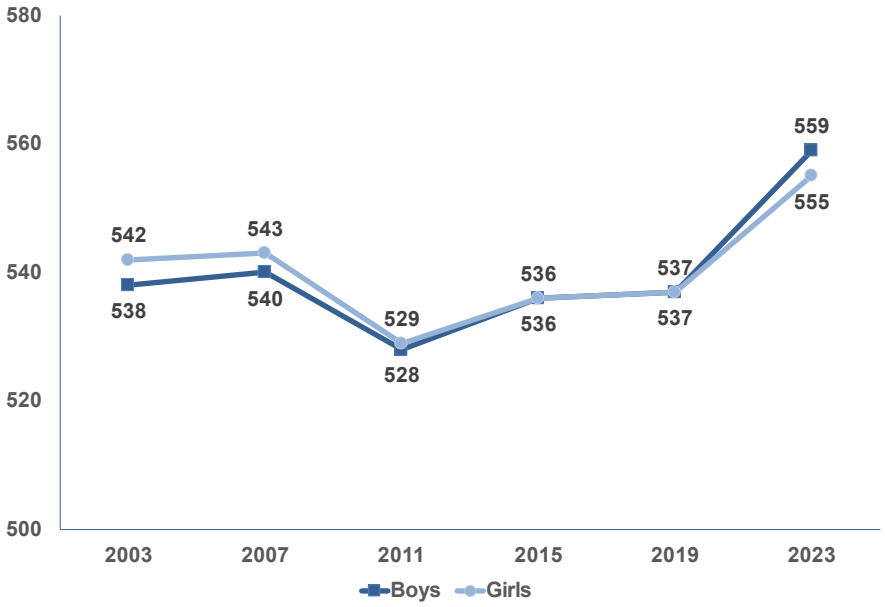
Table 8: Trends in year 9 performance by gender in mathematics 2003-2023 (England average scores)

Year	Boys' average score	Girls' average score
2003	498	499
2007	516	511
2011	505	508
2015	517	520
2019	516	514
2023	538 (significantly different from girls')	512

Source: TIMSS International Report 2023

As Figure 9 and Table 9 below show, between 2003 and 2023, the differences between average science scores for year 5 boys and girls in England have consistently been within 4 scale points. In none of these TIMSS cycles was the difference significant.

Figure 9: Trends in year 5 performance by gender in science 2003-2023



Source: TIMSS International Report 2023

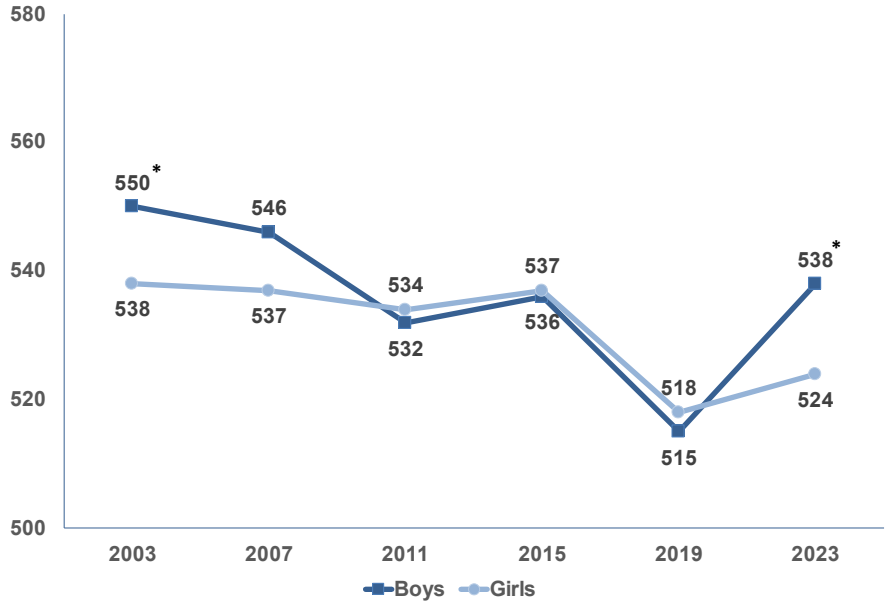
Table 9: Trends in year 5 performance by gender in science 2003-2023 (England average scores)

Year	Boys' average score	Girls' average score
2003	538	542
2007	540	543
2011	528	529
2015	536	536
2019	537	537
2023	559	555

Source: TIMSS International Report 2023

As Figure 10 and Table 10 below show, between 2003 and 2023, the differences between average science scores for year 9 boys and girls in England have fluctuated across TIMSS cycles. In 2023, as in 2003, the differences were significant with the average score for boys in 2023 being 14 scale points above that for girls.

Figure 10: Trends in year 9 performance by gender in science 2003-2023 (England average scores)



Source: TIMSS International Report 2023

Note 1: An average score marked with an asterisk denotes significant difference between boys' and girls' average scores.

Table 10: Trends in year 9 performance by gender in science 2003-2023 (England average scores)

Year	Boys' average score	Girls' average score
2003	550 (significantly different from girls)	538
2007	546	537
2011	532	534
2015	536	537
2019	515	518
2023	538 (significantly different from girls)	524

Source: TIMSS International Report 2023

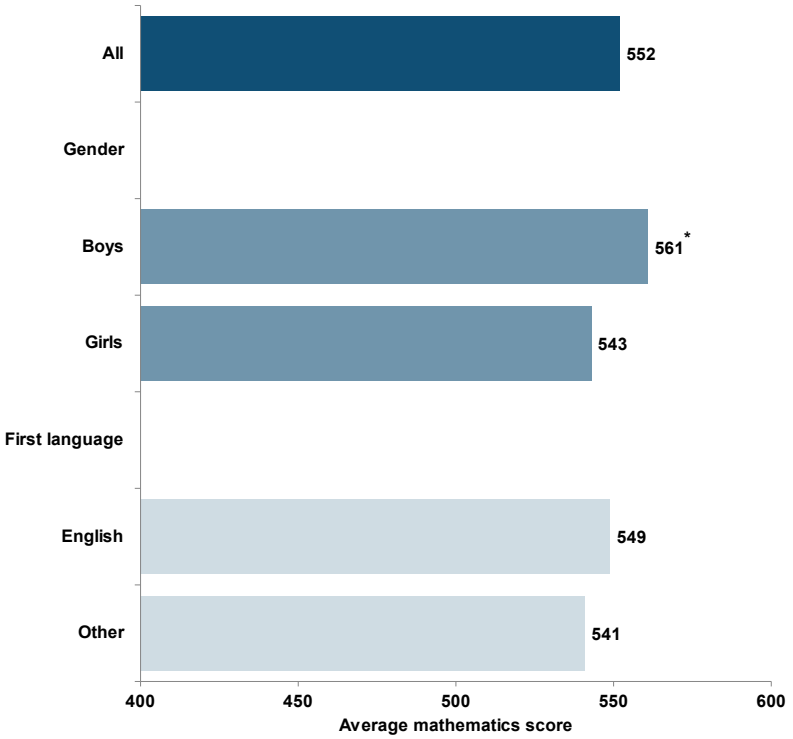
7.3 Does performance differ by gender and first language in year 5 mathematics?

Figure 11 and Table 11 below present the performance of different year 5 pupil groups alongside the overall mathematics score for 2023.

In 2023, the average score for year 5 boys (561) was significantly above that for girls (543) in mathematics in England. This performance of pupils in England is in contrast to 2019 when, although boys' average score was above that for girls, the difference was not significant (560 and 552 respectively).

The average score for year 5 pupils in England whose first language was English (549) was not significantly different from the average score for pupils whose first language was not English (541).

Figure 11: Average scores in year 5 mathematics by gender and first language in 2023 (England)



Source: NPD and IEA TIMSS International Report 2023

Note 1: An average score marked with an asterisk denotes significant difference between the 2 pupil characteristics being compared.

Table 11: Average scores in year 5 mathematics by gender and first language in 2023 (England)

Pupil characteristic	Average score
Overall mathematics score	552
Boys	561 (significantly different from girls)
Girls	543
First language − English	549
First language − other	541

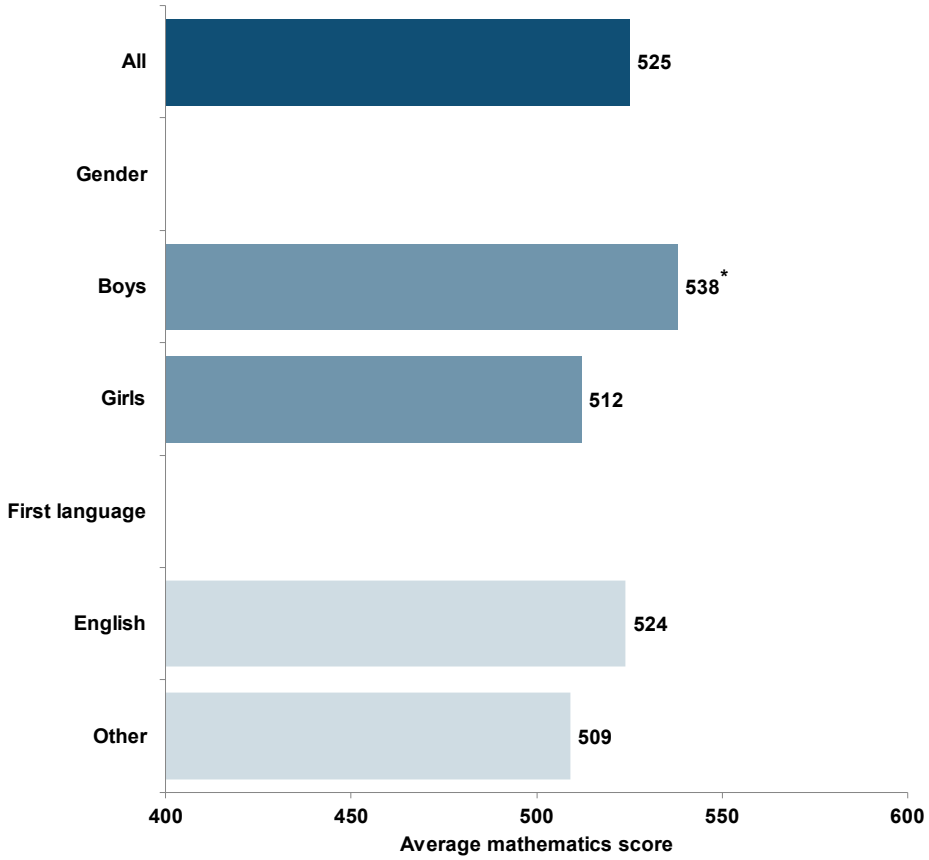
Source: NPD and IEA TIMSS International Report 2023

As in England in 2023, in each of the highest-performing countries, year 5 boys' average scores in mathematics were significantly above those for girls. This was also the case for each of the English-speaking countries (with the exception of Ireland) and for each of the European comparator countries.

7.4 Does performance differ by gender and first language in year 9 mathematics?

Figure 12 and Table 12 below present the performance of different year 9 pupil groups alongside the overall mathematics score for 2023. In 2023, the year 9 boys' average score (538) was significantly above the year 9 girls' average score (512) in mathematics in England. This performance of pupils in England is in contrast to 2019 when boys' and girls' scores were similar (516 and 514 respectively). The average score for year 9 pupils in England whose first language was English (524) was not significantly different from the average score for pupils whose first language was not English (509).

Figure 12: Average scores in year 9 mathematics by gender and first language in 2023 (England)



Source: NPD and IEA TIMSS International Report 2023

Note 1: An average score marked with an asterisk denotes significant difference between the 2 pupil characteristics being compared.

Table 12: Average scores in year 9 mathematics by gender and first language in 2023 (England)

Pupil characteristic	Average score
Overall mathematics score	525
Boys	538 (significantly different from girls)
Girls	512
First language − English	524
First language − other	509

Source: NPD and IEA TIMSS International Report 2023

In 2023, there were no significant differences between boys' and girls' performances in each of the highest-performing countries with the exception of Japan. However, in each of the other English-speaking countries boys' performance was significantly above that for girls, as in England[11]. This was also the case for each of the European comparator countries with the exception of Finland where there was no significant difference. The 26 point scale score difference between boys' and girls' average scores in England was the largest for any of the countries participating in 2023.

7.5 Does performance differ by gender and first language in year 5 science?

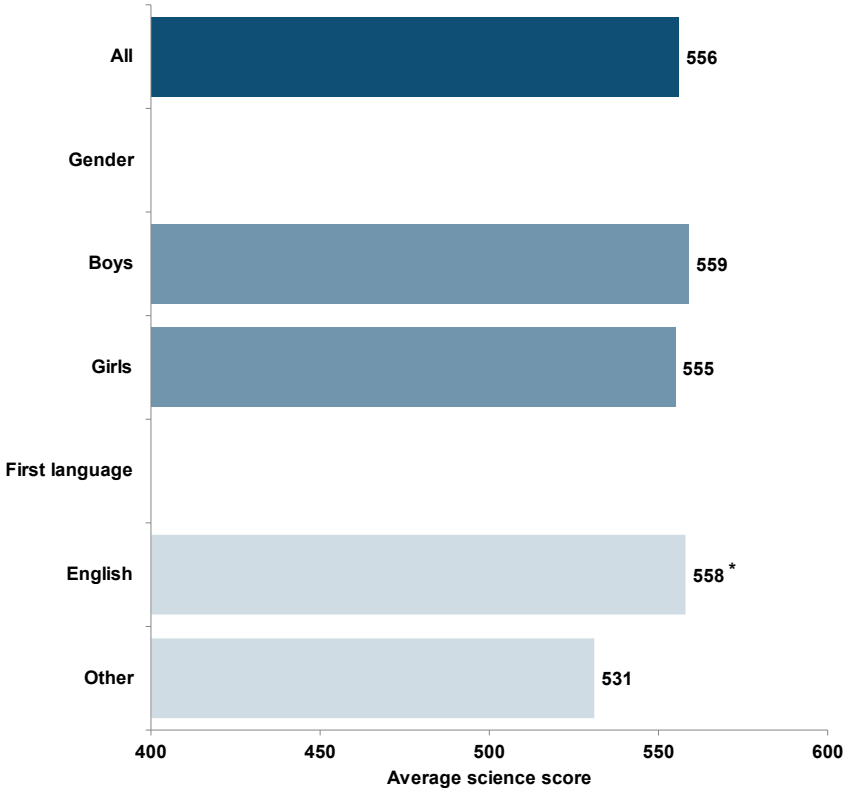
Figure 13 and Table 13 below presents the performance of different pupil groups alongside the overall science score for 2023.

In 2023, the year 5 boys' average score in science (559) was not significantly different from the girls' average score in England (555). This mirrored the 2019 study when their average scores were the same (537).

The average score for year 5 pupils in England whose first language was English (558) was significantly above the average score for pupils whose first language was not English (531).

[11] Minimum participation rates in New Zealand for year 9 were not satisfied in 2023. Canada did not participate in year 9 assessments.

Figure 13: Average scores in year 5 science by gender and first language in 2023 (England)



Source: NPD and IEA TIMSS International Report 2023

Note 1: An average score marked with an asterisk denotes significant difference between the 2 pupil characteristics being compared.

Table 13: Average scores in year 5 science by gender and first language in 2023 (England)

Pupil characteristic	Average score
Overall science score	556
Boys	559
Girls	555
First language − English	558 (significantly different from First language − other)
First language − other	531

Source: NPD and IEA TIMSS International Report 2023

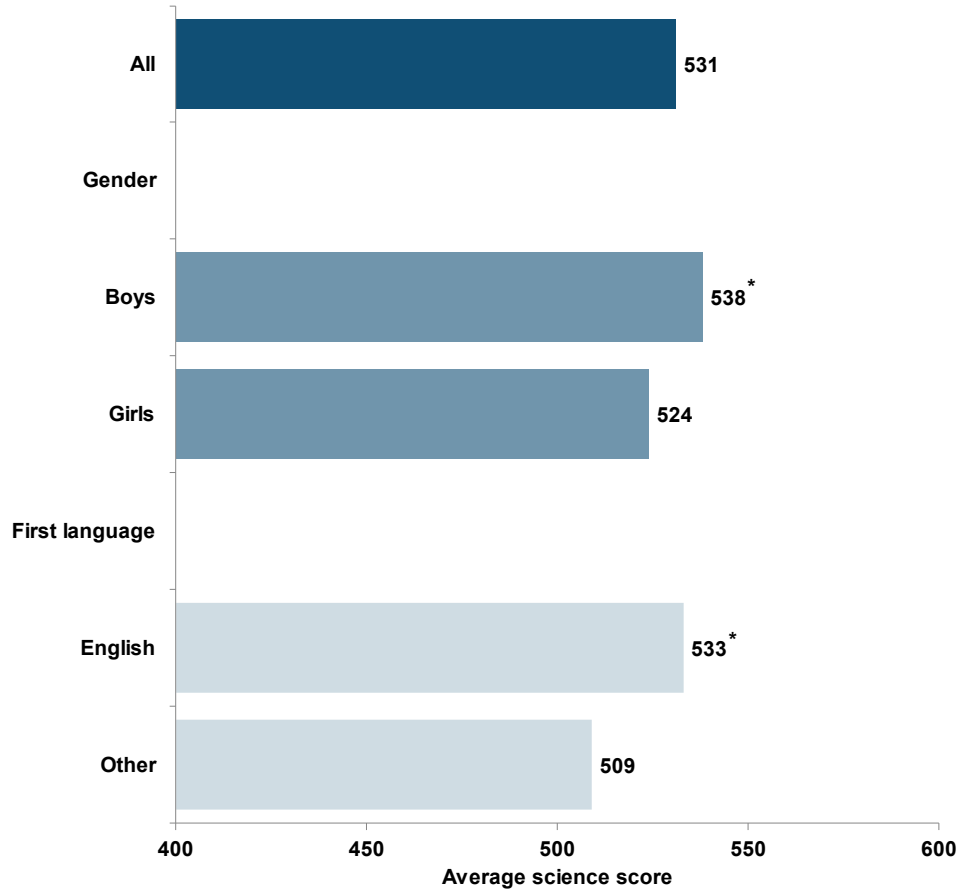
In contrast to the performance of England's year 5 pupils, in each of the highest-performing countries the average score for boys was significantly above that for girls. This was also the case for pupils in 3 of the English-speaking countries: Australia, Canada and the United States. In Ireland and New Zealand, there were no significant

differences between boys' and girls' average scores, as in England. In the European comparator countries, the findings were mixed. In France and Italy, boys' average scores were significantly above that for girls, while in Finland it was the opposite and in Lithuania there was no significant difference.

7.6 Does performance differ by gender and first language in year 9 science?

Figure 14 and Table 14 below present the performance of different pupil groups alongside the overall science score for 2023. In 2023, in England year 9 boys' average score in science (538) was significantly above that for girls (524). This performance is in contrast to 2019 when boys' and girls' scores were not significantly different (515 and 518 respectively). The average score for year 9 pupils in England whose first language was English (533) was significantly above the average score for pupils whose first language was not English (509).

Figure 14: Average scores in year 9 science by gender and first language in 2023 (England)



Source: NPD and IEA TIMSS International Report 2023.

Note 1: An average score marked with an asterisk denotes significant difference between the 2 pupil characteristics being compared.

Table 14: Average scores in year 9 science by gender and first language in 2023 (England)

Pupil characteristic	Average score
Overall science score	531
Boys	538 (significantly different from girls)
Girls	524
First language − English	533 (significantly different from First language − other)
First language − other	509

Source: NPD and IEA TIMSS International Report 2023

Of the highest-performing countries, only in Japan was the boys' average score significantly above that for girls. In each of the other countries in this group, there were no significant differences. However, as in England, boys' average scores were significantly above those for girls in each of the other English-speaking countries[12]. In the European comparator countries, the findings were mixed. In Italy, the boys' average score was significantly above that for girls, while in Finland it was the opposite, and in France and Lithuania there were no significant differences. The 14 point scale score difference between year 9 boys' and girls' average science scores in England was the largest (jointly held) for any of the countries participating in 2023 where boys' performance exceeded girls'[13].

7.7 Does performance differ by socio-economic status?

As set out in the chapter introduction, while pupils' past and current eligibility for free school meals (FSM) is used as measure of disadvantage in England, TIMSS uses books at home as an internationally comparable proxy measure.

Table 15 below shows that there was some association between FSM eligibility and the TIMSS books at home measure in TIMSS 2023. Overall, larger percentages of pupils eligible for FSM have fewer books at home compared to their non-eligible peers. Correspondingly, smaller percentages of pupils eligible for FSM have relatively large numbers of books at home compared to their non-eligible peers.

[12] Minimum participation rates in New Zealand in year 9 were not satisfied in 2023. Canada did not participate in year 9 assessments.
[13] The scale score differences between girls' and boys' average scores in 7 primarily Middle East and North African countries was higher than 14 scale points, with girls outperforming boys.

Table 15: The number of books at home and free school meal (FSM) eligibility

Number of books	Percentage of year 5 pupils eligible for FSM	Percentage of year 5 pupils not eligible for FSM	Percentage of year 9 pupils eligible for FSM	Percentage of year 9 pupils not eligible for FSM
0-10	20.3	9.9	25.9	15.6
11-25	27.4	19.9	28.5	19.9
26-100	23.5	30.6	26.5	27.0
101-200	10.6	18.6	8.0	18.8
More than 200	8.2	13.7	5.8	15.1
Unknown	10.0	7.3	5.2	3.5

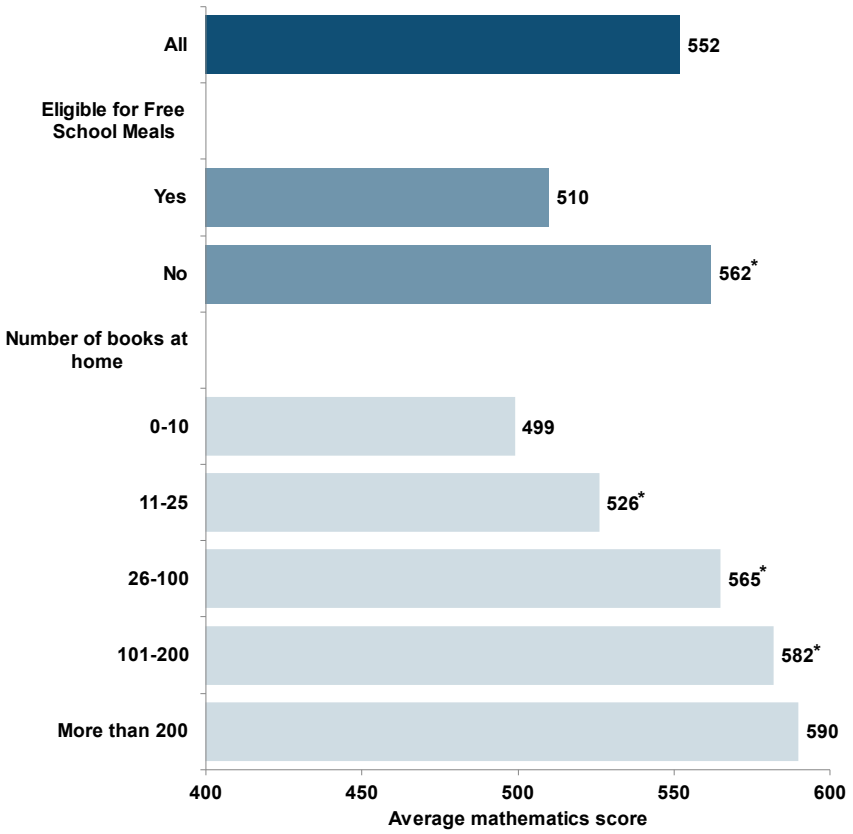
Source: NPD and IEA TIMSS International Report 2023

7.7.1 Did year 5 pupils' performance in mathematics differ by FSM status and the number of books at home?

Year 5 pupils who were eligible for FSM at any time in the previous 6 years achieved an average score of 510 in mathematics, significantly lower than the average score of 562 for pupils who were not eligible for FSM. In 2023, this difference of 52 scale points was larger than in 2019 when it was 36 scale points (525 compared with 561).

For year 5 pupils in England, increases in the number of books at home were positively and significantly associated with higher average mathematics scores, except in 1 instance. The average score for pupils with more than 200 books at home (590) was not significantly higher than the average score for pupils with between 101–200 books at home (582). See Figure 15 and Table 16 below.

Figure 15: Average scores in year 5 mathematics by eligibility for free school meals and number of books at home (England)



Source: NPD and IEA TIMSS International Report 2023

Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

Table 16: Average scores in year 5 mathematics by eligibility for free school meals and number of books at home (England)

Characteristic	Average score
All pupils	552
Eligible for FSM	510
Not eligible for FSM	562 (significantly different)
0-10 books at home	499
11-25 books at home	526 (significantly different)
26-100 books at home	565 (significantly different)
101-200 books at home	582 (significantly different)
More than 200 books at home	590

Source: NPD and IEA TIMSS International Report 2023

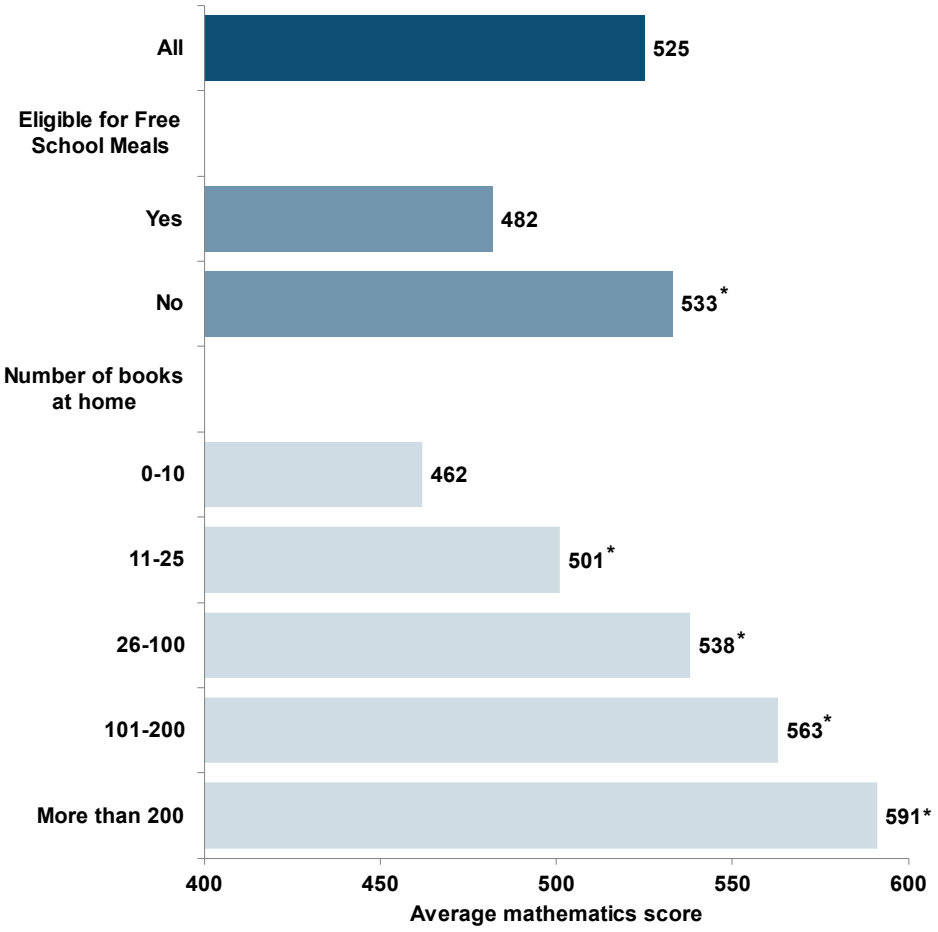
Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

7.7.2 Did year 9 pupils' performance in mathematics differ by FSM status and the number of books at home?

As shown in Figure 16 and Table 17 below, year 9 pupils who were eligible for FSM at any time in the previous 6 years achieved an average score of 482 in mathematics, significantly lower than the average score of 533 for pupils who were not eligible for FSM. In 2023, this difference of 51 scale points was larger than in 2019 when it was 46 scale points (522 compared with 476).

For year 9 pupils in England, increases in the number of books at home were positively and significantly associated with higher average mathematics scores in all cases.

Figure 16: Average scores in year 9 mathematics by eligibility for free school meals and number of books at home (England)



Source: NPD and IEA TIMSS International Report 2023

Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

Table 17: Average scores in year 9 mathematics by eligibility for free school meals and number of books at home (England)

Characteristic	Average score
All pupils	525
Eligible for FSM	482
Not eligible for FSM	533 (significantly different)
0-10 books at home	462
11-25 books at home	501 (significantly different)
26-100 books at home	538 (significantly different)
101-200 books at home	563 (significantly different)
More than 200 books at home	591 (significantly different)

Source: NPD and IEA TIMSS International Report 2023

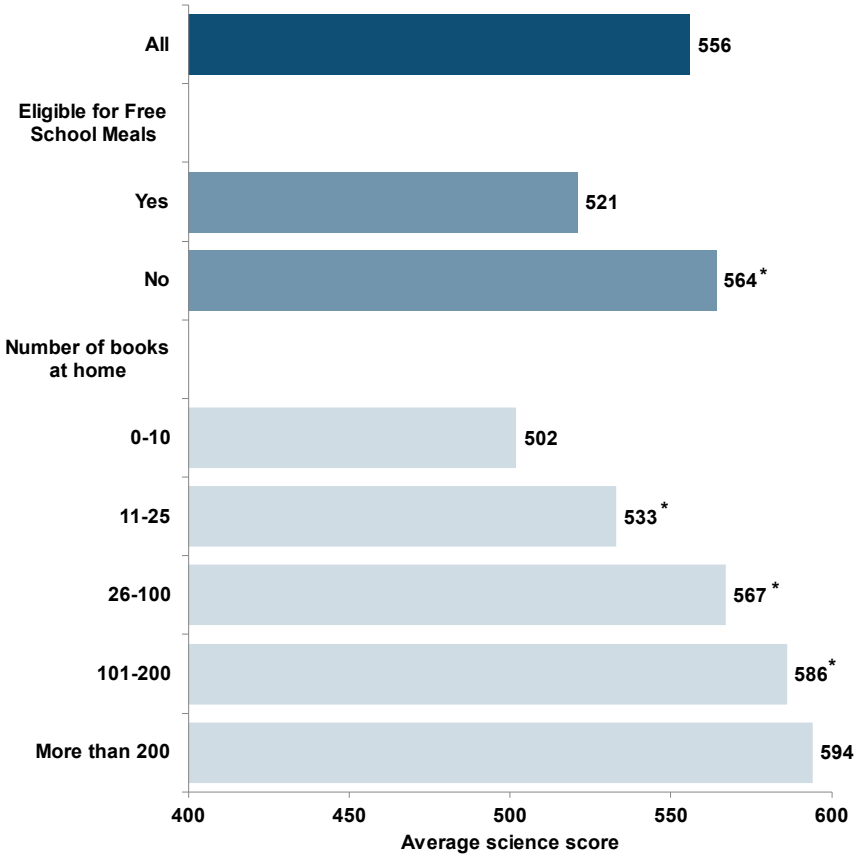
Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

7.7.3 Did year 5 pupils' performance in science differ by FSM status and the number of books at home?

Year 5 pupils who were eligible for FSM at any time in the previous 6 years achieved an average score of 521 in science, significantly lower than the average score of 564 for pupils who were not eligible for FSM. In 2023, this difference of 43 scale points was larger than in 2019 when it was 32 scale points (542 compared with 510).

For year 5 pupils in England, increases in the number of books at home were positively and significantly associated with higher average science scores, except in 1 instance. The average score for pupils with more than 200 books at home (594) was not significantly higher than the average score for pupils with between 101–200 books at home (586). See Figure 17 and Table 18 below.

Figure 17: Average scores in year 5 science by eligibility for free school meals and number of books at home (England)



Source: NPD and IEA TIMSS International Report 2023

Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

Table 18: Average scores in year 5 science by eligibility for free school meals and number of books at home (England)

Characteristic	Average score
All pupils	556
Eligible for FSM	521
Not eligible for FSM	564 (significantly different)
0-10 books at home	502
11-25 books at home	533 (significantly different)
26-100 books at home	567 (significantly different)
101-200 books at home	586 (significantly different)
More than 200 books at home	594

Source: NPD and IEA TIMSS International Report 2023

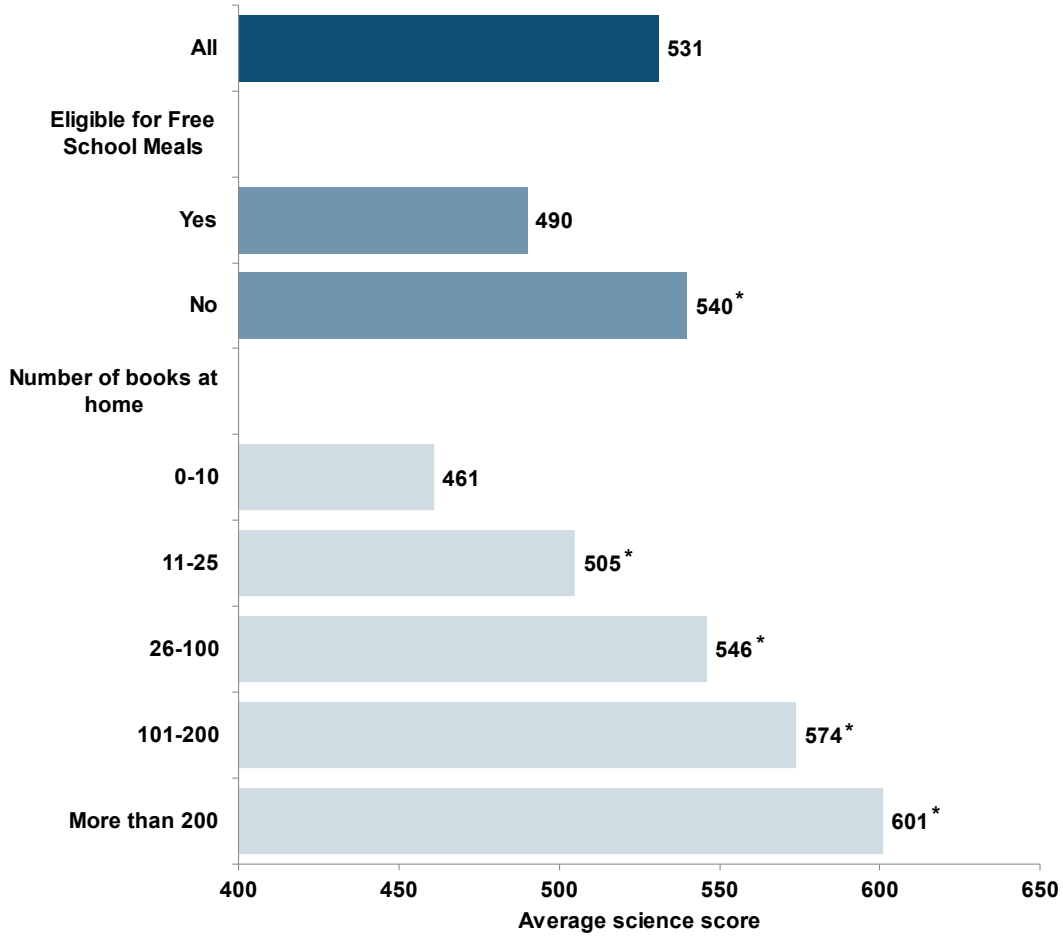
Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

7.7.4 Did year 9 pupils' performance in science differ by FSM status and the number of books at home?

Year 9 pupils who were eligible for FSM at any time in the previous 6 years achieved an average score of 490 in science, significantly lower than the average score of 540 for pupils who were not eligible for FSM. In 2023, this difference of 50 scale points was similar to 2019 when it was 47 scale points (523 compared with 476).

For year 9 pupils in England, increases in the number of books at home were positively and significantly associated with higher average science scores in all cases. See Figure 18 and Table 19 below.

Figure 18: Average scores in year 9 science by eligibility for free school meals and number of books at home (England)



Source: NPD and IEA TIMSS International Report 2023

Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

Table 19: Average scores in year 9 science by eligibility for free school meals and number of books at home (England)

Characteristic	Average score
All pupils	531
Eligible for FSM	490
Not eligible for FSM	540 (significantly different)
0-10 books at home	461
11-25 books at home	505 (significantly different)
26-100 books at home	546 (significantly different)
101-200 books at home	574 (significantly different)
More than 200 books at home	601 (significantly different)

Source: NPD and IEA TIMSS International Report 2023

Note 1: Where significant difference is stated, the average score is significantly above the average score for the preceding category, whether in relation to FSM eligibility or the number of books at home.

7.8 What percentage of pupils reached each international benchmark by pupil characteristics?

7.8.1 What percentage of pupils reached each international benchmark by pupil characteristics in year 5 mathematics?

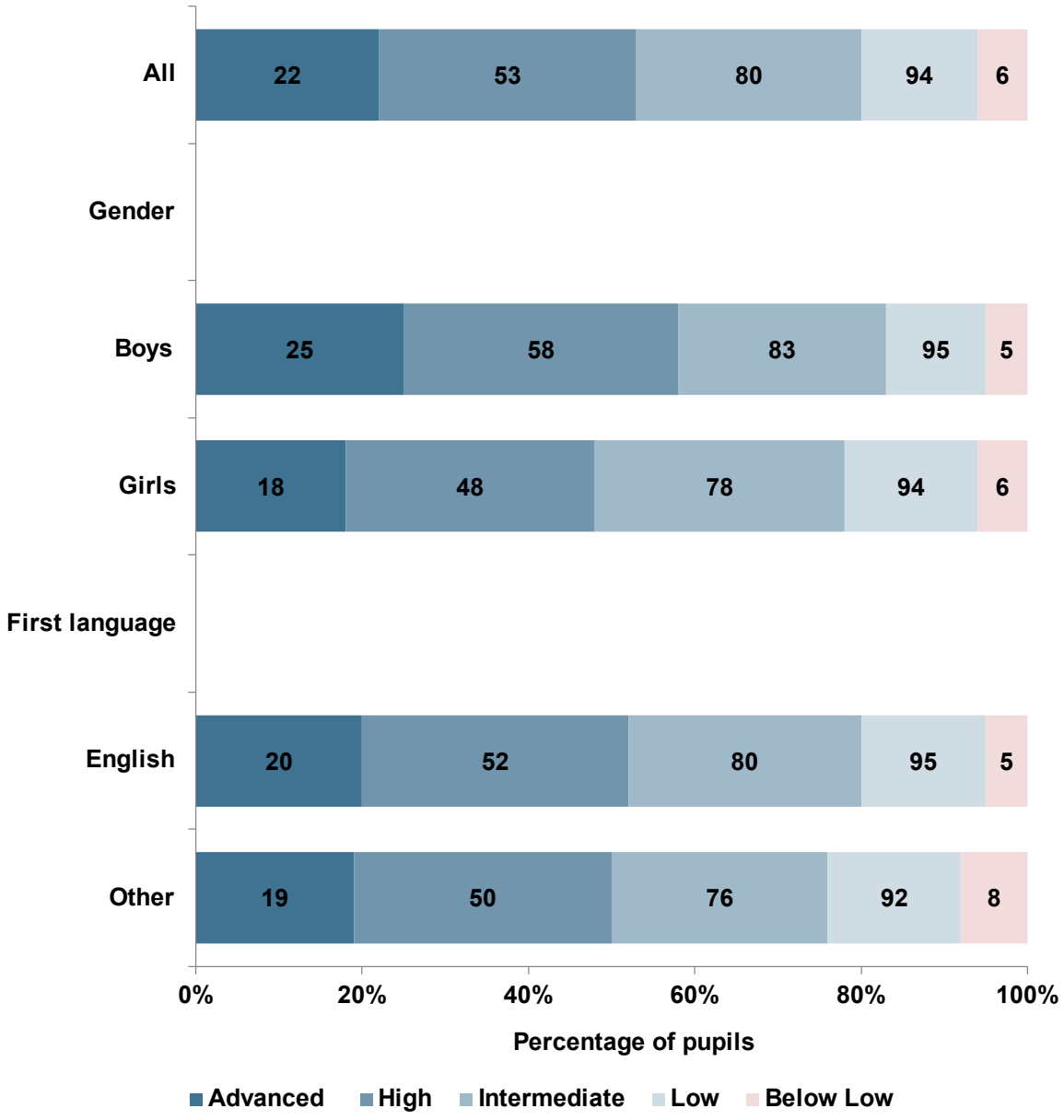
Figure 19 and Table 20 below show the percentage of year 5 pupils in England meeting each of the international TIMSS benchmarks[14] in mathematics since 2003. Figure 19 is cumulative so that, reading left to right, it presents the percentage of pupils who reached all of the benchmarks from the advanced benchmark to the low benchmark or above. For example, in 2023 in England 22% of pupils reached the advanced benchmark, 53% the high benchmark or above, 80% the intermediate benchmark or above and 94% the low benchmark or above. The remaining 6% did not reach the low benchmark.

The percentages of year 5 boys reaching each benchmark in mathematics, except the low benchmark or above, were significantly higher than the percentages of year 5 girls. In 2019, while this significant difference was found for both the advanced and high benchmark or above, it was not the case for the intermediate benchmark or above. As Figure 19 and Table 20 show, for the low benchmark or above, the percentage difference by gender in 2023 was 1 point, which was not significant.

[14] See Section 2.3 and Appendix C in the TIMSS 2023 National Report for England Volume 1 for descriptions of the international benchmarks.

There was only one significant difference in the percentage of year 5 pupils reaching each of the benchmarks by first language in 2023: a significantly larger percentage of pupils with English as their first language reached the intermediate benchmark than pupils whose first language was not English.

Figure 19: The percentage of year 5 pupils reaching the international benchmarks in mathematics by gender and first language (England)



Source: NPD and IEA TIMSS International Report 2023

Table 20: The percentage of year 5 pupils reaching the international benchmarks in mathematics by gender and first language (England)

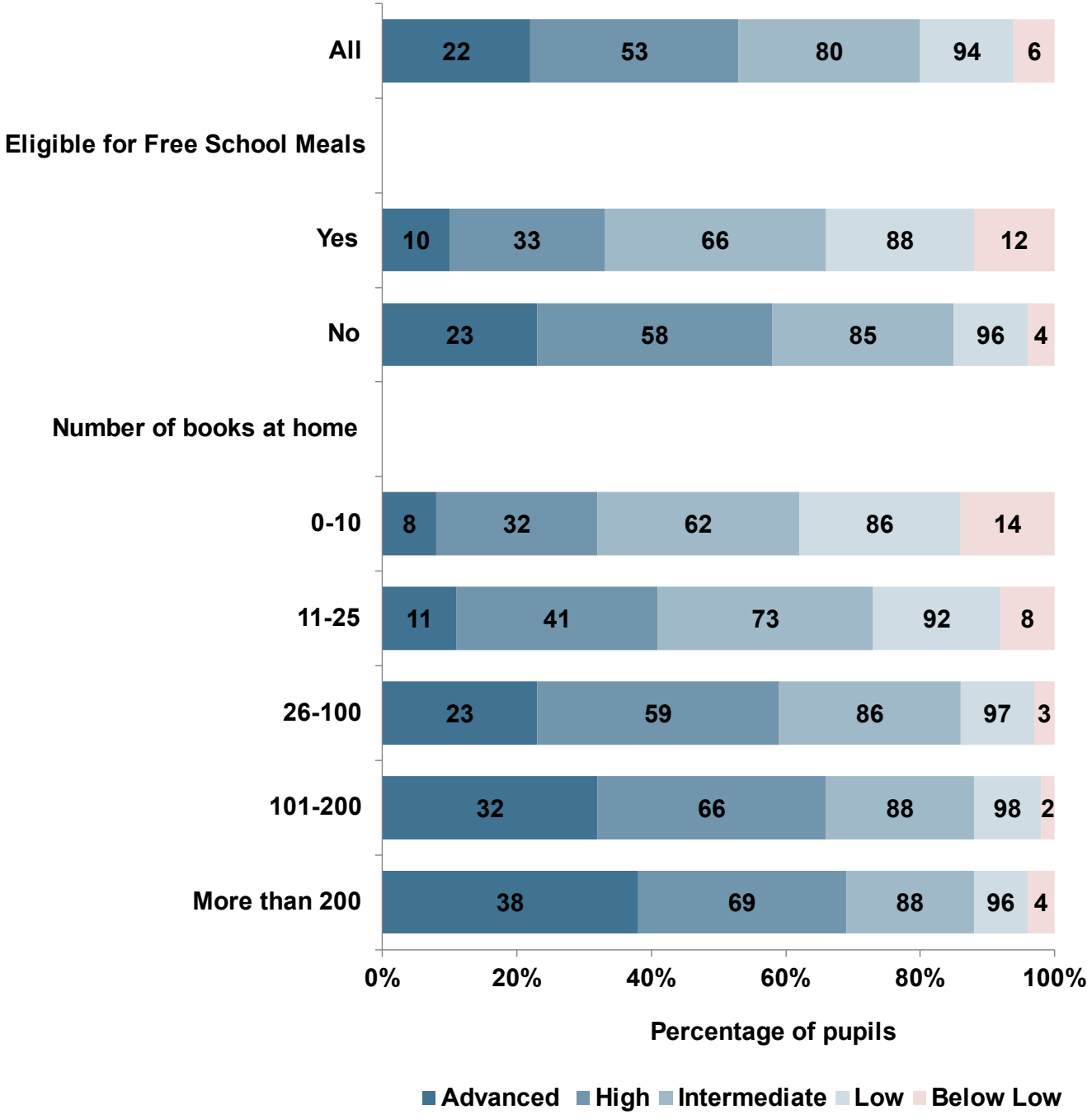
Pupil group	Advanced (%)	High or above (%)	Intermediate or above (%)	Low or above (%)	Below Low (%)
All pupils	22	53	80	94	6
Boys	25	58	83	95	5
Girls	18	48	78	94	6
First language English	20	52	80	95	5
First language other	19	50	76	92	8

Source: NPD and IEA TIMSS International Report 2023

In 2023, as in 2019, significantly smaller percentages of year 5 pupils who had been eligible for FSM in the previous 6 years reached each of the benchmarks in mathematics than their non-eligible peers (see Figure 20 and Table 21 below).

The percentage of year 5 pupils reaching each benchmark increased for each successive category of number of books, except in 2 instances. Firstly, a smaller percentage of pupils (96%) who reported more than 200 books at home reached the low benchmark or above compared with their peers who reported 101–200 books at home (98%). Secondly, the same percentage of pupils in both of these categories reached the intermediate benchmark or above (88%).

Figure 20: The percentage of year 5 pupils reaching the international benchmarks in mathematics by eligibility for free school meals and number of books at home (England)



Source: NPD and IEA TIMSS International Report 2023

Table 21: The percentage of year 5 pupils reaching the international benchmarks in mathematics by eligibility for free school meals and number of books at home (England)

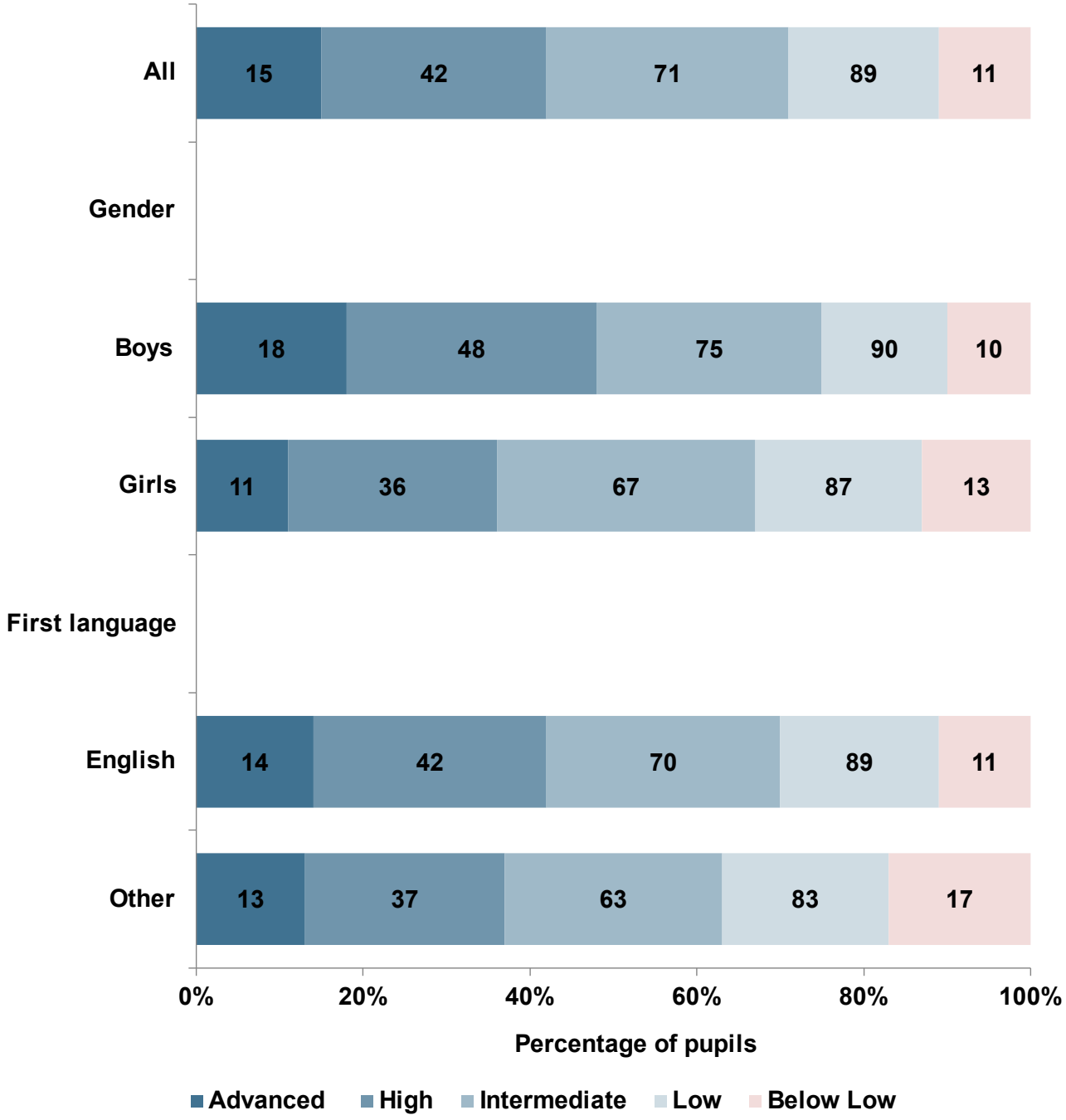
Pupil group	Advanced (%)	High or above (%)	Intermediate or above (%)	Low or above (%)	Below Low (%)
All pupils	22	53	80	94	6
Eligible for FSM	10	33	66	88	12
Not eligible for FSM	23	58	85	96	4
0-10 books at home	8	32	62	86	14
11-25 books at home	11	41	73	92	8
26-100 books at home	23	59	86	97	3
101-200 books at home	32	66	88	98	2
More than 200 books at home	38	69	88	96	4

Source: NPD and IEA TIMSS International Report 2023

7.8.2 What percentage of pupils reached each international benchmark by pupil characteristics in year 9 mathematics?

The percentages of year 9 boys reaching each of the benchmarks in mathematics in 2023 were significantly higher than the percentages for girls. There were no significant differences in the percentage of year 9 pupils achieving each of the TIMSS benchmarks by first language.

Figure 21: The percentage of year 9 pupils reaching the international benchmarks in mathematics by gender and first language (England)



Source: NPD and IEA TIMSS International Report 2023

Table 22 : The percentage of year 9 pupils reaching the international benchmarks in mathematics by gender and first language (England)

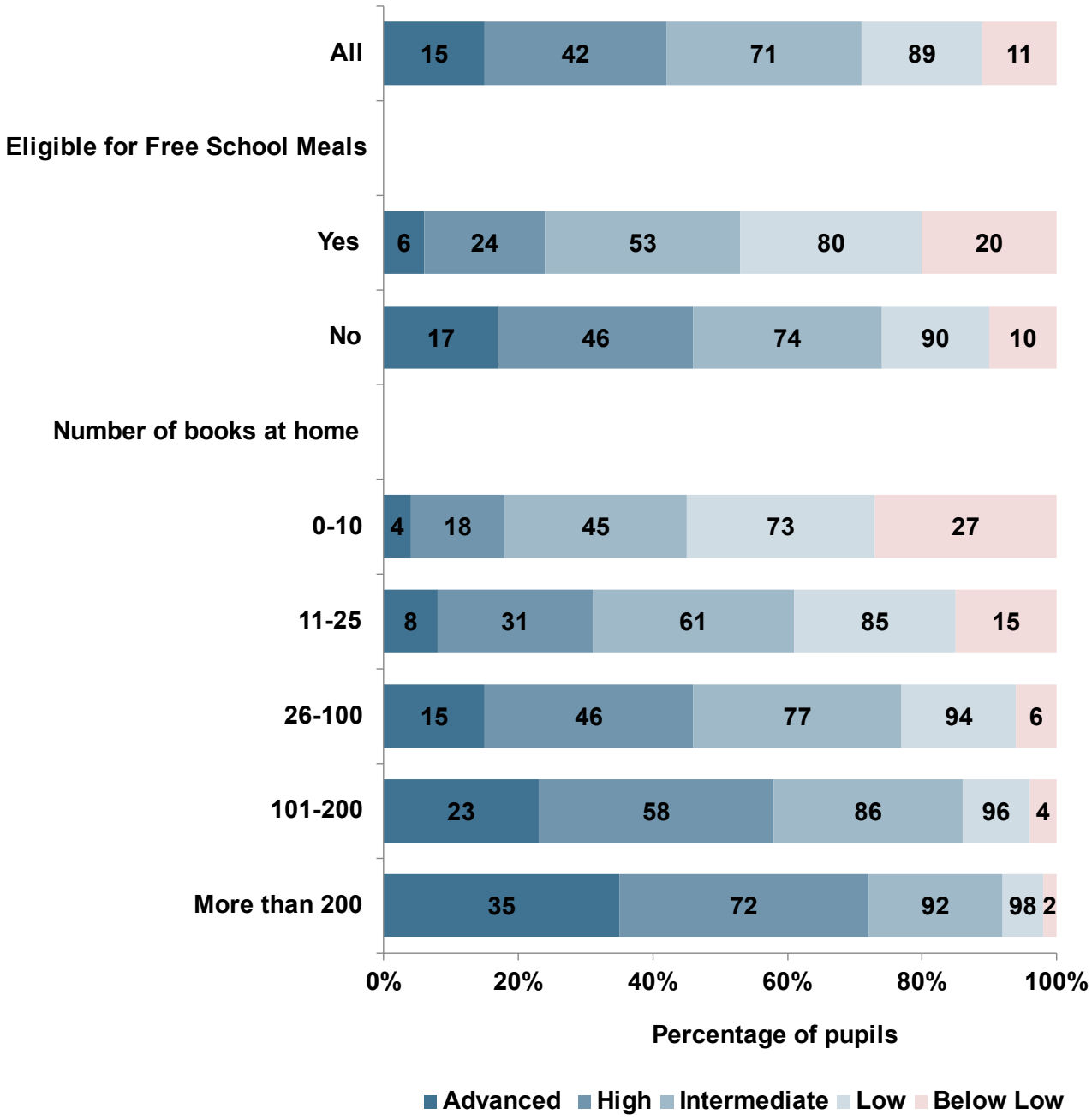
Pupil group	Advanced (%)	High or above (%)	Intermediate or above (%)	Low or above (%)	Below Low (%)
All pupils	15	42	71	89	11
Boys	18	48	75	90	10
Girls	11	36	67	87	13
First language − English	14	42	70	89	11
First language − other	13	37	63	83	17

Source: NPD and IEA TIMSS International Report 2023

In 2023, as in 2019, the percentages of year 9 pupils reaching each of the benchmarks in mathematics were significantly smaller for pupils who had been eligible for FSM in the previous 6 years than for their non-FSM eligible peers (see Figure 22 and Table 23 below).

The percentage of pupils reaching each benchmark increased for each successive category of number of books. Thirty-five per cent of pupils reporting more than 200 books at home reached the advanced benchmark compared with 4% of pupils reporting fewer than 10 books at home. Correspondingly, 2% per cent of pupils reporting more than 200 books at home did not reach the low benchmark or above compared with 27% of pupils reporting fewer than 10 books at home.

Figure 22: The percentage of year 9 pupils reaching the international benchmarks in mathematics by eligibility for free school meals and number of books at home (England)



Source: NPD and IEA TIMSS International Report 2023

Table 23: The percentage of year 9 pupils reaching the international benchmarks in mathematics by eligibility for free school meals and number of books at home (England)

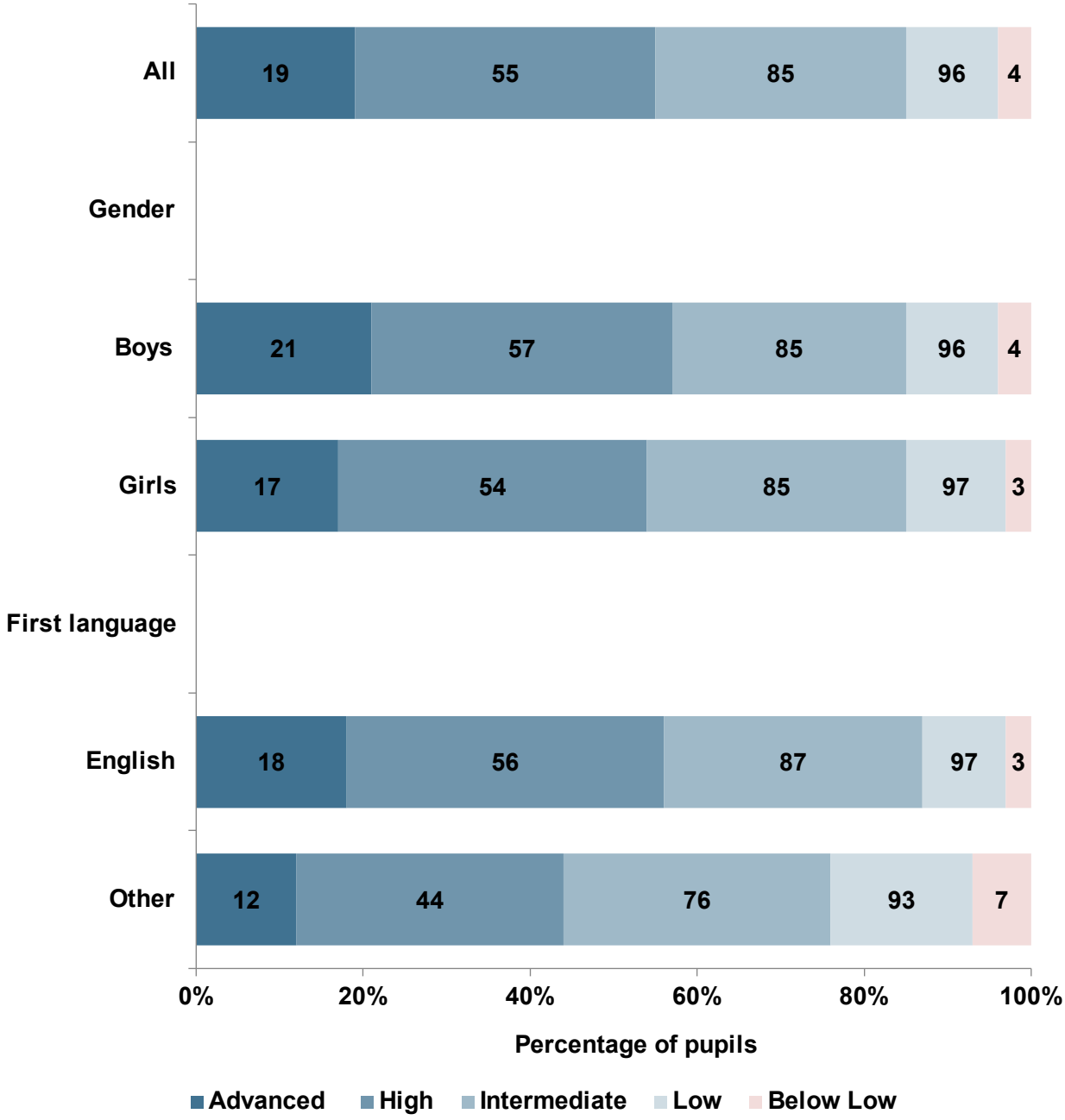
Pupil group	Advanced (%)	High or above (%)	Intermediate or above (%)	Low or above (%)	Below Low (%)
All pupils	15	42	71	89	11
Eligible for FSM	6	24	53	80	20
Not eligible for FSM	17	46	74	90	10
0-10 books at home	4	18	45	73	27
11-25 books at home	8	31	61	85	15
26-100 books at home	15	46	77	94	6
101-200 books at home	23	58	86	96	4
More than 200 books at home	35	72	92	98	2

Source: NPD and IEA TIMSS International Report 2023

7.8.3 What percentage of pupils reached each international benchmark by pupil characteristics in year 5 science?

In 2023, there were no significant differences between the percentages of year 5 boys and girls reaching each benchmark in science. Larger percentages of year 5 pupils whose first language was English reached each benchmark in science compared with their peers for whom their first language was not English. However, the differences between these percentages were not significant.

Figure 23: The percentage of year 5 pupils reaching the international benchmarks in science by gender and first language (England)



Source: NPD and IEA TIMSS International Report 2023

Table 24: The percentage of year 5 pupils reaching the international benchmarks in science by gender and first language (England)

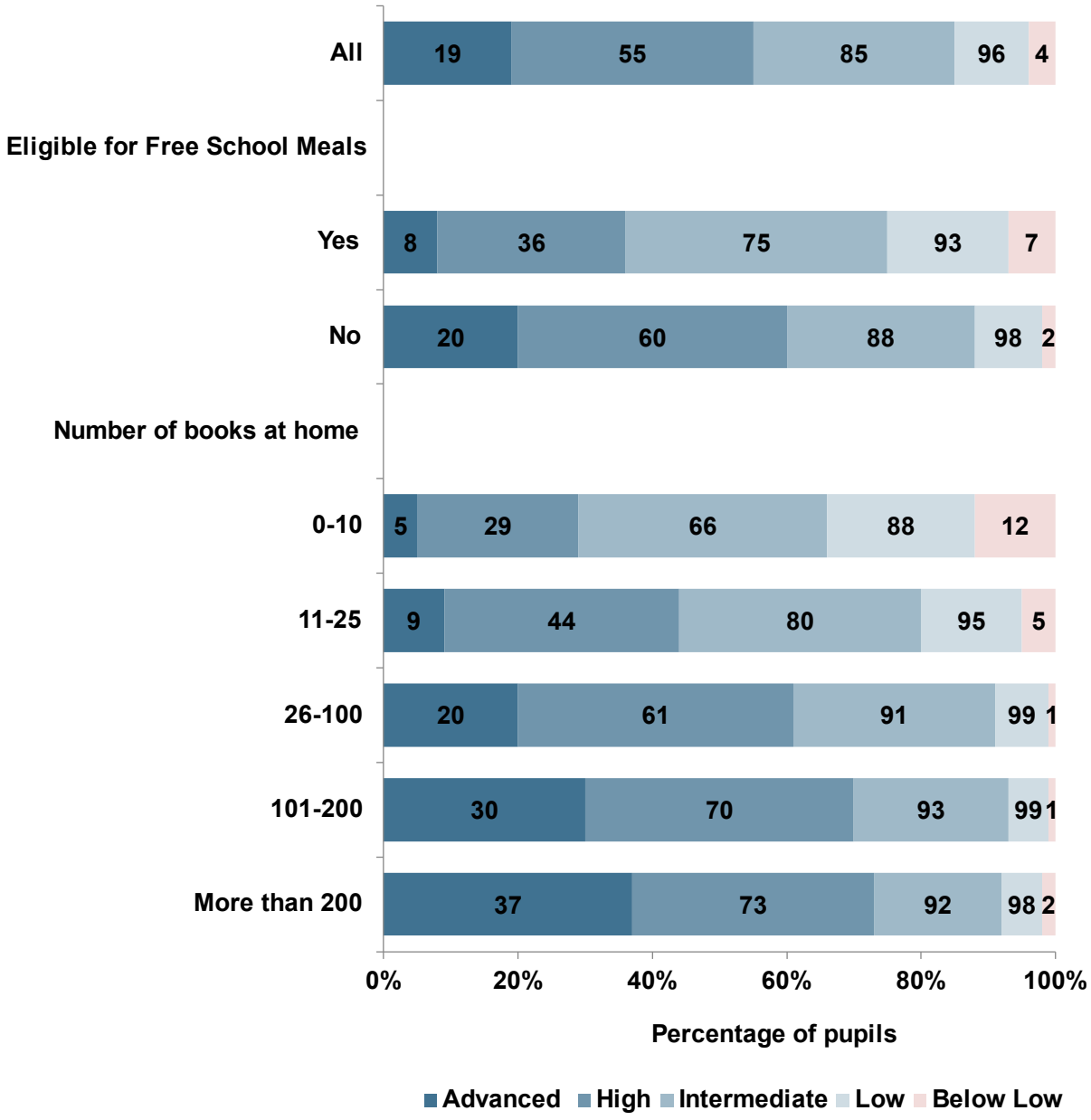
Pupil group	Advanced (%)	High or above (%)	Intermediate or above (%)	Low or above (%)	Below Low (%)
All pupils	19	55	85	96	4
Boys	21	57	85	96	4
Girls	17	54	85	97	3
First language English	18	56	87	97	3
First language other	12	44	76	93	7

Source: NPD and IEA TIMSS International Report 2023

In 2023, as in 2019, significantly smaller percentages of year 5 pupils who had been eligible for FSM in the previous 6 years reached each of the benchmarks in science compared with their non-FSM eligible peers (see Figure 24 and Table 25 below).

The percentage of pupils reaching each benchmark increased for each successive category of number of books, except in 2 instances. Smaller percentages of pupils who reported more than 200 books at home reached the intermediate benchmark or above and the low benchmark or above compared with their peers who reported 101–200 books at home.

Figure 24: The percentage of year 5 pupils reaching the international benchmarks in science by eligibility for free school meals and number of books at home (England)



Source: NPD and IEA TIMSS International Report 2023

Table 25: The percentage of year 5 pupils reaching the international benchmarks in science by eligibility for free school meals and number of books at home (England)

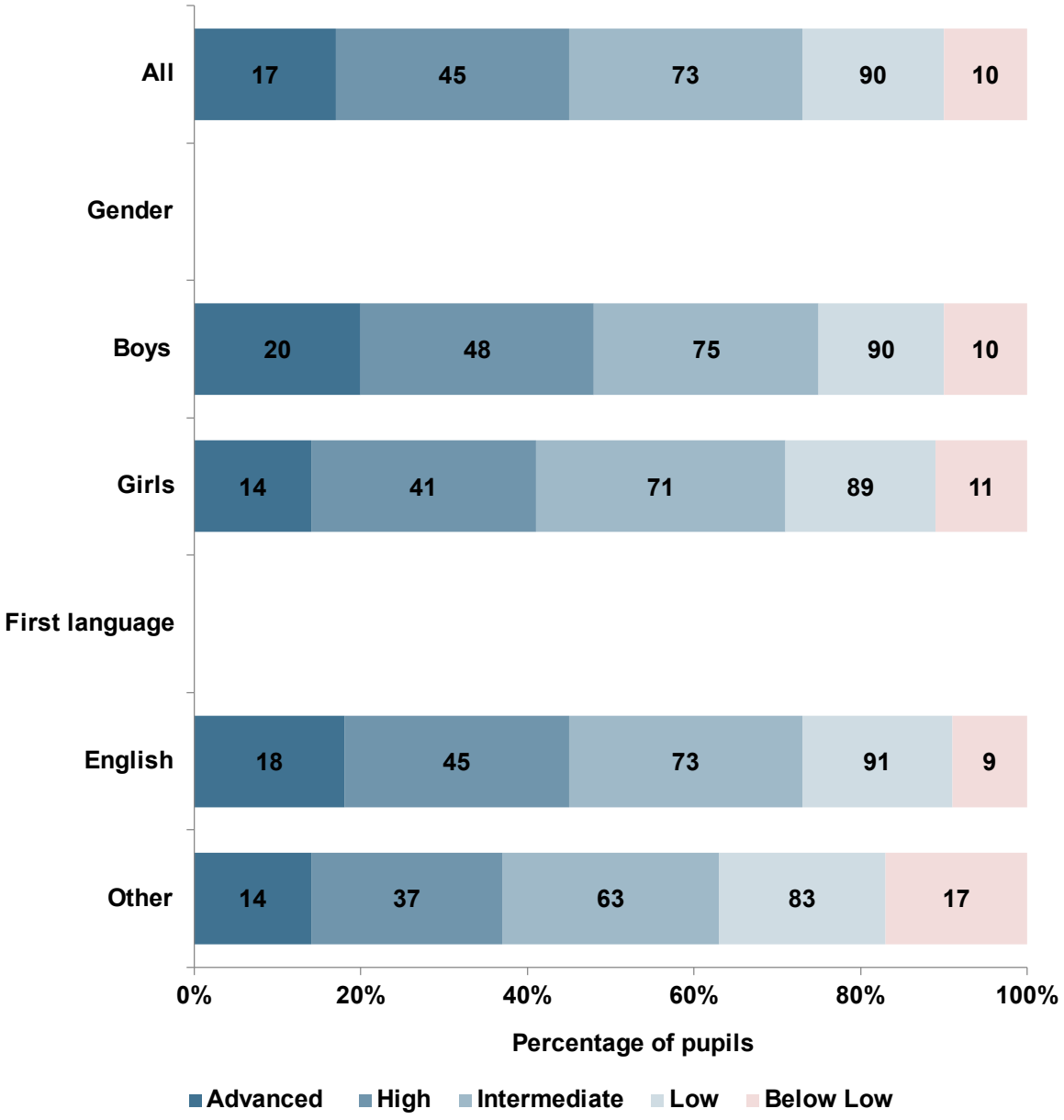
Pupil group	Advanced (%)	High or above (%)	Intermediate or above (%)	Low or above (%)	Below Low (%)
All pupils	19	55	85	96	4
Eligible for FSM	8	36	75	93	7
Not eligible for FSM	20	60	88	98	2
0-10 books at home	5	29	66	88	12
11-25 books at home	9	44	80	95	5
26-100 books at home	20	61	91	99	1
101-200 books at home	30	70	93	99	1
More than 200 books at home	37	73	92	98	2

Source: NPD and IEA TIMSS International Report 2023

7.8.4 What percentage of pupils reached each international benchmark by pupil characteristics in year 9 science?

Significantly larger percentages of year 9 boys reached the advanced and high or above benchmarks in science compared with girls in 2023. The percentages for the intermediate or above and low or above benchmarks were not significantly different. Significantly larger percentages of year 9 pupils whose first language was English reached the low or above, intermediate or above and high or above benchmarks in science. However, the difference between the percentages reaching the advanced benchmark was not significant.

Figure 25: The percentage of year 9 pupils reaching the international benchmarks in science by gender and first language (England)



Source: NPD and IEA TIMSS International Report 2023

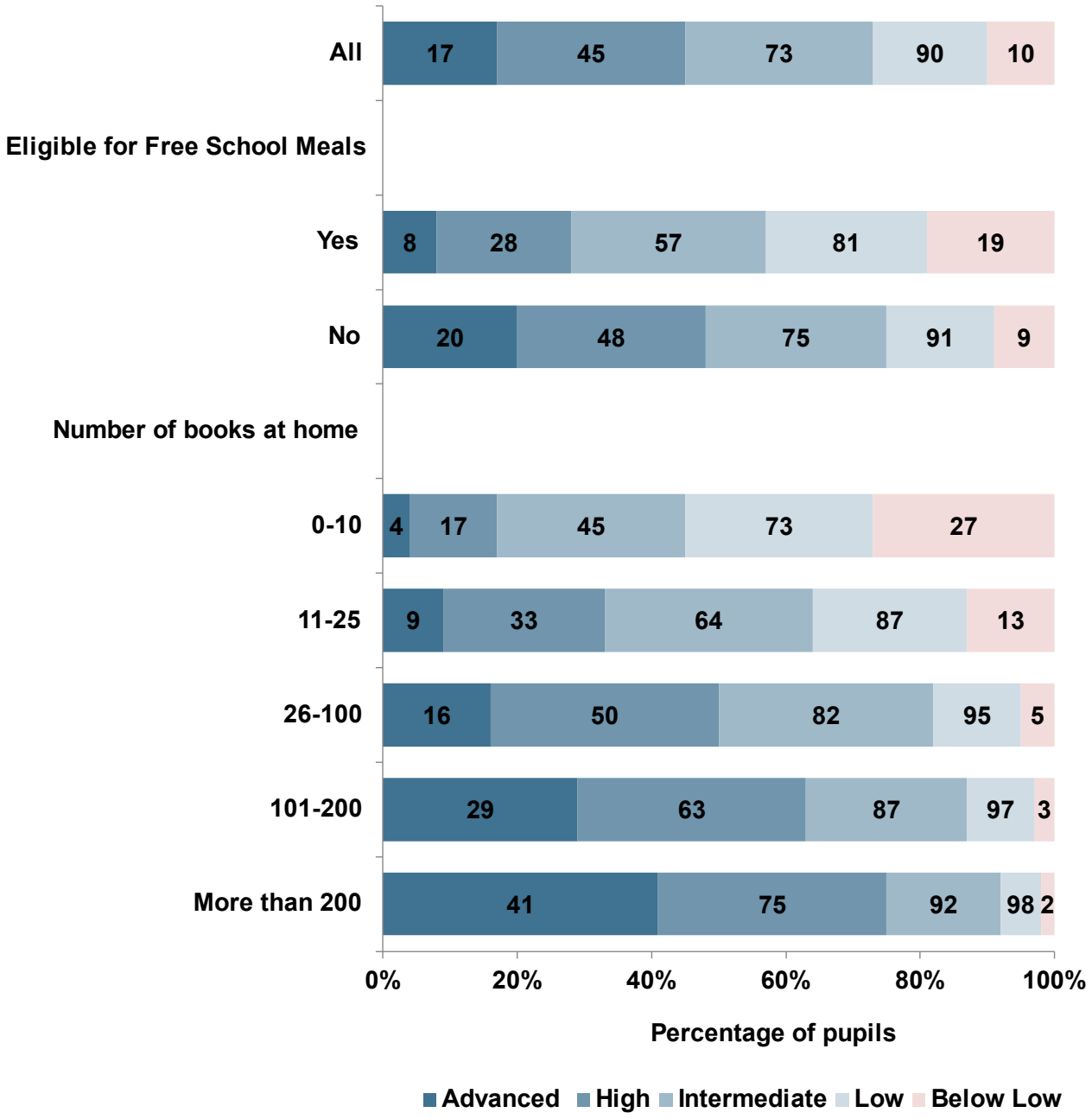
Table 26: The percentage of year 9 pupils reaching the international benchmarks in science by gender and first language (England)

Pupil group	Advanced (%)	High or above (%)	Intermediate or above (%)	Low or above (%)	Below Low (%)
All pupils	17	45	73	90	10
Boys	20	48	75	90	10
Girls	14	41	71	89	11
First language English	18	45	73	91	9
First language other	14	37	63	83	17

Source: NPD and IEA TIMSS International Report 2023

In 2023, as in 2019, significantly smaller percentages of year 9 pupils who had been eligible for FSM in the previous 6 years reached each of the benchmarks in science compared with their non-FSM eligible peers (see Figure 26 and Table 27 below). The percentage of pupils reaching each benchmark increased for each successive category of number of books.

Figure 26: The percentage of year 9 pupils reaching the international benchmarks in science by eligibility for free school meals and number of books at home (England)



Source: NPD and IEA TIMSS International Report 2023

Table 27: The percentage of year 9 pupils reaching the international benchmarks in science by eligibility for free school meals and number of books at home (England)

Pupil group	Advanced (%)	High or above (%)	Intermediate or above (%)	Low or above (%)	Below Low (%)
All pupils	17	45	73	90	10
Eligible for FSM	8	28	57	81	19
Not eligible for FSM	20	48	75	91	9
0-10 books at home	4	17	45	73	27
11-25 books at home	9	33	64	87	13
26-100 books at home	16	50	82	95	5
101-200 books at home	29	63	87	97	3
More than 200 books at home	41	75	92	98	2

Source: NPD and IEA TIMSS International Report 2023

Chapter 8. Pupil attitudes and aspirations in mathematics and science

This chapter summarises findings from the questionnaire on pupils' attitudes towards mathematics and science and their aspirations in these subjects.

The chapter's sections focus on whether pupils in each subject:

- reported that lessons provide instructional clarity
- were confident in their abilities in mathematics and science
- valued the subject[15]
- liked learning it
- had aspirations to study it after age 16
- would like a job that involves the subject[16]

Where there were interesting comparisons to be drawn between pupils in England and their peers in other comparator group countries, these are discussed[17]. However, there can be difficulties when comparing reported pupil attitudes between different countries and cultures, due to, for example varied interpretation, expectations and experiences.

The comparator countries referred to in this chapter are listed in Volume 1 section 1.5 and in Appendix A of this volume.

The chapter also reports whether or not these attitudinal factors were associated with performance in the TIMSS assessments. However, it is important to note that an association (or correlation) between 2 variables (such as level of engagement and average scores) is *not* the same as causation (i.e. that one thing causes the other).

8.1 Main findings

- Overall, analysis indicates that across all attitudinal factors (instructional clarity, pupils' confidence in their ability in a subject, valuing the subject and liking the subject) pupils' confidence in their ability was more strongly associated with performance than other factors.

[15] In all participating countries only pupils in year 9 were asked about the extent to which they valued the subject.
[16] This was an additional TIMSS questionnaire question posed for England's pupils only on behalf of the Department for Education.
[17] In addition to year 9 pupils in Canada not participating in questionnaires, the IEA exhibits did not include the responses from year 9 pupils in New Zealand to these questionnaires.

- There was also a positive and significant association between the extent to which England's year 5 and year 9 pupils reported that their lessons provided instructional clarity and their mathematics and science performance.
- There was a positive and significant association between confidence in mathematical ability and average scores in both years 5 and 9. Pupils in both year groups who were very confident in mathematics scored over 100 scale points higher, on average, compared to their peers who were not confident, as did pupils in year 9 science. The same associations were evident in year 5 science, although here the scale point difference was not as high (53).
- Year 9 pupils who strongly valued mathematics and science had significantly higher average scores compared with their peers who did not value these subjects.
- Significantly larger percentages of boys than girls strongly valued both subjects in year 9, while significantly larger percentages of girls than boys did not value the subjects (only year 9 pupils were asked how much they valued the subjects).
- Both year 5 and year 9 pupils who very much liked learning mathematics and science had significantly higher average scores compared with their peers who did not like learning these subjects.
- Across both year groups in mathematics and in year 9 only in science, significantly larger percentages of boys were very confident and significantly larger percentages of girls were not confident. In year 5 science there was no significant difference. The same findings applied to the percentages of boys who very much liked learning the subjects and of girls who did not like learning the subjects.
- There was a positive and significant association between the extent to which year 5 and 9 pupils agreed that they would like to study mathematics after secondary school and higher average scores. For science this was evident for year 9 pupils only, as in year 5 the association was mixed.
- A significantly larger percentage of boys in both year 5 and year 9 strongly agreed than girls that they would like to study mathematics after secondary school. In both year 5 and year 9 a significantly larger percentage of girls strongly disagreed that they want to study mathematics further. For science the gender results were mixed.
- There was a positive and significant association between the extent to which year 5 and year 9 pupils strongly agreed that they would like a job that involves mathematics after secondary school and their average scores. For science this was evident for year 9 pupils only, as in year 5 the association was mixed.
- In years 5 and 9, a significantly larger percentage of boys strongly agreed that they want to do work that involves mathematics than girls. Correspondingly, a

significantly larger percentage of girls strongly disagreed that they would like to do work that involves mathematics than boys. For science the gender results were mixed.

- Pupils in England overall showed that they were knowledgeable about the environment in both years 5 and 9. Their knowledge corresponded well with their overall science average score.

8.2 To what extent did pupils in England report that their lessons provide instructional clarity in mathematics and science?

Instructional clarity was a new focus in the questionnaires for TIMSS 2019. Consequently, there are no comparisons to be made between 2023 data and TIMSS cycles prior to 2019.

For both mathematics and science, pupils responded to the following statements using a 4 point scale from ‘Agree a lot’ to ‘Disagree a lot’. Statements were the same across both subjects. There were some variations in the phrasing of statements in 2023 compared with 2019. Statement 1 below replaced ‘I know what my teacher expects me to do’ in 2019 and Statement 7 below replaced ‘My teacher links new lessons to what I already know’ (which was only asked of year 9 pupils in 2019).

1. My teacher makes it clear what we should learn in each lesson
2. My teacher is easy to understand
3. My teacher has clear answers to my questions
4. My teacher is good at explaining mathematics/science
5. My teacher does a variety of things to help us learn
6. My teacher explains a topic again when we don’t understand
7. My teacher gives me helpful feedback on my work

Based on their responses, scores were calculated that assigned pupils into 1 of 3 categories related to the extent to which they reported that their lessons provided instructional clarity: high clarity, moderate clarity or low clarity[18].

For year 5 and 9 pupils in England, overall, there was a positive and significant association between the reporting of more instructional clarity and higher average scores in mathematics and science. Pupils who reported that their lessons provided high instructional clarity had significantly higher average scores than those who reported low

[18] For full methodological explanations see the TIMSS 2023 International Report.

instructional clarity. However, some of the differences between either high and moderate, or moderate and low, instructional clarity were not significant.

When reading the figures in this chapter, the following should be taken into account:

- The lines at the top of the figures show the average scores for pupils in England (uppermost) compared with the average of all pupils internationally (lowermost).
- The bars at the bottom of the figures show the percentage of pupils who reported views about their teaching and learning at a higher, medium or lower level.

Where significant gender differences are reported, these are based on a comparison of the average scores for the highest category for each factor (such as high instructional clarity) and the lowest category (such as low instructional clarity).

8.2.1 To what extent did pupils in England report that their lessons provided instructional clarity in mathematics?

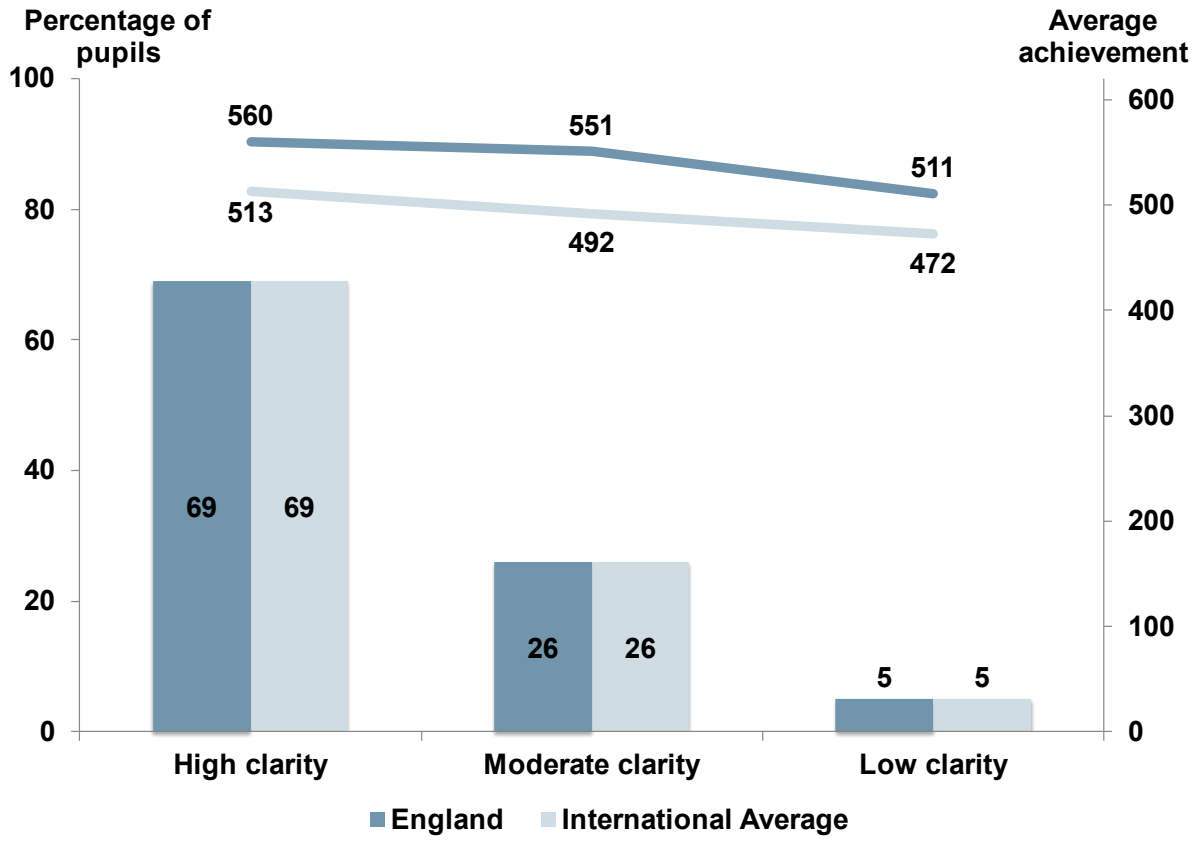
Year 5

Compared with 2019, the average scores for year 5 pupils who reported their lessons provided either high or moderate instructional clarity were similar in 2023. The average score for pupils who reported low instructional clarity in 2023 was below that achieved in 2019 (511 compared with 524). This meant that the range of average scores between the highest and lowest categories widened between 2019 and 2023 from 37 scale points to 49 scale points.

The percentages of year 5 pupils in England who reported that their lessons provided high, moderate or low instructional clarity in mathematics were the same as the international averages (see Figure 27 and Table 28 below).

There were no gender differences in year 5 pupils' reported views on instructional clarity in mathematics.

Figure 27: The percentage of year 5 pupils reporting high, moderate or low instructional clarity in their mathematics lessons and their average score (England and international average)



Source: IEA TIMSS International Report 2023

Table 28: The percentage of year 5 pupils reporting high, moderate or low instructional clarity in their mathematics lessons and their average score (England and international average)

Reported instructional clarity	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
High clarity of instruction	560	513	69	69
Moderate clarity of instruction	551	492	26	26
Low clarity of instruction	511	472	5	5

Source: IEA TIMSS International Report 2023

A larger percentage of year 5 pupils in England (69%) reported that their mathematics lessons provided high instructional clarity compared with their peers from any of the highest-performing group of countries, except in the Republic of Korea (74%). In

comparison with the other English-speaking countries, a larger percentage of year 5 pupils in England reported that their lessons provided high instructional clarity compared with their peers in Australia, New Zealand and the United States, while the reverse was the case for Canada. In Ireland the percentage was the same (69%). A larger percentage of pupils in England reported that their mathematics lessons provided high instructional clarity compared with their peers in any of the European comparator countries.

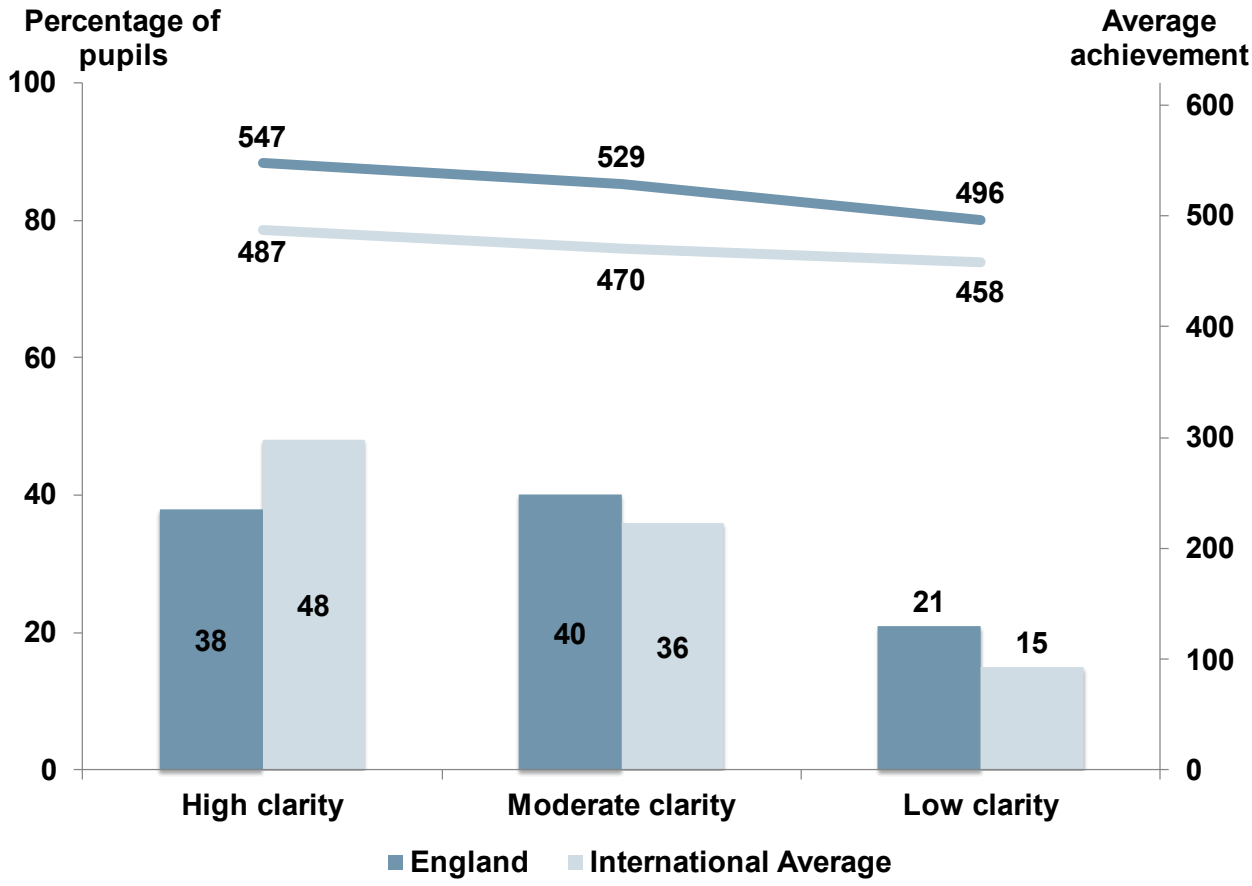
Year 9

Compared with 2019, the average scores for year 9 pupils who reported their lessons provided either high or moderate instructional clarity were higher in 2023. The average score for pupils who reported high instructional clarity increased by 19 scale points (547 in 2023 compared with 528 in 2019) and increased by 17 scale points for pupils who reported that their lessons provided moderate instructional clarity (529 compared with 512). However, the average score for pupils who reported low instructional clarity in 2023 was below that achieved in 2019 (496 compared with 507). This meant that the range of average scores between the highest and lowest categories more than doubled between 2019 and 2023 from 21 scale points to 51 scale points.

The percentage of year 9 pupils in England who reported that their lessons provided high instructional clarity in mathematics was below the international average (38% compared with 48%) while the reverse was the case for pupils who reported low instructional clarity (21% compared with the international average of 15%). See Figure 28 and Table 29 below.

There were some significant gender differences in year 9 pupils' reported views on instructional clarity in mathematics. A significantly larger percentage of boys reported high instructional clarity in comparison with girls (41% compared with 35%), while, correspondingly, a significantly larger percentage of girls reported low instructional clarity (26% compared with 17% for boys).

Figure 28: The percentage of year 9 pupils reporting high, moderate or low instructional clarity in their mathematics lessons and their average score (England and international average)



Source: IEA TIMSS International Report 2023

Table 29: The percentage of year 9 pupils reporting high, moderate or low instructional clarity in their mathematics lessons and their average score (England and international average)

Reported instructional clarity	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
High clarity of instruction	547	487	38	48
Moderate clarity of instruction	529	470	40	36
Low clarity of instruction	496	458	21	15

Source: IEA TIMSS International Report 2023

A larger percentage of year 9 pupils in England (38%) reported that their mathematics lessons provided high instructional clarity compared with their peers in Chinese Taipei, Hong Kong and Japan from the highest-performing group of countries. The reverse was the case compared with pupils in the Republic of Korea and Singapore. In comparison with the other English-speaking countries, a smaller percentage year 9 pupils in England reported that their lessons provided high instructional clarity compared with their peers in Australia, Ireland and the United States. A larger percentage of pupils in England reported that their mathematics lessons provided high instructional clarity compared with their peers in Finland and France from the European comparator countries and were similar to pupils in Italy and Lithuania.

8.2.2 To what extent did pupils in England report that their lessons provided instructional clarity in science?

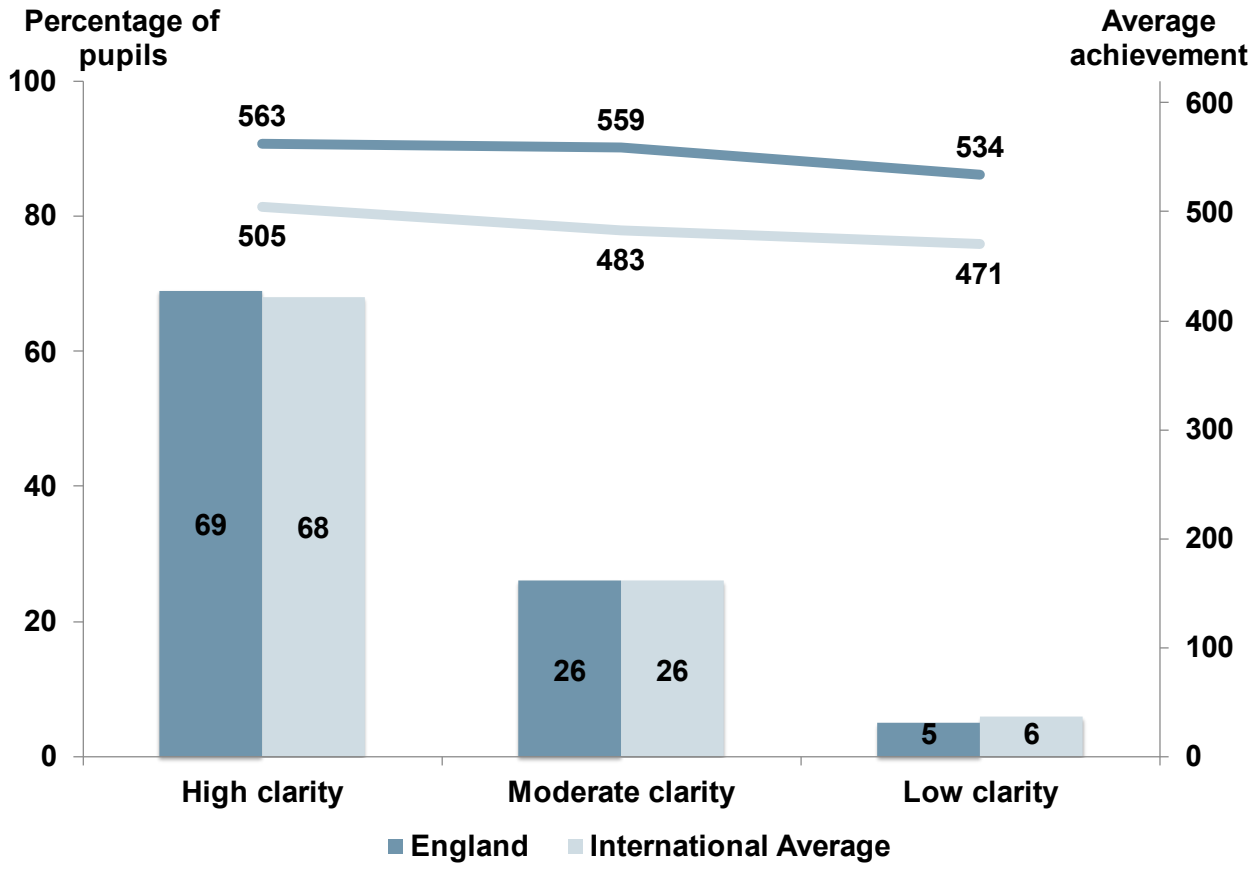
Year 5

Compared with 2019, the average scores for year 5 pupils who reported their science lessons provided either high or moderate instructional clarity were higher in 2023. The average score for pupils who reported high instructional clarity increased by 24 scale points (563 in 2023 compared with 539 in 2019) and increased by 21 scale points for pupils who reported that their lessons provided moderate instructional clarity (559 compared with 538). However, the average score for pupils who reported low instructional clarity in 2023 was below that achieved in 2019 (534 compared with 540). The range of average scores for pupils in England, between the highest and lowest categories (29 scale points), was narrower than the range calculated from the international averages for 2023 (34 scale points).

The percentages of year 5 pupils in England who reported that their lessons provided high, moderate or low instructional clarity in science were very similar to the international averages (see Figure 29 and Table 30 below).

As with year 5 science, there were no gender differences in year 5 pupils' reported views on instructional clarity.

Figure 29: The percentage of year 5 pupils reporting high, moderate or low instructional clarity in their science lessons and their average score (England and international average)



Source: IEA TIMSS International Report 2023

Table 30: The percentage of year 5 pupils reporting high, moderate or low instructional clarity in their science lessons and their average score (England and international average)

Reported instructional clarity	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
High clarity of instruction	563	505	69	68
Moderate clarity of instruction	559	483	26	26
Low clarity of instruction	534	471	5	6

Source: IEA TIMSS International Report 2023

A larger percentage of year 5 pupils in England (69%) reported that their science lessons provided high instructional clarity compared with their peers from any of the highest-performing group of countries, except in the Republic of Korea where the percentage was the same. A larger percentage of year 5 pupils in England reported that their lessons provided high instructional clarity compared with their peers in any of the English-speaking countries, except in Canada (71%). This was also the case compared with their peers in any of the European comparator countries.

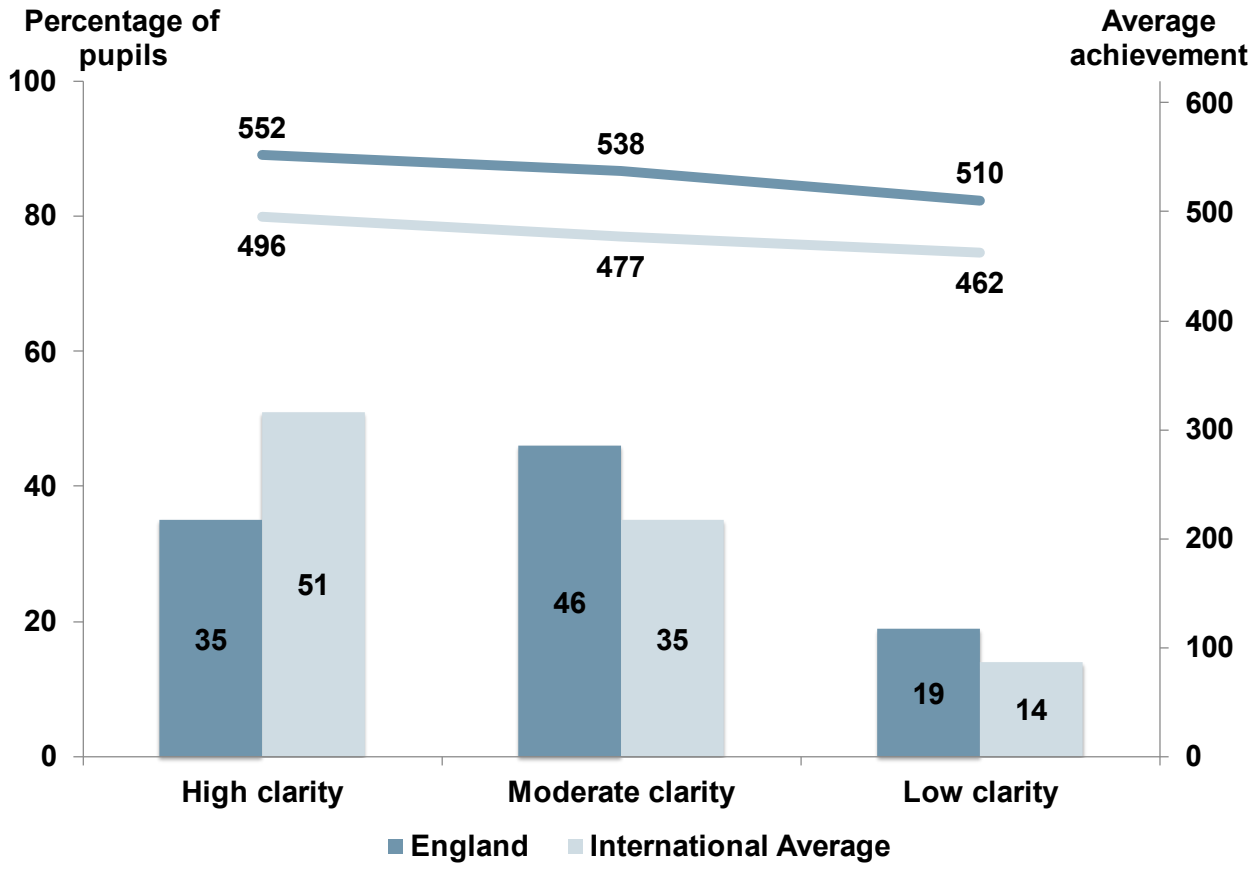
Year 9

Compared with 2019, the average scores for year 9 pupils who reported their science lessons provided either high, moderate or low instructional clarity were higher in 2023. The average score for pupils who reported high instructional clarity increased by 18 scale points (552 in 2023 compared with 534 in 2019), by 17 scale points for pupils who reported that their lessons provided moderate instructional clarity (538 compared with 521) and 23 scale points for pupils who reported low instructional clarity (510 compared with 487). The range of average scores for pupils in England, between the highest and lowest categories in 2023 (42 scale points), was wider than the range calculated from the international averages for 2023 (34 scale points). However, this scale point difference for England's pupils in 2023 (42 scale points) represented a narrowing of the performance gap by 5 scale points compared with the range for England's pupils in 2019 (47 scale points).

The percentages of year 9 pupils in England who reported that their lessons provided high instructional clarity in science was below the international average (35% compared with 51%) while the reverse was the case for pupils who reported low instructional clarity (19% compared with the international average of 14%). See Figure 30 and Table 31 below.

There were some significant gender differences in year 9 pupils' reported instructional clarity in science. A significantly larger percentage of boys reported high instructional clarity in comparison with girls (37% compared with 33%), while, correspondingly, a significantly larger percentage of girls reported low instructional clarity (23% compared with 15% for boys).

Figure 30: The percentage of year 9 pupils reporting high, moderate or low instructional clarity in their science lessons and their average score (England and international average)



Source: IEA TIMSS International Report 2023

Table 31: The percentage of year 9 pupils reporting high, moderate or low instructional clarity in their science lessons and their average score (England and international average)

Reported instructional clarity	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
High clarity of instruction	552	496	35	51
Moderate clarity of instruction	538	477	46	35
Low clarity of instruction	510	462	19	14

Source: IEA TIMSS International Report 2023

A smaller percentage of year 9 pupils in England (35%) reported that their science lessons provided high instructional clarity compared with their peers in any of the highest-performing group of countries except in Japan. Similarly, a smaller percentage of year 9 pupils in England reported that their lessons provided high instructional clarity compared with their peers in any of the English-speaking countries (Australia, Ireland and the United States) and, from the European comparator countries, Italy (the only country whose pupils participated in this questionnaire)[19].

8.3 To what extent were pupils in England confident about their mathematics and science abilities?

For both mathematics and science, pupils responded to the following statements using a 4 point scale from 'Agree a lot' to 'Disagree a lot'. These were consistent across both subjects (with the exception of item 6). There were some variations in the number of statements and their phrasing in 2023, however these have not affected the IEA's use of comparisons across TIMSS cycles[20].

1. I usually do well in mathematics/science
2. Mathematics/science is more difficult for me than for many of my classmates
3. Mathematics/science is not one of my strengths
4. Mathematics/science is easy for me
5. I am good at working out difficult mathematics/science problems
6. I am good at explaining mathematics/science to others (for year 9 pupils only)
7. Mathematics/science is harder for me than any other subject
8. Mathematics/science makes me confused

Based on their responses, scores were calculated that assigned pupils into 1 of 3 categories. These related to the extent to which they were confident in mathematics or science:

- very confident
- somewhat confident
- not confident[21]

[19] Pupils in Finland, France and Lithuania participated in questionnaires for the separate sciences.
[20] In 2019 statements included, 'I learn things quickly in mathematics/science', 'mathematics/science makes me nervous' and 'my teacher tells me I am good at mathematics/science'. 'I am good at explaining mathematics/science to others' was not included in 2019.
[21] For full methodological explanations see the TIMSS 2023 International Report.

As in 2015 and 2019, there was a positive and significant association between having more confidence in mathematics and science ability and higher average scores in 2023, both in year 5 and year 9. Pupils in England who reported that they were very confident in their mathematics and science ability had significantly higher average scores than those who reported that they were somewhat or not confident in their ability, while pupils who reported that they were somewhat confident in their ability had significantly higher average scores than those who reported that they were not confident.

8.3.1 To what extent were pupils in England confident about their mathematical abilities?

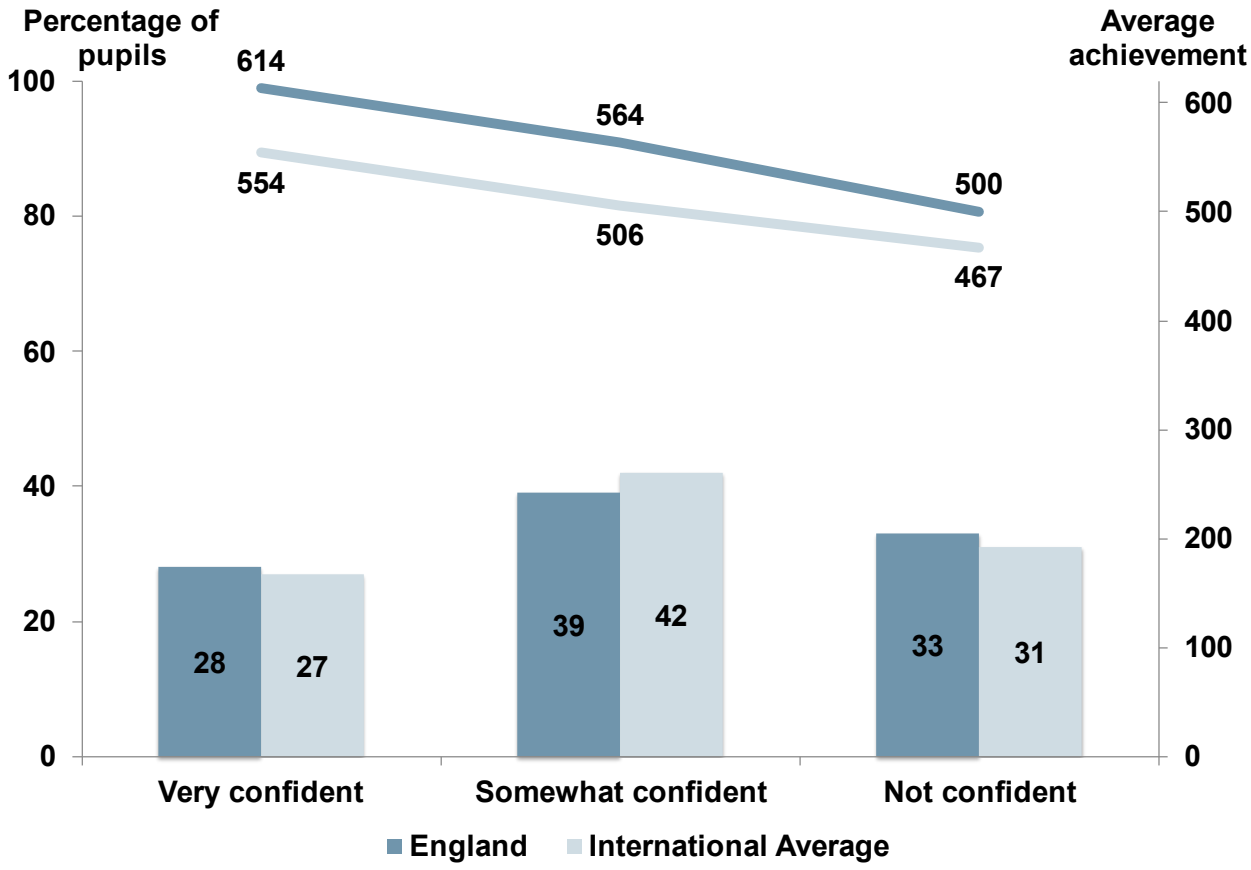
Year 5

Compared with 2019, the average scores for year 5 pupils in the very confident and somewhat confident categories were higher in 2023. The average score for very confident pupils increased by 7 scale points (614 in 2023 compared with 607 in 2019) and by 15 scale points for somewhat confident pupils (564 compared with 549). The average score for very confident pupils in England was 60 scale points above the international average. However, the average score for pupils who were not confident decreased from 506 in 2019 to 500 in 2023. This has further widened the range of average scores between the highest and lowest categories noted in the previous study (from 101 scale points in 2019 to 114 in 2023). By contrast the range calculated from the international average for 2023 was 87 scale points.

As shown in Figure 31 and Table 32 below, the percentages of England's pupils in each category were similar to the international averages in 2023. However, the percentage of pupils in England who were either very confident or somewhat confident has decreased over time: 80% in 2015, 76% in 2019 and 67% in 2023 meaning that around one-third of pupils considered themselves not confident in the latest cycle.

There were some significant gender differences in year 5 pupils' reported confidence in mathematics. A significantly larger percentage of boys were very confident in comparison with girls (36% compared with 20%), while, correspondingly, a significantly larger percentage of girls were not confident (42% compared with 25%). This latter difference of 17 percentage points is larger than in 2019 when it was 12 percentage points (30% compared with 18%).

Figure 31: The percentage of year 5 pupils reporting the extent to which they were confident in their mathematical ability and their average score in 2023 (England and international average)



Source: IEA TIMSS International Report 2023

Table 32: The percentage of year 5 pupils reporting the extent to which they were confident in their mathematical ability and their average score in 2023 (England and international average)

Confidence in mathematical ability	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very confident	614	554	28	27
Somewhat confident	564	506	39	42
Not confident	500	467	33	31

Source: IEA TIMSS International Report 2023

A larger percentage of year 5 pupils in England were very confident in mathematics compared with their peers in each of the highest-performing countries. The percentage of

pupils in England (28%) who were very confident was similar to the majority of English-speaking countries. The percentage of very confident pupils in England was lower than in Finland, France and Italy from the European comparator countries. However, A larger percentage of pupils in England (28%) were very confident compared with their peers in Lithuania (20%).

Year 9

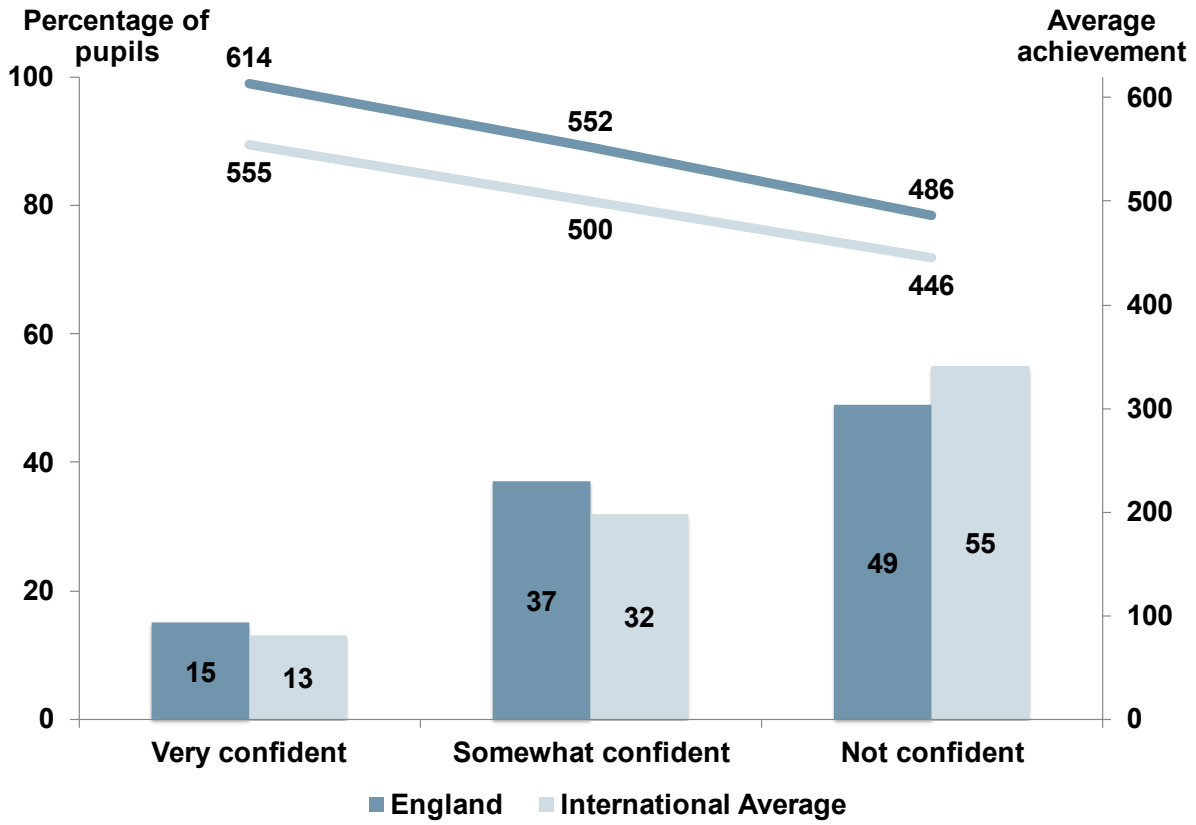
In 2023, there was a 26 scale point increase in the average score of very confident year 9 pupils (614) compared with 2019 (588). This was 59 scale points above the international average. The average scores for pupils that were somewhat confident (552) and not confident (486) in 2023 were also higher than in 2019 (528 and 480 respectively). The percentage of year 9 pupils in England who were very confident in mathematics in 2023 was similar to the international average (15% compared with 13% respectively), while a smaller percentage of pupils were not confident in mathematics compared with the international average (49% compared with 55%). This data is shown in Figure 32 and Table 33 below.

The difference between the average scores of those who reported that they were very confident (614) and those who reported that they were not confident (486) was 128 scale points, widening the 108 point gap in the 2019 study. By contrast the range calculated from the international averages in 2023 was 109 scale points.

The percentage of England's pupils who were either very confident or somewhat confident has decreased over time: 65% in 2015, 63% in 2019 and 52% in 2023. The 49% of England's pupils who were not confident was above the percentages in both 2019 and 2015 (38% and 35% respectively).

As in year 5, there were some significant gender differences in year 9 pupils' reported confidence in mathematics. A significantly larger percentage of boys was very confident in mathematics in comparison with girls (21% compared with 9%), while, correspondingly, a significantly larger percentage of girls was not confident (60% compared with 38%). These percentage gaps of 12 percentage points and 22 percentage points respectively were larger than those recorded in 2019 (8 percentage points and 14 percentage points respectively).

Figure 32: The percentage of year 9 pupils reporting the extent to which they were confident in their mathematical ability and their average score in 2023 (England and international average)



Source: IEA TIMSS International Report 2023

Table 33: The percentage of year 9 pupils reporting the extent to which they were confident in their mathematical ability and their average score in 2023 (England and international average)

Confidence in mathematical ability	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very confident	614	555	15	13
Somewhat confident	552	500	37	32
Not confident	486	446	49	55

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

A larger percentage of England's year 9 pupils were very confident in mathematics compared with their peers in any of the highest-performing countries apart from Singapore, which was similar. In comparison with the other English-speaking countries, a larger percentage of pupils in England than in Australia and Ireland were very confident in mathematics while the United States' percentage was the same as England's. A larger percentage of pupils were very confident in mathematics in England than most comparator European comparator countries, with only Italy having a similar percentage of very confident pupils.

8.3.2 To what extent were pupils in England confident about their science abilities?

Year 5

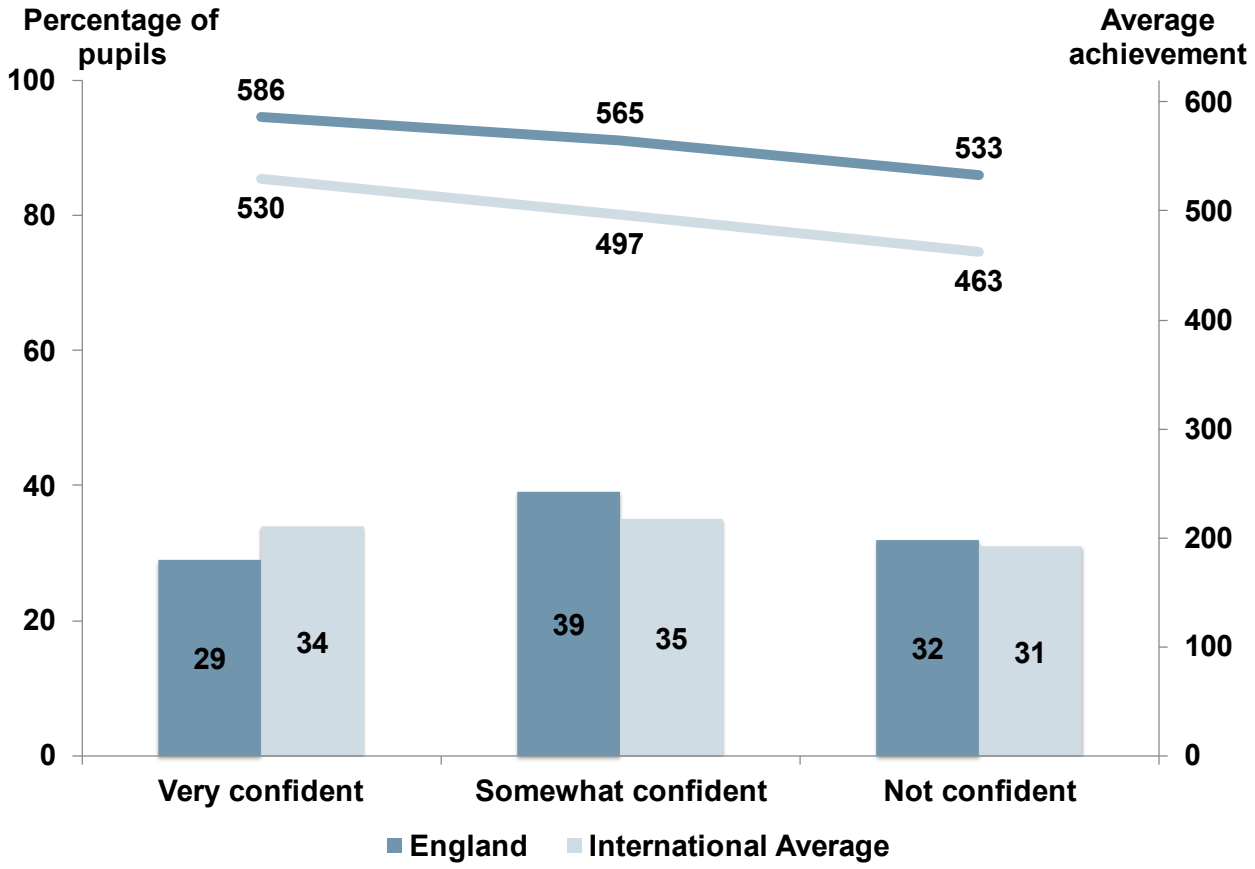
In 2023, there was a 27 scale point increase in the average score of very confident year 5 pupils (586) compared with 2019 (559). This 2023 average score was 56 scale points above the international average (530). The average scores for pupils that were either somewhat confident (565) or not confident (533) were also higher than in 2019 (538 and 516 respectively). The percentage of year 5 pupils in England who were very confident in science in 2023 was below the international average (29% compared with 34% respectively), while a similar percentage of pupils was not confident in science compared with the international average (32% compared with 31%). This data is shown in Figure 33 and Table 34 below.

The difference between the average score of those who reported that they were very confident (586) and those who reported that they were not confident (533) was 53 scale points, widening the 43 scale point gap compared to the 2019 study. However, it was below the international average for 2023 (a gap of 67 scale points).

The percentage of England's pupils who were either very confident or somewhat confident has decreased compared with the previous 2 cycles: 75% in 2015, 75% in 2019 and 68% in 2023. The 32% of pupils who were not confident was larger than England's percentages in both 2015 and 2019 (25% for both cycles).

There were no significant gender differences in year 5 pupils' reported confidence in science. Boys and girls were equally likely to report being either confident in their science ability or not confident in their science ability.

Figure 33: The percentage of year 5 pupils reporting the extent to which they were confident in their science ability and their average score in 2023 (England and international average)



Source: IEA TIMSS International Report 2023

Table 34: The percentage of year 5 pupils reporting the extent to which they were confident in their science ability and their average score in 2023 (England and international average)

Confidence in mathematical ability	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very confident	586	530	29	34
Somewhat confident	565	497	39	35
Not confident	533	463	32	31

Source: IEA TIMSS International Report 2023

A larger percentage of England's year 5 pupils were very confident in science compared with their peers in any of the highest-performing countries apart from Chinese Taipei (38%) and Japan (33%). In comparison with the other English-speaking countries, a larger percentage of pupils in England were very confident in science than their peers in New Zealand. In Australia the same percentage of pupils were very confident as in England and compared with Canada, Ireland and the United States, which had larger percentages of very confident pupils. A larger percentage of pupils in England were very confident in science than in France and Lithuania from the European comparator countries, while the reverse was the case compared with pupils in Finland and Italy.

Year 9

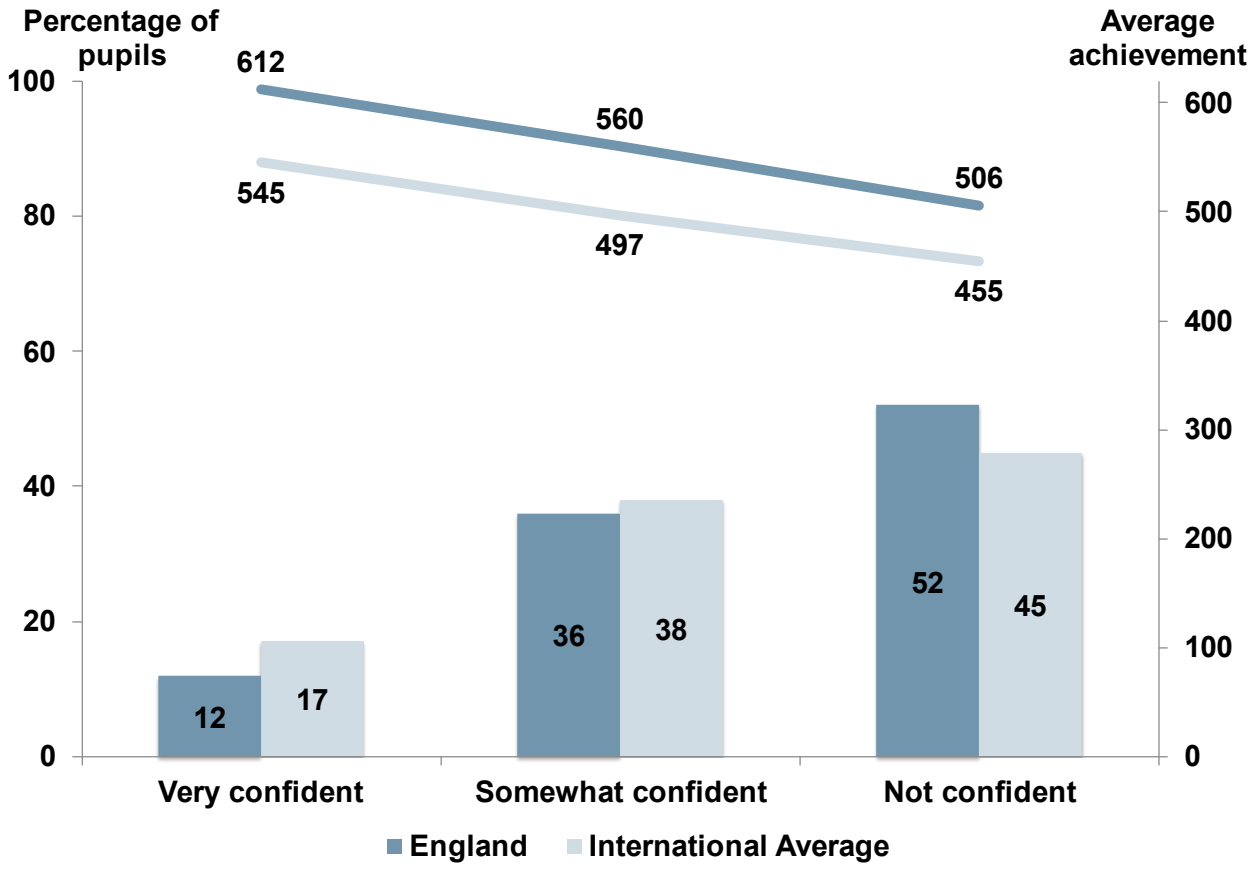
In 2023, there was a 31 scale point increase in the average score of very confident year 9 pupils (612) compared with 2019 (581). This average score of 612 for England's very confident pupils in 2023 was 67 scale points above the international average (545). The percentage of year 9 pupils in England who were very confident in science in 2023 was below the international average (12% compared with 17% respectively), while a larger percentage of pupils were not confident in science compared with the international average (52% compared with 45%). The average scores for England's pupils that were either somewhat confident (560) or not confident (506) were also higher than in 2019 (539 and 488 respectively). This data is shown in Figure 34 and Table 35 below.

The difference between the average score of those who reported that they were very confident (612) and those who reported that they were not confident (506) was 106 scale points, widening the 93 scale point gap noted in the 2019 study. This was similar to the international average gap in 2023 (90 scale points).

The percentage of England's pupils who were either very confident or somewhat confident has decreased compared over time: 62% in 2015, 53% in 2019 and 48% in 2023. Just over half (52%) of pupils were not confident in 2023, above England's percentages in both 2015 and 2019 (38% and 48% respectively) and above the international average (45%).

Although there were no significant gender differences in year 5 pupils' reported confidence in science, significant gender differences did exist for year 9 pupils. A significantly larger percentage of boys than girls were very confident (14% compared with 10%), while, correspondingly, a significantly larger percentage of girls were not confident (60% compared with 44%). While the difference between boys and girls that were very confident in 2023 (4%) was smaller than in 2019 (6%), the difference for not confident pupils was larger at 16 percentage points compared with 2019 when it was 10 percentage points.

Figure 34: The percentage of year 9 pupils reporting the extent to which they were confident in their science ability and their average score in 2023 (England and international average)



Source: IEA TIMSS International Report 2023

Table 35: The percentage of year 9 pupils reporting the extent to which they were confident in their science ability and their average score in 2023 (England and international average)

Confidence in mathematical ability	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very confident	612	545	12	17
Somewhat confident	560	497	36	38
Not confident	506	455	52	45

Source: IEA TIMSS International Report 2023

A larger percentage of England's year 9 pupils were very confident in science compared with their peers in any of the highest-performing countries apart from Hong Kong (12% − the same as England) and Singapore (16%). In comparison with the other English-speaking countries, pupils in England who were very confident in science was similar to their peers in Australia. A smaller percentage of pupils in England were very confident compared with their peers in the remaining 2 countries (Ireland and the United States). A smaller percentage of pupils in England were very confident in science than in Italy with no other countries from the European comparator group participating in this questionnaire.

Across mathematics and science in England, the percentages of pupils who were not confident were larger in year 9 than in year 5, and the percentages of year 9 pupils who were very confident were lower than in year 5.

8.4 To what extent did year 9 pupils in England value mathematics and science?

For both mathematics and science, only year 9 pupils responded to the following statements using a 4 point scale from 'Agree a lot' to 'Disagree a lot'. All statements were common to both subjects with just the subject title changed, and were the same as in 2019.

1. I think learning mathematics/science will help me in my daily life
2. I need mathematics/science to learn other school subjects
3. I need to do well in mathematics/science to get into the university of my choice
4. I need to do well in mathematics/science to get the job I want
5. I would like a job that involves using mathematics/science
6. It is important to learn about mathematics/science to get ahead in the world
7. Learning mathematics/science will give me more job opportunities when I am an adult
8. My parents think that it is important that I do well in mathematics/science
9. It is important to do well in mathematics/science

Based on their responses, scores were calculated that assigned pupils into 1 of 3 categories. These related to the extent to which they valued the subject:

- strongly value
- somewhat value

- do not value[22]

As in 2015 and 2019, there was a positive and significant association in 2023 between year 9 pupils in England valuing mathematics and science and average scores. In 2023, pupils who strongly valued mathematics and science had significantly higher average scores than those who somewhat valued or did not value the subjects, while pupils who somewhat valued mathematics and science had significantly higher average scores than those who did not.

8.4.1 To what extent did year 9 pupils value mathematics?

In 2023, the average scores for year 9 pupils in all 3 categories were higher than in 2019. The average score for pupils who strongly valued mathematics increased by 21 scale points (549 compared with 528) while for those who somewhat valued mathematics the increase was 19 scale points (534 compared with 515). For pupils who did not value mathematics it was 3 scale points higher (503 compared with 500).

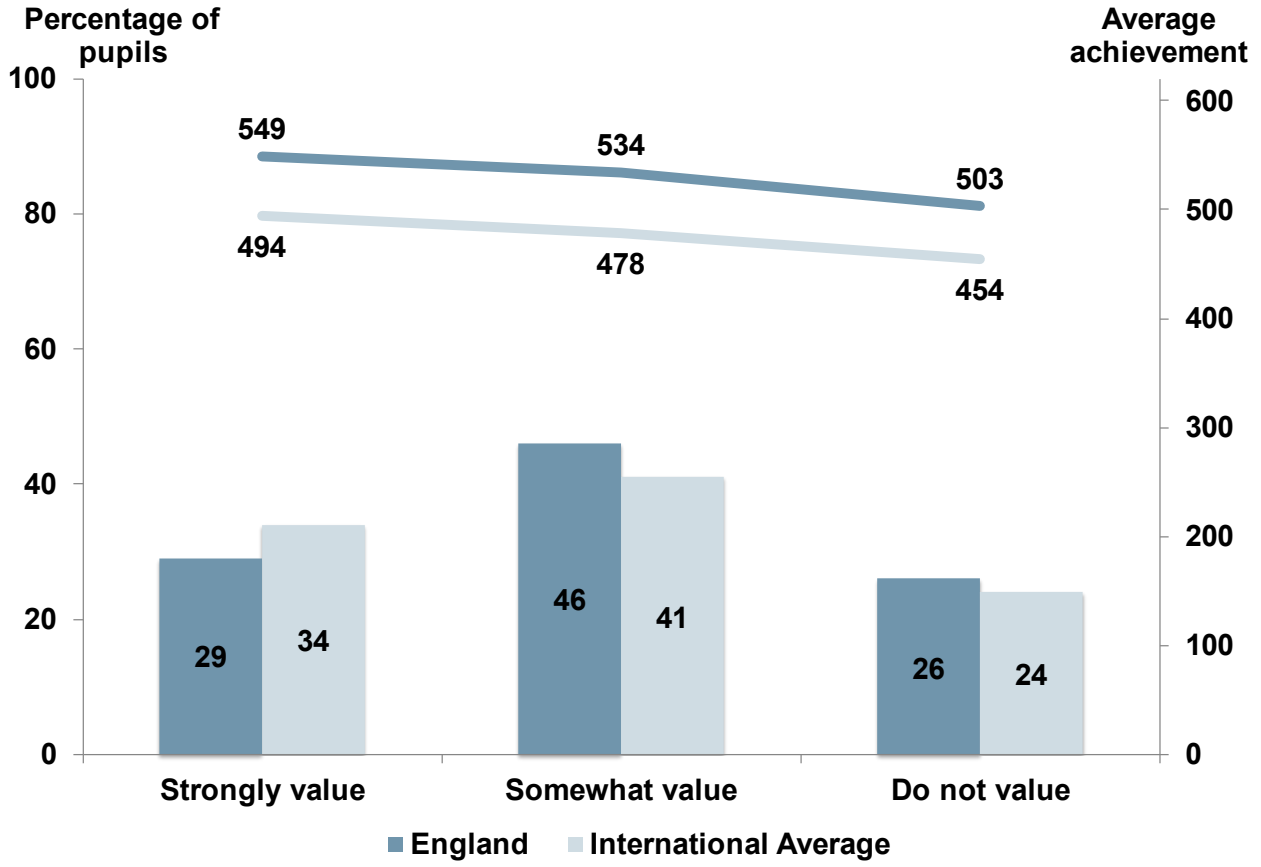
The difference between the average score for those who strongly valued mathematics (549) and those who did not value mathematics (503) was 46 scale points, above the international average gap (40 scale points). It was also more than the 28 scale point difference between England's pupils' average scores in these categories in 2019 by 18 scale points.

As shown in Figure 35 and Table 36 below, the percentage of pupils in England who strongly valued mathematics in 2023 was below the international average (29% compared with 34%) while the reverse was true for those pupils who somewhat valued mathematics (46% compared with 41%). The percentage of pupils who did not value mathematics in England was similar to the international average (26% compared with 24%).

A significantly larger percentage of boys strongly valued the subject than girls (33% compared with 24%), while, correspondingly, a significantly larger percentage of girls did not value the subject (31% compared with 20%). The difference in the percentage of girls not valuing the subject compared with boys in 2023 (11 percentage points) is larger than in 2019 (3 percentage points).

[22] For full methodological explanations see the TIMSS 2023 International Report.

Figure 35: The percentage of year 9 pupils reporting the extent to which they value mathematics and their average score (England and international average)



Source: IEA TIMSS International Report 2023

Table 36: The percentage of year 9 pupils reporting the extent to which they value mathematics and their average score (England and international average)

Extent to which year 9 pupils value mathematics	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Strongly value	549	494	29	34
Somewhat value	534	478	46	41
Do not value	503	454	26	24

Source: IEA TIMSS International Report 2023

A larger percentage of year 9 pupils in England strongly valued mathematics than was the case for their peers from any of the highest-performing comparator group countries, except in Singapore. In comparison with the 3 English-speaking countries whose pupils participated in this questionnaire, a larger percentage of pupils in England strongly

valued mathematics than pupils in Ireland, while a similar percentage did in Australia and the United States. A larger percentage of year 9 pupils in England strongly valued mathematics than was the case for their peers in any of the European comparator countries.

8.4.2 To what extent did year 9 pupils value science?

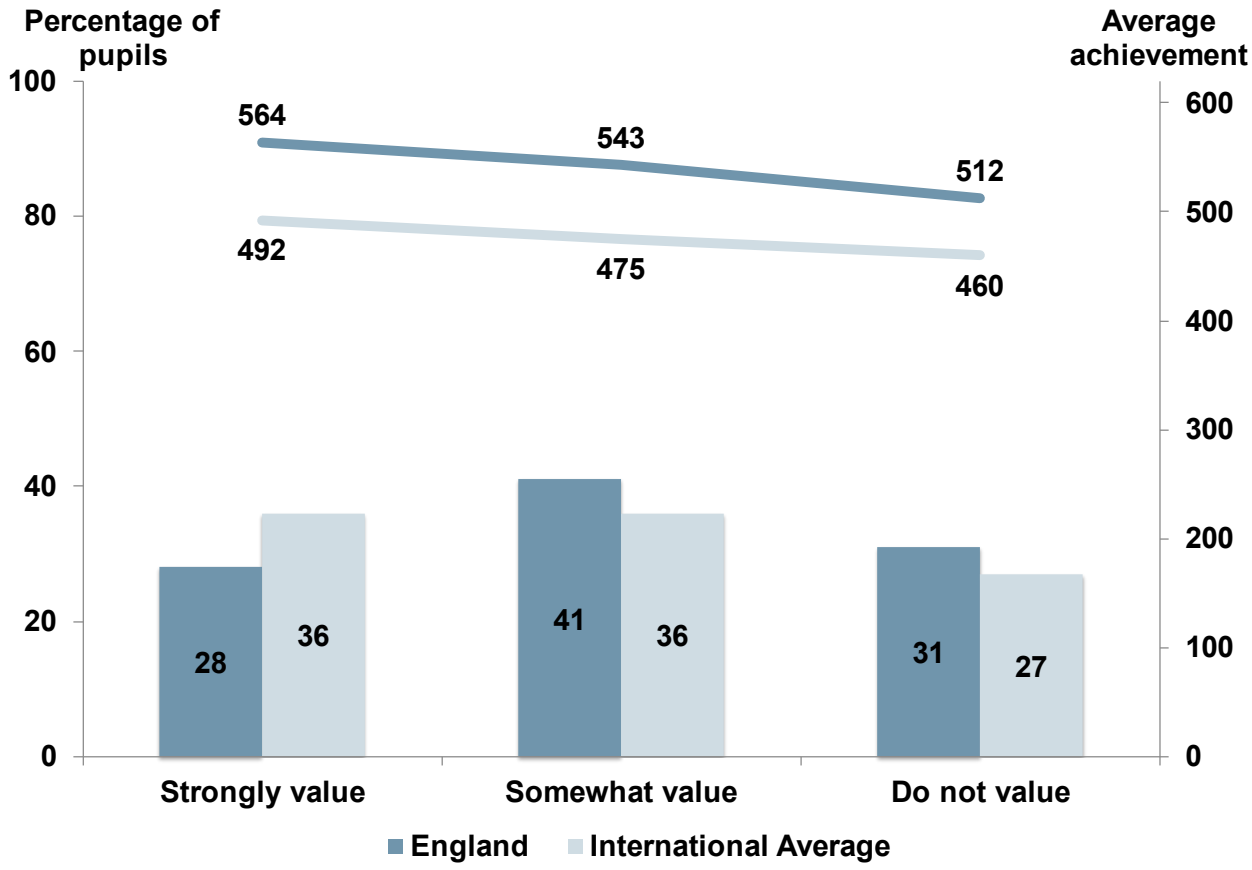
In 2023, the average scores for year 9 pupils in all 3 categories were higher than in 2019. The average score for pupils who strongly valued science increased by 24 scale points (564 compared with 540) while for those who somewhat valued mathematics the increase was 20 scale points (543 compared with 523). For pupils who did not value mathematics it was 21 scale points higher (512 compared with 491).

The difference between the average score for those who strongly valued science (564) and those who did not value science (512) was 52 scale points, above the international average gap (32 scale points) and larger than the 49 scale point difference between these categories in 2019.

As shown in Figure 36 and Table 37 below, the percentage of pupils in England who strongly valued science in 2023 was below the international average (28% compared with 36%) while the reverse was true for those pupils who somewhat valued science (41% compared with 36%). The percentage of pupils who did not value science in England was above the international average (31% compared with 27%).

A significantly larger percentage of boys strongly valued the subject than girls (29% compared with 26%), while, correspondingly, a significantly larger percentage of girls did not value the subject (35% compared with 28%). The percentage difference between boys and girls who strongly valued science was similar in 2023 compared with 2019 (3 percentage points compared with 4 percentage points respectively), as was the case for pupils who did not value science (7 percentage points and 5 percentage points respectively).

Figure 36: The percentage of year 9 pupils reporting the extent to which they value science and their average score (England and international average)



Source: IEA TIMSS International Report 2023

Table 37: The percentage of year 9 pupils reporting the extent to which they value science and their average score (England and international average)

Extent to which year 9 pupils value science	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Strongly value	564	492	28	36
Somewhat value	543	475	41	36
Do not value	512	460	31	27

Source: IEA TIMSS International Report 2023

A larger percentage of year 9 pupils in England strongly valued science than their peers in Chinese Taipei and Japan from the highest-performing comparator group countries. The same percentage of pupils in England strongly valued science compared with peers

in the Republic of Korea, while a smaller percentage did compared with peers in Hong Kong and Singapore. In comparison with the 3 English-speaking countries whose pupils participated in this questionnaire, a larger percentage of pupils in England strongly valued science than pupils in Australia and Ireland, while a similar percentage did in the United States. A larger percentage of year 9 pupils in England strongly valued science than was the case for their peers in any of the European comparator countries apart from Lithuania where the percentage was the same.

8.5 To what extent did pupils in England like learning mathematics and science?

For both mathematics and science, pupils responded to the following statements using a 4 point scale from 'Agree a lot' to Disagree a lot'. There were some common statements between subjects and others were different, as noted below. Most statements were consistent (in terms of content) with those used in 2019[23].

1. I enjoy learning mathematics/science
2. I learn many interesting things in mathematics/science
3. I like mathematics/science
4. I like any schoolwork that involves numbers/science teaches me how things in the world work
5. I like to solve mathematics problems (mathematics questionnaire only)
6. I look forward to mathematics lessons/I look forward to learning science in school
7. Mathematics/science is one of my favourite subjects

Based on their responses, scores were calculated that assigned pupils into 1 of 3 categories related to the extent to which they liked learning:

- very much like learning
- somewhat like learning
- do not like learning

As in 2015 and 2019, there was a positive and significant association between liking mathematics and science and higher average scores in mathematics and science for pupils in years 5 and 9 in 2023. Pupils in England who reported that they very much liked learning the subjects had a significantly higher average score than those who reported

[23] Statements in 2019 but not 2023 were: I wish I did not have to study mathematics/science; mathematics/science is boring; and I like to conduct science experiments.

that they did not like learning them. In most cases, pupils who very much liked learning the subjects had higher average scores than pupils who somewhat liked learning them. However, there was 1 exception: year 5 pupils who very much liked learning science did not have a significantly higher average score than pupils who somewhat liked learning the subject. Pupils who reported that they somewhat liked learning mathematics and science had a significantly higher average score than those who reported that they did not like learning the subjects in each case.

8.5.1 To what extent did year 5 and year 9 pupils like learning mathematics?

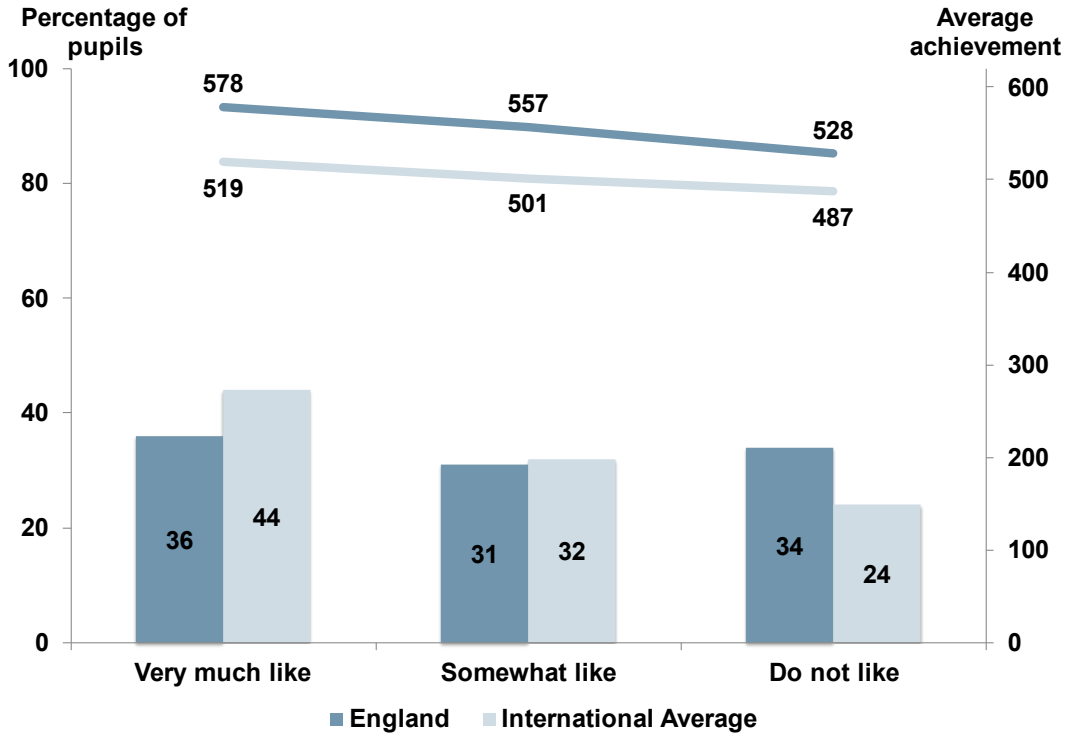
Year 5

Compared with 2019, the average scores for year 5 pupils in the 'very much like learning' and 'somewhat like learning' mathematics categories were higher in 2023. The average score for pupils who very much liked learning mathematics increased by 2 scale points (578 compared with 576) and by 8 scale points for those who somewhat liked learning mathematics (557 compared with 549). The average score for pupils in England who very much liked learning mathematics was 59 scale points above the international average. However, there was a small decrease in the average score for pupils who did not like learning mathematics (530 in 2019 to 528 in 2023). This has widened the range of average scores between the highest and lowest categories noted in the previous study (from 46 scale points in 2019 to 50 in 2023). By contrast the range calculated from the international average for 2023 was 32 scale points.

As shown in Figure 37 and Table 38 below, the percentages of England's pupils were only similar to the international averages in the somewhat like learning mathematics category in 2023. A smaller percentage of pupils in England very much liked learning mathematics (36%) compared with the international average (44%) with the reverse the case for those who did not like learning mathematics (34% compared with 24%). The percentage of pupils in England who either very much liked or somewhat liked learning mathematics has decreased over time: 82% in 2015, 78% in 2019 and 67% in 2023 meaning that around one-third of pupils considered that they did not like learning mathematics in the latest cycle.

There were some significant gender differences in the extent to which year 5 pupils liked learning in mathematics. A significantly larger percentage of boys very much liked learning mathematics in comparison with girls (45% compared with 27%), while, correspondingly, a significantly larger percentage of girls did not like learning mathematics (41% compared with 27%).

Figure 37: The percentage of year 5 pupils reporting the extent to which they like learning in mathematics and their average score in 2023 (England and international average)



Source: IEA TIMSS International Report 2023

Note: Percentages may not sum to 100% due to rounding.

Table 38: The percentage of year 5 pupils reporting the extent to which they like learning in mathematics and their average score in 2023 (England and international average)

Extent to which year 5 pupils like learning mathematics	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very much like learning mathematics	578	519	36	44
Somewhat like learning mathematics	557	501	31	32
Do not like learning mathematics	528	487	34	24

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

A larger percentage of England's year 5 pupils very much liked learning mathematics compared with their peers in any of the highest-performing countries apart from Hong Kong (37%). In comparison with the other English-speaking countries, a larger percentage of pupils in England very much liked learning mathematics than their peers in Ireland. A similar percentage in Australia very much liked learning and in New Zealand the percentage was the same as in England. Compared with the remaining 2 countries (Canada and the United States) a smaller percentage of pupils in England very much liked learning mathematics. A larger percentage of pupils in England very much liked learning mathematics than in Finland and Lithuania from the European comparator countries, while the reverse was the case compared with pupils in France and Italy.

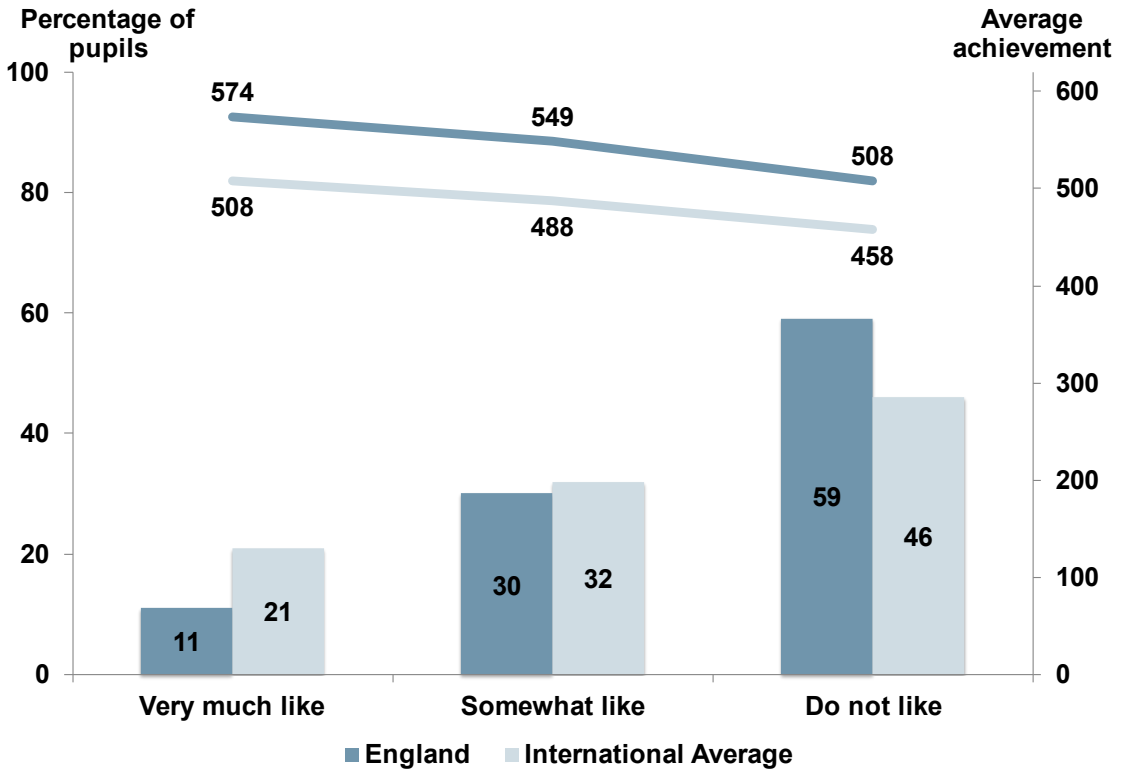
Year 9

Compared with 2019, the average scores for year 9 pupils in the very much like learning and somewhat like learning mathematics categories were higher in 2023. The average score for pupils who very much liked learning mathematics increased by 22 scale points (574 compared with 552) and by 19 scale points for those who somewhat liked learning mathematics (549 compared with 530). The average score for pupils in England who very much liked learning mathematics was 66 scale points above the international average. There was a smaller increase in the average score for pupils who did not like learning mathematics (500 in 2019 to 508 in 2023). The range of average scores between the highest and lowest categories in England has widened as noted also in the previous study (from 52 scale points in 2019 to 66 in 2023). By contrast the range calculated from the international average for 2023 was 50 scale points.

As shown in Figure 38 and Table 39 below, the percentages of England's pupils were only similar to the international averages in the somewhat like learning mathematics category in 2023.The percentages of England's pupils who very much like learning (11%) is much lower than the corresponding group internationally (21%). A larger percentage of pupils in England did not like learning mathematics. The percentage of pupils in England who either very much liked or somewhat liked learning mathematics has decreased over time: 53% in 2015, 50% in 2019 and 41% in 2023.

There were some significant gender differences in the extent to which year 9 pupils liked learning mathematics. A significantly larger percentage of boys very much liked learning mathematics in comparison with girls (14% compared with 7%), while, correspondingly, a significantly larger percentage of girls did not like learning mathematics (69% compared with 48%).

Figure 38: The percentage of year 9 pupils reporting the extent to which they like learning in mathematics and their average score in 2023 (England and international average)



Source: IEA TIMSS International Report 2023

Table 39: The percentage of year 9 pupils reporting the extent to which they like learning in mathematics and their average score in 2023 (England and international average)

Extent to which year 9 pupils like learning mathematics	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very much like learning mathematics	574	508	11	21
Somewhat like learning mathematics	549	488	30	32
Do not like learning mathematics	508	458	59	46

Source: IEA TIMSS International Report 2023

A larger percentage of England's year 9 pupils very much liked learning mathematics compared with their peers in Japan from the highest-performing countries. A smaller

percentage of pupils in England very much liked learning mathematics compared with their peers in Singapore (11% and 24% respectively). In comparison with the other English-speaking countries, a similar percentage of pupils in England very much liked learning mathematics compared with their peers in Australia and Ireland. A smaller percentage of pupils in England very much liked learning mathematics compared with their peers in the United States. A larger percentage of pupils in England very much liked learning mathematics than in Finland from the European comparator countries, with similar percentages found in France, Italy and Lithuania.

8.5.2 To what extent did year 5 and year 9 pupils like learning science?

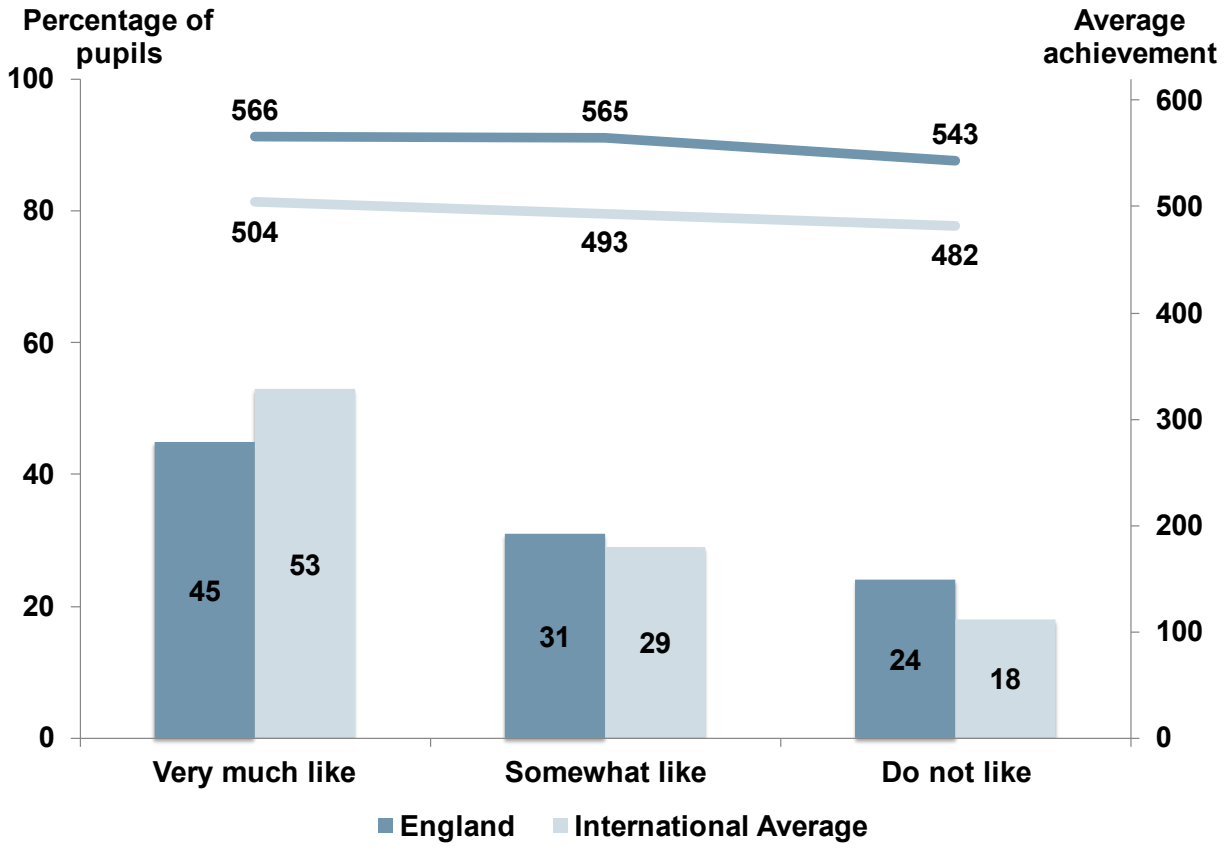
Year 5

Compared with 2019, the average scores for year 5 pupils in the ‘very much like’ learning and ‘somewhat like learning’ science categories were higher in 2023. The average score for pupils who very much liked learning science increased by 24 scale points (566 in 2023 compared with 542 in 2019) and by 25 scale points for those who somewhat liked learning science (565 compared with 540). There was also a 15 scale point increase in the average score for pupils who did not like learning science (528 in 2019 to 543 in 2023). The average score for pupils in England who very much liked learning science was 62 scale points above the international average. The range between the average scores for the highest and lowest categories noted in the previous study has widened (from 14 scale points in 2019 to 23 in 2023). This range for England’s pupils in 2023 is very similar to that calculated from the international average range for 2023 (22 scale points).

As shown in Figure 39 and Table 40 below, the percentages of England’s pupils were similar to the international averages in the somewhat like learning science category in 2023. A smaller percentage of pupils in England very much liked learning science compared with the international average with the reverse the case for those who did not like learning science. The percentage of pupils in England who either very much liked or somewhat liked learning science has reduced compared with the previous 2 cycles: 83% in 2015, 83% in 2019 and 76% in 2023.

There were some significant gender differences in the extent to which year 5 pupils reported they liked learning in science. A significantly larger percentage of boys very much liked learning science in comparison with girls (47% compared with 42%). However, there was no significant difference in terms of not liking learning science (25% for girls compared with 24% for boys).

Figure 39: The percentage of year 5 pupils reporting the extent to which they like learning in science and their average score in 2023 (England and international average)



Source: IEA TIMSS International Report 2023

Table 40: The percentage of year 5 pupils reporting the extent to which they like learning in science and their average score in 2023 (England and international average)

Extent to which year 5 pupils like learning science	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very much like learning science	566	504	45	53
Somewhat like learning science	565	493	31	29
Do not like learning science	543	482	24	18

Source: IEA TIMSS International Report 2023

A smaller percentage of England's year 5 pupils very much liked learning science compared with their peers in each of the highest-performing countries except for the Republic of Korea (38%). In comparison with the other English-speaking countries, the same or a similar percentage of pupils in England (45%) very much liked learning science compared with their peers in Australia (44%), Ireland (45%) and New Zealand (45%). A smaller percentage of pupils in England very much liked learning science compared with their peers in Canada (49%) and the United States (55%). A larger percentage of pupils in England very much liked learning science than in any of the European comparator countries, with the exception of Italy (52%).

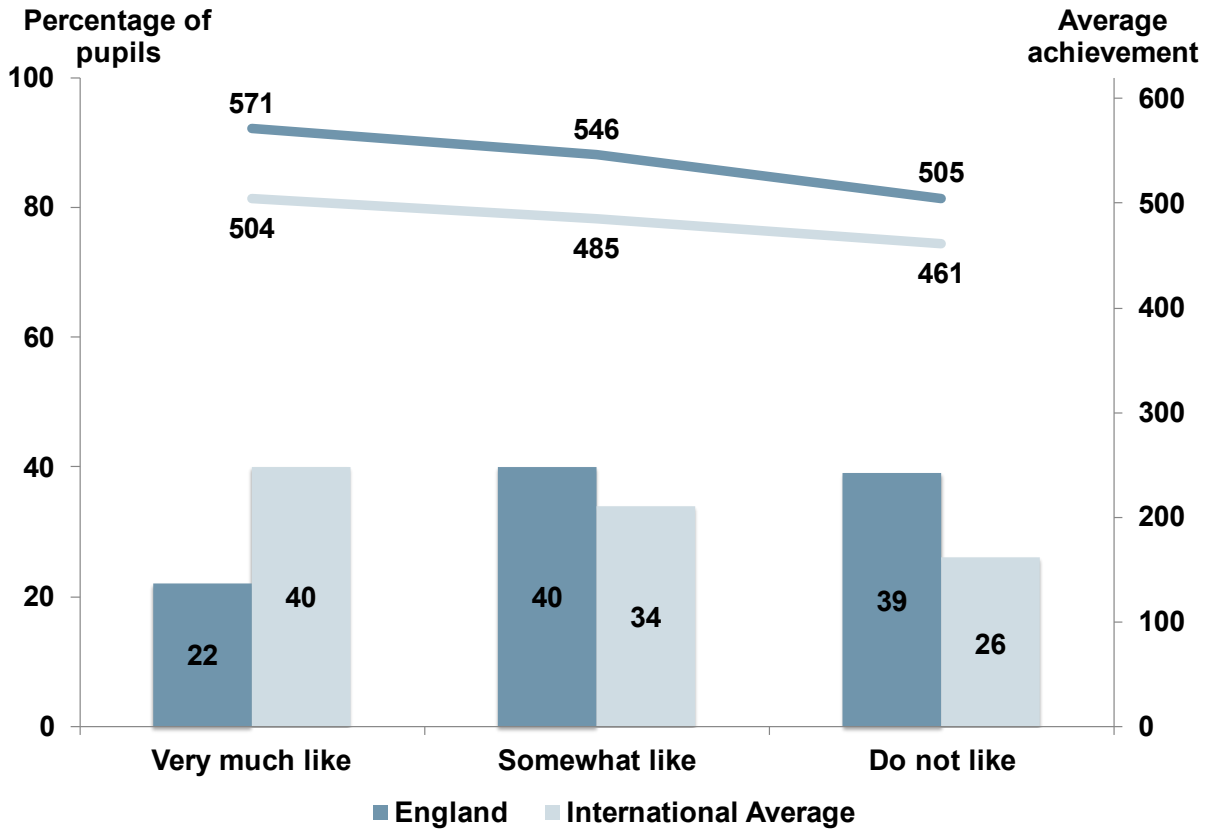
Year 9

Compared with 2019, the average scores for year 9 pupils in the very much like learning and somewhat like learning science categories were higher in 2023. The average score for pupils who very much liked learning science increased by 15 scale points (571 in 2023 compared with 556 in 2019) and by 22 scale points for those who somewhat liked learning science (546 compared with 524). There was also a 20 scale point increase in the average score for pupils who did not like learning science (485 in 2019 to 505 in 2023). The average score for pupils in England who very much liked learning science was 67 scale points above the international average. The increased range between the average scores for the highest and lowest categories noted in the previous study has been reduced in 2023 (from 71 scale points in 2019 to 66 in 2023). This range for England's pupils is larger compared with the one calculated from the international average for 2023 (43 scale points).

As shown in Figure 40 and Table 41 below, 22% of pupils in England very much liked learning science compared with the international average (40%) while 39% of England's pupils did not like learning science compared with the international average of 26%. The percentage of pupils in England who either very much liked or somewhat liked learning science has reduced over time: 75% in 2015, 69% in 2019 and 62% in 2023.

There were some significant gender differences in the extent to which year 9 pupils reported they liked learning in science. A significantly larger percentage of boys very much liked learning science in comparison with girls (25% compared with 19%), while, correspondingly, a significantly larger percentage of girls did not enjoy learning science (46% compared with 31%).

Figure 40: The percentage of year 9 pupils reporting the extent to which they like learning in science and their average score in 2023 (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 41: The percentage of year 9 pupils reporting the extent to which they like learning in science and their average score in 2023 (England and international average)

Extent to which year 9 pupils like learning science	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very much like learning science	571	504	22	40
Somewhat like learning science	546	485	40	34
Do not like learning science	505	461	39	26

Source: IEA TIMSS International Report 2023

Note: Percentages may not sum to 100% due to rounding.

A larger percentage of England's year 9 pupils very much liked learning science compared with their peers in Japan (18%) from the highest-performing countries with the same or similar percentages to pupils in Chinese Taipei (21%) and the Republic of Korea (22%). The percentage of pupils in Singapore reporting that they very much liked learning science (44%) was double the percentage for England (22%). A smaller percentage of pupils in England very much liked learning science compared with their peers in three English-speaking countries: Australia (24%), Ireland (28%) and the United States (34%). A smaller percentage of pupils in England also very much liked learning science compared with Italy (30%) the only European comparator country to participate in this questionnaire.

Across mathematics and science in England, the percentages of pupils who did not like the subject increased between years 5 and 9, while correspondingly the percentages who were very confident decreased.

8.6 To what extent were the 4 pupil attitude factors associated with performance?

Figures 41 and 42 and Tables 42 and 43 below compare the attitudinal factors from this chapter and the extent to which they were associated with pupils' average scores in England. This was achieved through comparing the average score for pupils in the highest and lowest categories to calculate a range (shown by the bars below). While associations between different factors and average scores can be noted, this does not mean the associations are causal.

As in 2019, across all these attitudinal factors (instructional clarity, confidence in ability, valuing the subject and liking the subject), confidence was most strongly associated with average scores.

In year 5 the difference between the average scores for pupils reporting high instructional clarity in mathematics compared with those who reported low clarity was larger than in 2019 (50 compared with 37) and was similar to that evidenced for year 9 (51). In science, the difference in 2023 was 24 scale points having been -1 in 2019. Therefore, in both mathematics and science, the ranges were larger than in 2019. In year 9, the difference between the average scores for pupils reporting high instructional clarity in science compared with those who reported low clarity was similar to that in mathematics (46 compared with 51) having been more than double in 2019 (46 compared with 21). This difference in mathematics in 2023 was more than double that recorded in 2019 (51 compared with 21).

As in 2019, confidence was most evident as a factor in year 9 mathematics. The difference between the average score for pupils in England who were very confident

compared with their not-confident peers was 128 scale points. In 2019 the difference was 108 scale points meaning there was a widening of this range by 20 scale points in 2023. This was more than double the differences for instructional clarity (51), valuing (46) and around double for liking mathematics (66).

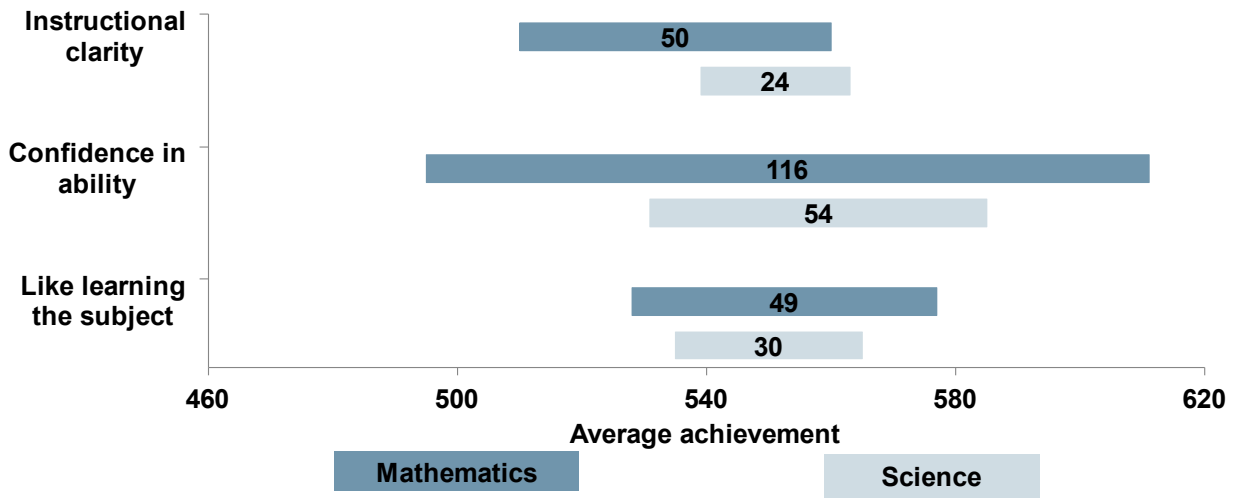
Similarly, the difference related to confidence in mathematics for pupils in year 5 (116 scale points, an increase from 101 in 2019 and 79 in 2015) was more than double the differences for instructional clarity (50) and liking mathematics (49) and also more than double the difference for confidence in science (54).

The differences in mathematics average scores for pupils' confidence in their ability was similar in years 5 and 9 (116 compared with 128). However, in year 9 science, the difference in scores between the most and least confident pupils was around double the difference for year 5 science (106 in year 9 compared with 54 in year 5).

The second largest differences related to liking learning the subject in both 2023 and 2019, with the exception of year 5 mathematics where the differences for liking and instructional clarity in mathematics were similar (49 compared with 50). The differences between the average scores for pupils who very much liked learning the subject compared with pupils who did not like learning the subject were greater in year 9 than in year 5 for this factor (66 compared with 49). In science, year 9 pupils' average score difference for liking the subject was more than double the difference for year 5 pupils (66 compared with 30).

In 2023, the ranges for year 9 pupils who valued mathematics and science were similar (46 compared with 52). This was similar for science in 2023 (52) compared with 2019 (49). However, it was larger for mathematics in 2023 (46) compared with 2019 (28).

Figure 41: Differences in average scores by pupil attitude in mathematics and science in 2023 (England, year 5)



Source: IEA TIMSS International Report 2023

Note 1. Year 5 pupils did not participate in the questionnaires for valuing subjects.

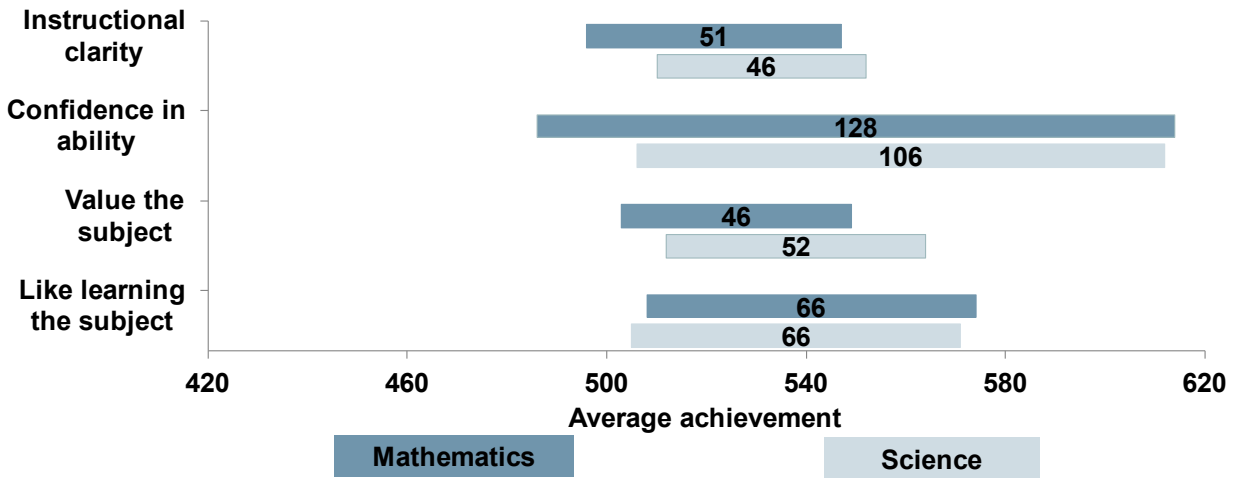
Table 42: Differences in average scores by pupil attitude in mathematics and science in 2023 (England, Year 5)

Factor	Range in mathematics (average score)	Range in science (average score)
Instructional clarity	50	24
Confidence in ability	116	54
Like learning the subject	49	30

Source: IEA TIMSS International Report 2023

Note 1. Year 5 pupils did not participate in the questionnaires for valuing subjects.

Figure 42: Differences in average scores by pupil attitude in mathematics and science in 2023 (England, year 9)



Source: IEA TIMSS International Report 2023

Table 43: Differences in average scores by pupil attitude in mathematics and science in 2023 (England, year 9)

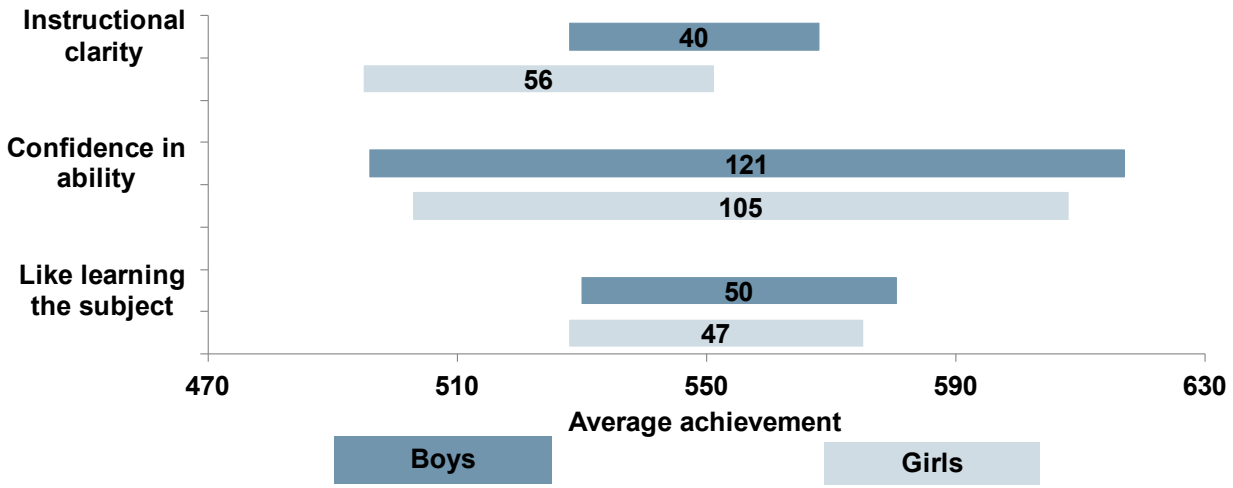
Factor	Range in mathematics (average score)	Range in science (average score)
Instructional clarity	51	46
Confidence in ability	128	106
Value the subject	46	52
Like learning the subject	66	66

Source: IEA TIMSS International Report 2023

Overall, analysis of these factors suggests that pupil confidence (and the statements related to this category in the TIMSS questionnaires) was more strongly associated with performance compared to the other factors. The ranges for confidence in both subjects have increased in 2023 compared with 2019. The difference between the size of ranges for instructional clarity and liking the subject has narrowed in 2023 compared with 2019.

In Figure 43 and Table 44 below, the difference between year 5 girls' and boys' average scores in mathematics were calculated as above by taking the highest and lowest categories to calculate a range in each of the attitudinal areas. There were no significant differences by gender in these ranges.

Figure 43: Differences in average scores in mathematics by pupil attitude and gender (England, year 5)



Source: IEA TIMSS International Report 2023

Table 44: Differences in average scores in mathematics by pupil attitude and gender (England, year 5)

Factor	Range in mathematics (average score) − boys	Range in mathematics (average score) − girls
Instructional clarity	40	56
Confidence in ability	121	105
Like learning the subject	50	47

Source: IEA TIMSS International Report 2023

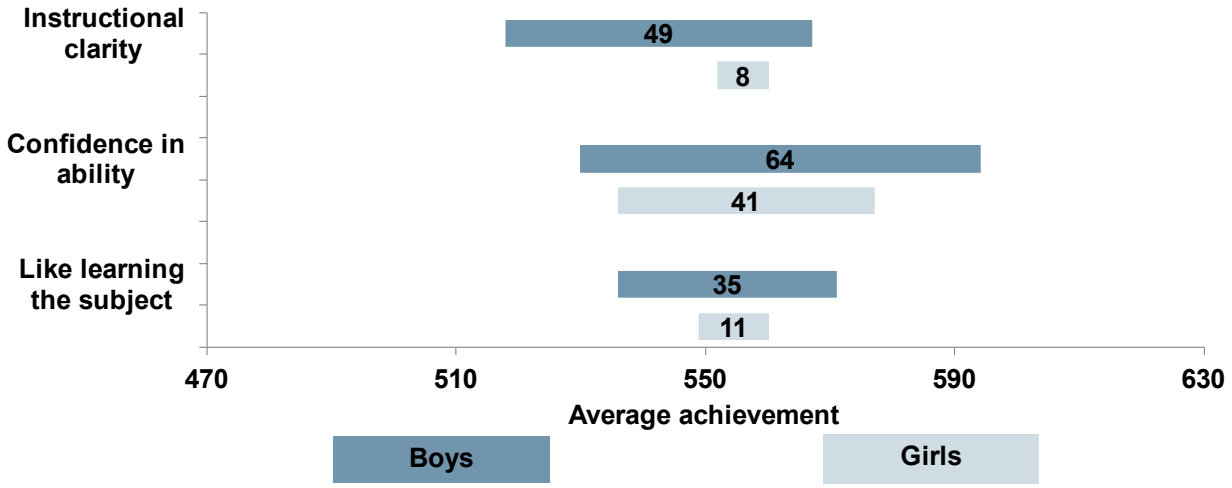
As Figure 44 and Table 45 below show, the differences in scores by pupil attitudes were larger for boys than for girls in year 5 science. Each of these gender differences was significant.

While the average scores by the extent of instructional clarity (high, moderate and low) were not significantly different by gender, the range of the average scores was.

With respect to the significant difference between boys' and girls' confidence, additional analysis shows that very confident boys have significantly higher average scores than very confident girls. However, there were no gender differences for either somewhat confident or not confident boys and girls. The significant difference in the range was therefore largely driven by the significant difference between the average scores for very confident boys and girls.

This was similarly found in the significant difference between boys and girls in the extent to which they liked learning science. Boys who did not like learning science performed significantly below girls, but boys who very much liked learning science performed significantly above girls. This results in the significantly larger range for boys.

Figure 44: Differences in average scores in science by pupil attitude and gender (England, year 5)



Source: IEA TIMSS International Report 2023

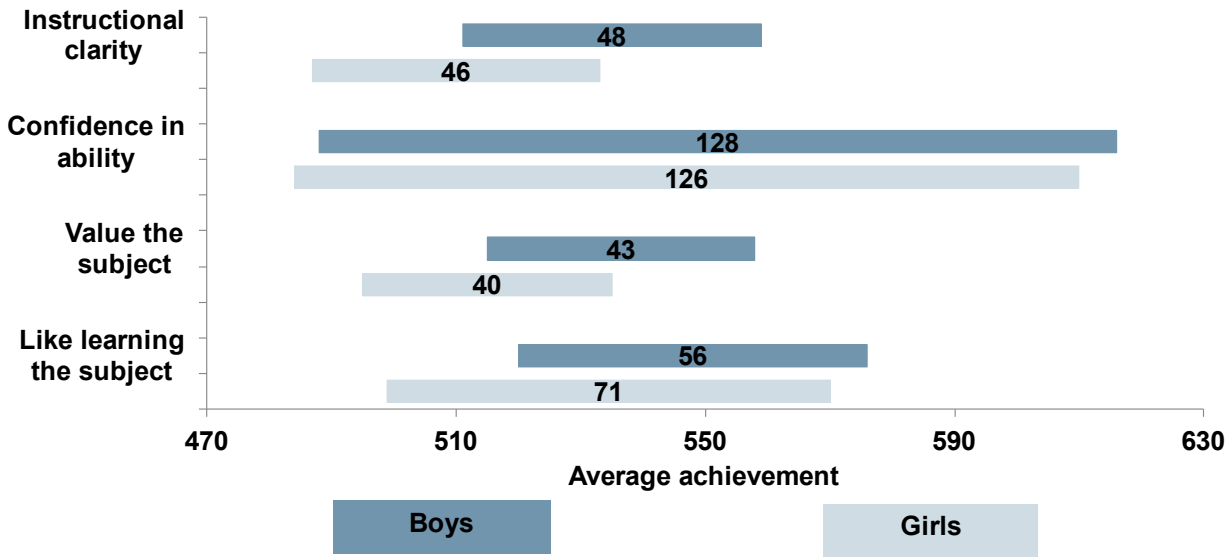
Table 45: Differences in average scores in science by pupil attitude and gender (England, year 5)

Factor	Range in science (average score) − boys	Range in science (average score) − girls
Instructional clarity	49	8
Confidence in ability	64	41
Like learning the subject	35	11

Source: IEA TIMSS International Report 2023

In Figure 45 and Table 46 below, the same differences between year 9 girls' and boys' average scores in mathematics were calculated for the highest and lowest categories to calculate a range in each of the attitudinal areas. There were no significant gender differences in these ranges.

Figure 45: Differences in average scores in mathematics by pupil attitude and gender (England, year 9)



Source: IEA TIMSS International Report 2023

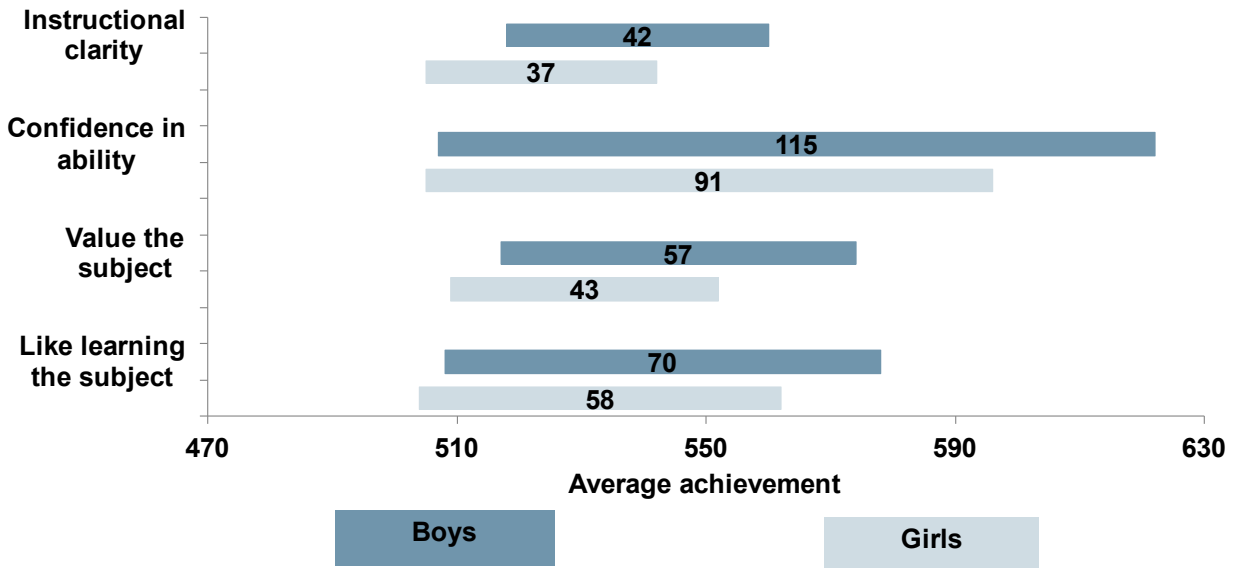
Table 46: Differences in average scores in mathematics by pupil attitude and gender (England, year 9)

Factor	Range in mathematics (average score) − boys	Range in mathematics (average score) − girls
Instructional clarity	48	46
Confidence in ability	128	126
Value the subject	43	40
Like learning the subject	56	71

Source: IEA TIMSS International Report 2023

Figure 46 and Table 47 below show the average science score ranges by year 9 pupils' attitudes and gender. The only range that was significantly different was for boys' and girls' confidence in ability. As with year 5, this was largely driven by the significant difference between the average scores for very confident boys and girls.

Figure 46: Differences in average scores in science by pupil attitude and gender (England, year 9)



Source: IEA TIMSS International Report 2023

Table 47: Differences in average scores in science by pupil attitude and gender (England, year 9)

Factor	Range in science (average score) − boys	Range in science (average score) − girls
Instructional clarity	42	37
Confidence in ability	115	91
Value the subject	57	43
Like learning the subject	70	58

Source: IEA TIMSS International Report 2023

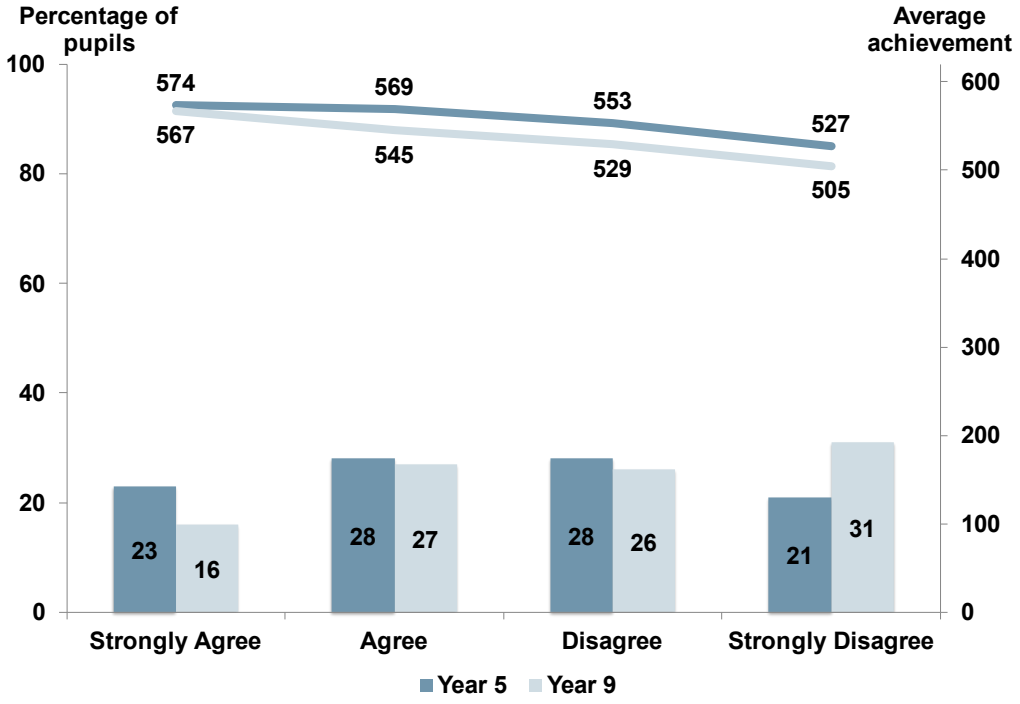
8.7 To what extent do pupils aspire to study mathematics and science after age 16?

This was an additional question for England's pupils only, posed on behalf of the Department for Education as part of the TIMSS questionnaires.

There was a positive and significant association between year 5 and year 9 pupils' average scores and the extent to which they strongly agreed that they would like to study mathematics after secondary school. Pupils who strongly agreed that they would like to study mathematics had significantly higher average scores, while those who strongly disagreed had significantly lower average scores.

As shown in Figure 47 and Table 48 below, in year 5, around one-half of pupils either strongly agreed or agreed they would like to study mathematics after secondary school. This was lower than in 2019 when this was the case for nearly two-thirds of year 5 pupils. In year 9 this percentage was 43%, which again was lower than in 2019 (50%), with the remaining 57% disagreeing or strongly disagreeing with this aspiration.

Figure 47: The percentage of year 5 and year 9 pupils reporting agreement that they would like to study mathematics after secondary school and their average scores in mathematics (England)



Source: IEA 2023 England-only questions

Table 48: The percentage of year 5 and year 9 pupils reporting agreement that they would like to study mathematics after secondary school and their average scores in mathematics (England)

Extent to which pupils agree that they would like to study mathematics after secondary school	Year 5 pupils (percentage)	Year 5 pupils (average score)	Year 9 pupils (percentage)	Year 9 pupils (average score)
Strongly agree	23	574	16	567
Agree	28	569	27	545
Disagree	28	553	26	529
Strongly disagree	21	527	31	505

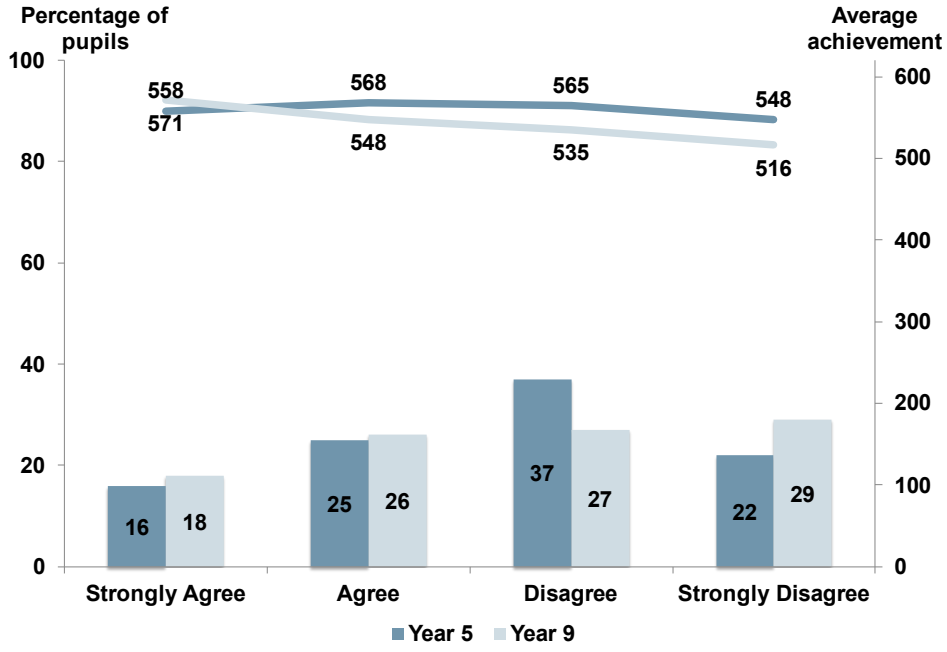
Source: IEA 2023 England-only questions

In science, the association between the extent to which year 5 pupils agreed that they would like to study science after secondary school and average scores was mixed. The average score for year 5 pupils who strongly agreed they would like to study science after secondary school (558) was lower than those who agreed (568). However, the average score for year 5 pupils who agreed with this statement (568) was significantly higher than for pupils who strongly disagreed with it (548).

There was a positive and significant association between year 9 pupils' average scores and the extent to which they agreed that they would like to study science after secondary school. The average score for year 9 pupils who strongly agreed with this statement (571) was significantly higher than for pupils who strongly disagreed with it (516).

Forty-one percent of year 5 pupils either strongly agreed or agreed that they would like to study science after secondary school, while in year 9, 44% did. Twenty-nine per cent of year 9 pupils strongly disagreed with this statement.

Figure 48: The percentage of year 5 and year 9 pupils reporting agreement that they would like to study science after secondary school and their average scores in science (England)



Source: IEA 2023 England-only questions

Table 49: The percentage of year 5 and year 9 pupils reporting agreement that they would like to study science after secondary school and their average score in science (England)

Extent to which pupils agree that they would like to study science after secondary school	Year 5 pupils (percentage)	Year 5 pupils (average score)	Year 9 pupils (percentage)	Year 9 pupils (average score)
Strongly agree	16	558	18	571
Agree	25	568	26	548
Disagree	37	565	27	535
Strongly disagree	22	548	29	516

Source: IEA 2023 England-only questions

There were significant gender differences among those pupils in both years 5 and 9 who strongly agreed that they would like to study mathematics after secondary school[24]. This significant difference was also the case for strongly disagreeing about studying mathematics. A significantly larger percentage of boys strongly agreed (27%) than girls (19%) in year 5. Similarly, in year 9, significantly larger percentage of boys (20%) strongly agreed than girls (12%). In both year 5 and year 9 a significantly larger percentage of girls strongly disagreed that they want to study mathematics further: 24% of girls compared with 19% of boys in year 5 and, in year 9, 39% of girls and 22% of boys.

In science, the differences in gender results were mixed. While a larger percentage of year 5 boys strongly agreed that they want to study science further (17%) the difference was not significant compared with girls (15%). In year 9, there was no difference (both 18%). A significantly smaller percentage of year 5 girls strongly disagreed that they want to study science further (21%) than boys (24%). However, in year 9, a significantly larger percentage of girls strongly disagreed that they want to study science further than boys (34% compared to 23%).

[24] Chapter 7 includes a presentation of gender differences and achievement.

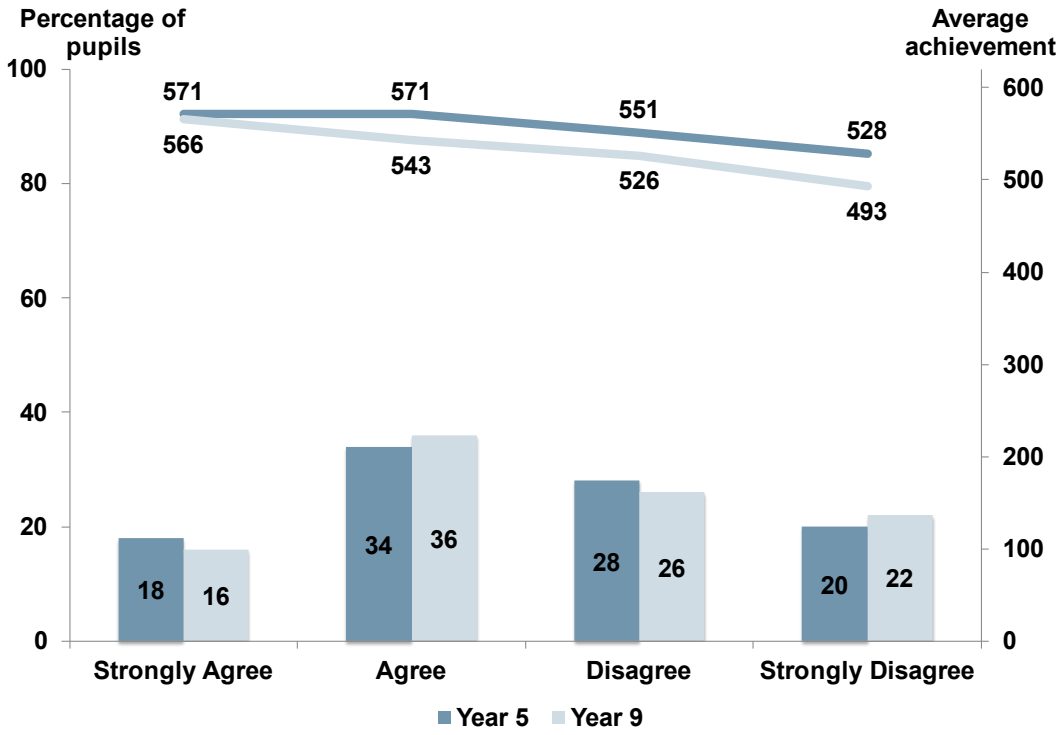
8.8 To what extent would pupils like a job that involves mathematics or science?

This was an additional question for England's pupils only, posed on behalf of the Department for Education as part of the TIMSS questionnaires.

There was a positive and significant association between year 5 and year 9 pupils' average scores and the extent to which they strongly agreed that they would like a job that involves mathematics after secondary school. Pupils who strongly agreed that they would like to study mathematics had significantly higher average scores, while those who strongly disagreed had significantly lower average scores.

As shown in Figure 49 and Table 50 below, just over one-half of year 5 and year 9 pupils (52%) either strongly agreed or agreed they would like a job that involves mathematics after secondary school.

Figure 49: The percentage of year 5 and year 9 pupils reporting agreement that they would like a job that involves mathematics and their average score in mathematics (England)



Source: IEA 2023 England-only questions

Table 50: The percentage of year 5 and year 9 pupils reporting agreement that they would like a job that involves mathematics and their average score in mathematics (England)

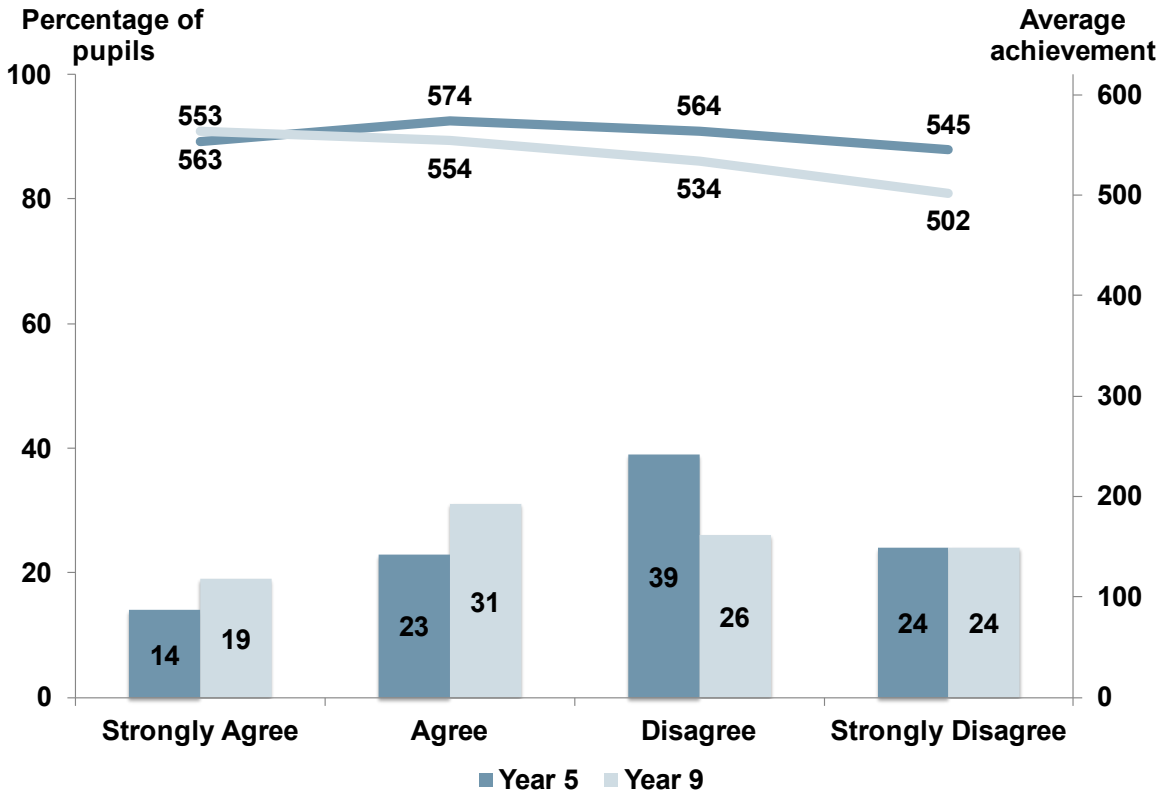
Extent to which pupils agree that they would like a job that involves mathematics	Year 5 pupils (percentage)	Year 5 pupils (average score)	Year 9 pupils (percentage)	Year 9 pupils (average score)
Strongly agree	18	571	16	566
Agree	34	571	36	543
Disagree	28	551	26	526
Strongly disagree	20	528	22	493

Source: IEA 2023 England-only questions

The average score for year 5 pupils who strongly agreed they would like a job involving science (553) was significantly lower than for pupils who agreed they would like this (574). However, the average score for year 5 pupils who agreed they would like a job involving science (574) was significantly higher than those who strongly disagreed (545). In year 9, all average score differences were significant, for example, the average score for pupils who strongly agreed they would like a job involving science (563) was significantly higher than those who strongly disagreed (502).

As shown in Figure 50 and Table 51 below, just over one-third of year 5 pupils (37%) either strongly agreed or agreed they would like a job that involves science after secondary school. However, in year 9 this was the case for half of all pupils.

Figure 50: The percentage of year 5 and year 9 pupils reporting agreement that they would like a job that involves science and their average score in science (England)



Source: IEA 2023 England-only questions

Table 51: The percentage of year 5 and year 9 pupils reporting agreement that they would like a job that involves science and their average score in science (England)

Extent to which pupils agree that they would like a job that involves science	Year 5 pupils (percentage)	Year 5 pupils (average score)	Year 9 pupils (percentage)	Year 9 pupils (average score)
Strongly agree	14	553	19	563
Agree	23	574	31	554
Disagree	39	564	26	534
Strongly disagree	24	545	24	502

Source: IEA 2023 England-only questions

There were significant gender differences among those pupils in both years 5 and 9 who strongly agreed that they would like to a job that involves mathematics[25]. These significant differences were also the case for strongly disagreeing about doing work that involves mathematics. In year 5, a significantly larger percentage of boys strongly agreed that they want to do work that involves mathematics (22%) than girls (15%). Correspondingly, a significantly larger percentage of year 5 girls (22%) strongly disagreed that they would like to do work that involves mathematics than boys (19%). For year 9 pupils, a significantly larger percentage of boys (21%) strongly agreed that they would like to do work that involves mathematics compared with girls (11%). A significantly larger percentage of year 9 girls (29%) strongly disagreed that they want to do work that involves mathematics than boys (14%).

For science the gender results were mixed. The difference between year 5 boys (15%) and girls (13%) strongly agreeing that they would like a job that involves science was not significant. However, a significantly smaller percentage of year 5 girls (22%) strongly disagreed that they would like a job that involves science than boys (26%). For year 9 pupils, there was no difference between girls and boys (both 19%) strongly agreeing that they want to do work that involves science. However, a significantly larger percentage of girls (29%) strongly disagreed that they would like a job that involves science than boys (19%).

8.9 To what extent did England's pupils demonstrate environmental knowledge and awareness?

In 2023, the TIMSS assessment frameworks for science singled out items focusing on year 5 and 9 pupils' environmental knowledge. Pupils were also asked to indicate the extent to which they agreed or disagreed with a series of statements that reflected environmental behaviour and attitudes. These resulted in pupils' performance being measured in terms of:

- their average environmental knowledge
- their relative performance in environmental knowledge
- their valuing environmental preservation

Pupils in England overall showed that they were knowledgeable about the environment in both years 5 and 9. Their knowledge corresponded well with their overall science average score, which was not the case in all countries. In year 5, 57% of pupils in England very strongly valued environmental preservation, while in year 9 this was 35%. A very small percentage of year 5 pupils somewhat valued environmental preservation (7%) compared with those who very strongly (57%) or strongly valued this (36%). In year

[25] Chapter 7 includes a presentation of gender differences and achievement.

9, the percentage of pupils who somewhat valued environmental preservation was larger than in year 5 (20%). However, year 9 pupils were asked to respond to the statement, ‘protecting nature is more important than economic growth’, which may help explain the difference in attitudes to value between years 5 and 9.

Chapter 9. School environment and resources

This chapter summarises findings from headteacher, teacher and pupil questionnaires on aspects of their school environment and resources.

Chapter sections below focus on the extent to which year 5 and year 9 pupils:

- were taught in schools where headteachers reported an emphasis on academic success
- were taught in schools where headteachers reported discipline problems
- were taught in schools that teachers reported were safe and orderly
- experienced bullying behaviours in school (pupil questionnaire)
- reported disorderly behaviour in school (pupil questionnaire)
- agreed that they felt a sense of school belonging (pupil questionnaire)

This chapter focuses on mathematics, making reference to science only where there are notable differences between the 2 subjects. A full account of findings is reported in the *TIMSS 2023 International Report*.

Using these findings, we discuss noteworthy comparisons drawn between pupils in England and their peers in other comparator group countries, which are listed in Volume 1 section 1.5 and Appendix A[26].

The chapter also describes whether or not the factors presented were associated with higher or lower performance in the TIMSS assessments, although it is important to note that an association (or correlation) between 2 variables (such as level of emphasis on success and average scores) is not the same as causation (i.e. that one thing causes the other).

Where notable, differences between England's pupils' performance in 2023 compared with 2019 are stated.

9.1 Main findings

- The 3 factors most strongly associated with pupils' performance at both years 5 and 9 in England were the same as in 2019:
    - headteachers reporting that their schools placed an emphasis on academic success (a significantly positive association with performance)

[26] In addition to Canada not participating in the year 9 questionnaires, the IEA exhibits did not include the responses from New Zealand year 9 questionnaires.

    - pupils reporting disorderly behaviour in school (a significantly negative association with performance)
    - pupils reporting experiencing bullying behaviour in schools (a significantly negative association with performance)

- In mathematics and science in both years 5 and 9, there was a positive and significant association between a reported emphasis on academic success and average scores.
- Across all reported aspects of discipline, disorderly behaviour and bullying, there was a negative and significant association with pupils' performance: the less that pupils were adversely impacted, the higher their performance. This finding applied to both year groups and subjects.
- A large majority of pupils in England were taught in schools where headteachers reported few problems with school discipline and which teachers reported to be safe and orderly.
- There was a significant positive association between being taught in schools in which fewer discipline problems were reported and higher average scores in both subjects for both years 5 and 9 pupils.
- The performance of year 9 pupils in mathematics was significantly negatively associated with being taught in classrooms reported to be less safe and orderly. In year 5, in both mathematics and science and in year 9 in science there was not the same significant association.
- The majority of year 5 and year 9 pupils in England reported that they never or almost never experienced bullying behaviours, although the percentage of pupils reporting weekly bullying was larger than in 2019.
- There was a significant positive association between pupils reporting not experiencing bullying behaviours and higher average scores in both years 5 and 9.
- There was a positive and significant association between pupils reporting disorderly behaviour to be less frequent and higher average scores for both years 5 and 9.
- Larger percentages of year 5 and 9 pupils in England reported disorderly behaviour in some or most lessons than the international average.
- Over half of year 5 pupils felt a high sense of school belonging. There was a significant positive association between pupils agreeing they felt a greater sense

of school belonging and higher average mathematics scores. The same findings applied to year 5 science.

- Half of year 9 pupils felt some sense of school belonging; however, a smaller percentage felt a high sense of school belonging compared with the international average (14% and 30% respectively). There was a significant positive association between pupils agreeing they felt a greater sense of school belonging and higher average mathematics scores. The same findings applied to year 9 science.

9.2 To what extent was academic success emphasised in the schools where pupils were taught?

Headteachers responded to the following statements using a 5 point rating scale from ‘Very high’ to ‘Very low’ – the same response options were used across both subjects, and questionnaire statements were consistent with those used in TIMSS 2019[27].

1. Teachers’ understanding of the school's curricular goals
2. Teachers’ degree of success in implementing the school's curriculum
3. Teachers’ expectations for student achievement
4. Teachers’ ability to inspire students
5. Parental involvement in school activities
6. Parental commitment to ensure that students are ready to learn
7. Parental expectations for student achievement
8. Parental support for student achievement
9. Students’ desire to do well in school
10. Students’ ability to reach school's academic goals
11. Students’ respect for classmates who excel academically

Based on headteachers’ responses, scores were calculated and their pupils assigned to 1 of 3 categories. These related to the extent of the emphasis on academic success in the schools in which they were taught:

- very high emphasis

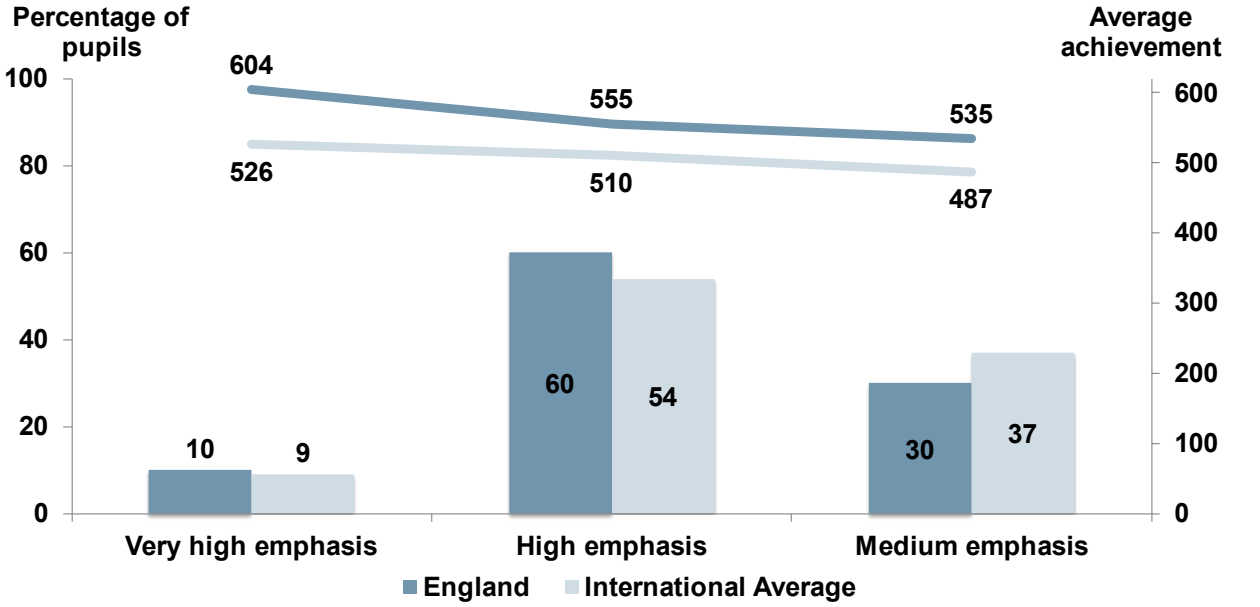
- high emphasis
- medium emphasis[28]

9.2.1 To what extent was academic success emphasised in the schools where year 5 pupils were taught?

As shown in Figure 51 and Table 52 below, 70% of year 5 pupils in England were taught in schools that were reported to place a very high (10%) or high (60%) emphasis on academic success. This total percentage was above the international average (63%). There was a significant positive association between a greater emphasis on academic success and higher average scores. Pupils taught in schools that placed a very high emphasis on academic success had a significantly higher average score than those taught in schools that placed a high or medium emphasis on academic success, while pupils taught in schools that placed a high emphasis on academic success had a significantly higher average score than those taught in schools that placed a medium emphasis on academic success. Similar findings were reported for year 5 science.

The difference between the average mathematics score for pupils in England taught in schools where headteachers reported a very high emphasis on academic success (604) and those taught in schools where headteachers reported a medium emphasis on academic success (535) was 69 scale points, above the international average (39).

Figure 51: Percentages of year 5 pupils in categories of schools by emphasis on academic success (headteachers' reports) and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

[28] For full methodological explanations see the *TIMSS 2023 International Report*.

Table 52: Percentages of year 5 pupils in categories of schools by emphasis on academic success (headteachers' reports) and their average score in mathematics (England and international average)

Extent of emphasis	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very high emphasis	604	526	10	9
High emphasis	555	510	60	54
Medium emphasis	535	487	30	37

Source: IEA TIMSS International Report 2023

A smaller percentage of year 5 pupils in England were taught mathematics in schools where headteachers reported very high emphasis on academic success than their peers in the highest-performing comparator countries, except in Hong Kong and Japan. The same was the case in comparison to pupils in the other English-speaking countries, apart from those in Australia, where the percentage was the same (10%). However, a larger percentage of year 5 pupils in England were taught in schools where headteachers reported a very high emphasis on academic success than in any of the European comparator countries.

9.2.2 To what extent was academic success emphasised in the schools where year 9 pupils were taught?

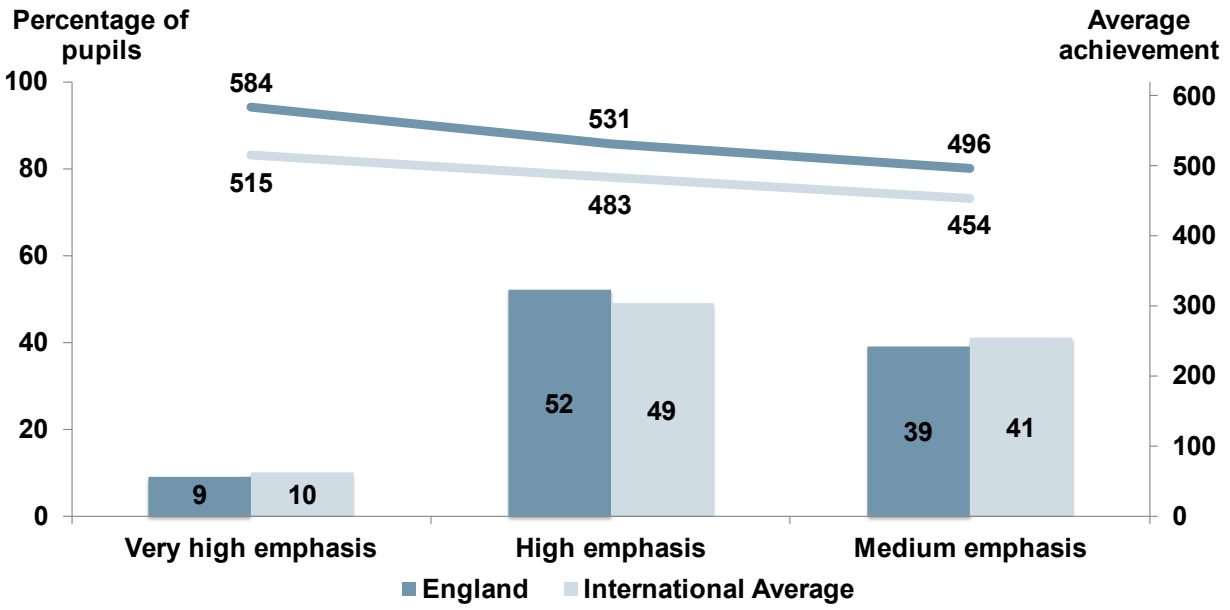
As shown in Figure 52 and Table 53 below, 61% of year 9 pupils in England were taught mathematics in schools that placed a very high (9%) or high (52%) emphasis on academic success. This total percentage was similar to the 2023 international average (59%). This percentage of England's pupils was lower than in 2019 (61% compared with 79%). Correspondingly, the percentage of England's pupils taught in schools that placed a very high emphasis on academic success (9%) was half that recorded in 2019 (18%).

As in year 5, there was a significant positive association between a reported greater emphasis on academic success and higher average scores. Pupils taught in schools that placed a very high emphasis on academic success had a significantly higher average score than those taught in schools that placed a high or medium emphasis on academic success, however, average scores for pupils taught in schools that placed a high or medium emphasis on academic success were not significantly different. Similar findings were reported for year 9 science.

The difference between the average mathematics score for those taught in schools that placed a very high emphasis on academic success (584) and those taught in schools that

placed a medium emphasis on academic success (496) was 88 scale points, above the international average (61).

Figure 52: Percentages of year 9 pupils in categories of schools by emphasis on academic success (headteachers' reports) and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 53: Percentages of year 9 pupils in categories of schools by emphasis on academic success (headteachers' reports) and their average score in mathematics (England and international average)

Extent of emphasis	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very high emphasis	584	515	9	10
High emphasis	531	483	52	49
Medium emphasis	496	454	39	41

Source: IEA TIMSS International Report 2023

A smaller percentage of year 9 pupils in England were taught mathematics in schools where headteachers reported a very high emphasis on academic success compared with their peers in any of the highest-performing comparator countries, except in Japan. A smaller percentage of year 9 pupils in England were taught in schools with a very high emphasis on academic success than in any of the other English-speaking countries, apart from the United States. However, a larger percentage of year 9 pupils in England

were taught in schools where headteachers reported a very high emphasis on academic success than in any of the European comparator countries.

9.3 How did pupils and staff rate their school climates in terms of discipline, safety and orderliness, and bullying?

9.3.1 To what extent were pupils taught in schools with discipline problems?

Headteachers responded to the following statements using a 4 point rating scale from 'Not a problem' to 'Severe problem'. Statement 11 was not included in the year 5 set of statements and statement 9 was 'physical injury to other students' in 2019. Otherwise, the statements used were consistent with those from the 2019 TIMSS study.

1. Arriving late at school
2. Absenteeism (i.e. unjustified absences)
3. Classroom disturbance
4. Cheating
5. Profanity
6. Vandalism
7. Theft
8. Intimidation or verbal abuse among students (including texting, emailing, etc.)
9. Physical fights among students
10. Intimidation or verbal abuse of teachers or staff (including texting, emailing, etc.)
11. Physical injury to teachers or staff

Based on headteachers' responses, scores were calculated and their pupils were assigned to 1 of 3 categories. These related to the extent to which the schools in which they were taught reported discipline problems:

- hardly any problems
- minor problems
- moderate to severe problems[29]

[29] For full methodological explanations see the *TIMSS 2023 International Report*.

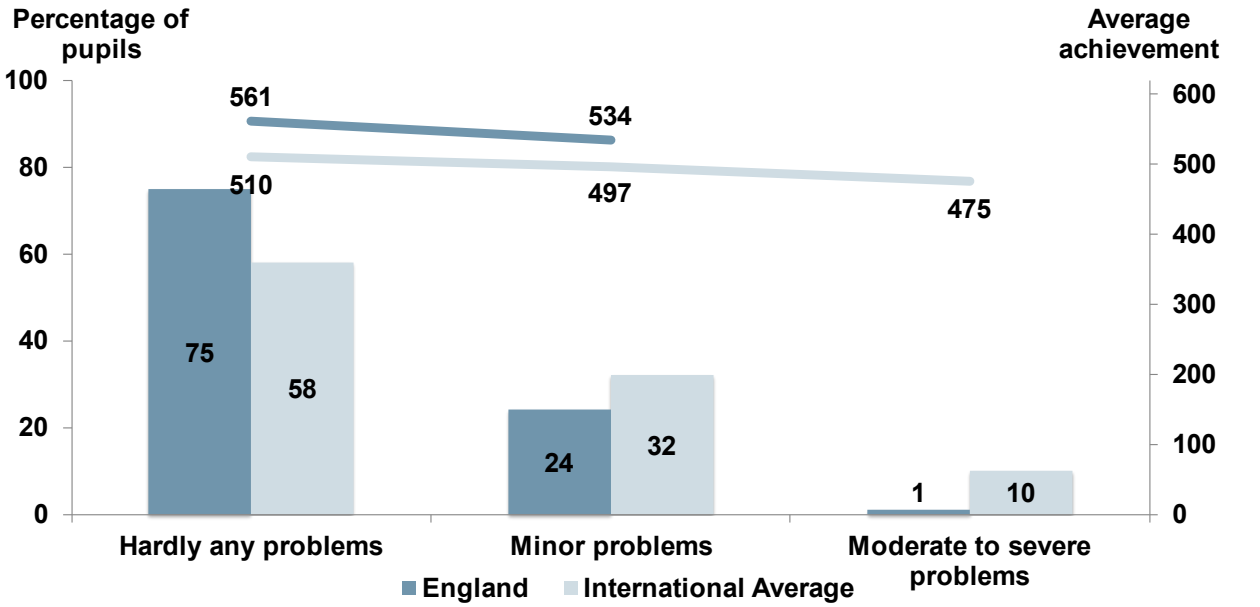
This section focuses on mathematics, referring to science only where there are notable differences between the 2 subjects. Full findings can be found in the *TIMSS 2023 International Report*.

Year 5

As shown in Figure 53 and Table 54 below, in 2023, the majority of year 5 pupils in England were taught mathematics in schools where there were reported to be hardly any discipline problems (75%). This was above the international average (58%), and was a larger percentage of England's pupils than in 2019 (67%). One per cent of year 5 pupils in England were reported to be taught in schools where there were moderate to severe discipline problems, below the international average (10%).

For year 5 pupils in England, there was a significant positive association between being taught in schools with fewer discipline problems and higher average scores. The differences between the average scores in mathematics and science of those taught in schools where there were hardly any problems reported (561 and 564 respectively) and those taught in schools with minor problems (534 and 541 respectively) were 27 and 23 scale points respectively, above the differences between the international average scores (13 scale points in mathematics and 14 scale points in science).

Figure 53: The percentage of year 5 pupils taught in schools in which the headteacher reported the extent of school discipline problems and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: No average score was provided for year 5 pupils taught in schools with moderate to severe problems as the percentage of pupils was too low for England.

Table 54: The percentage of year 5 pupils taught in schools in which the headteacher reported the extent of school discipline problems and their average score in mathematics (England and international average)

Extent of problems	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Hardly any problems	561	510	75	58
Minor problems	534	497	24	32
Moderate to severe problems	No data	475	1	10

Source: IEA TIMSS International Report 2023

Note 1: No average score was provided for year 5 pupils taught in schools with moderate to severe problems as the percentage of pupils was too low for England.

In 2023, a larger percentage of year 5 pupils in England were taught mathematics in schools with hardly any reported discipline problems compared with their peers in Japan and the Republic of Korea. The reverse was the case compared with pupils from the remaining 3 highest-performing comparator countries. A larger percentage of pupils in England were taught in schools with hardly any discipline problems compared with their peers in each of the English-speaking countries, except those in Ireland (85%). A larger percentage of year 5 pupils in England were taught in schools with hardly any discipline problems compared with their peers in each of the European comparator countries.

Year 9

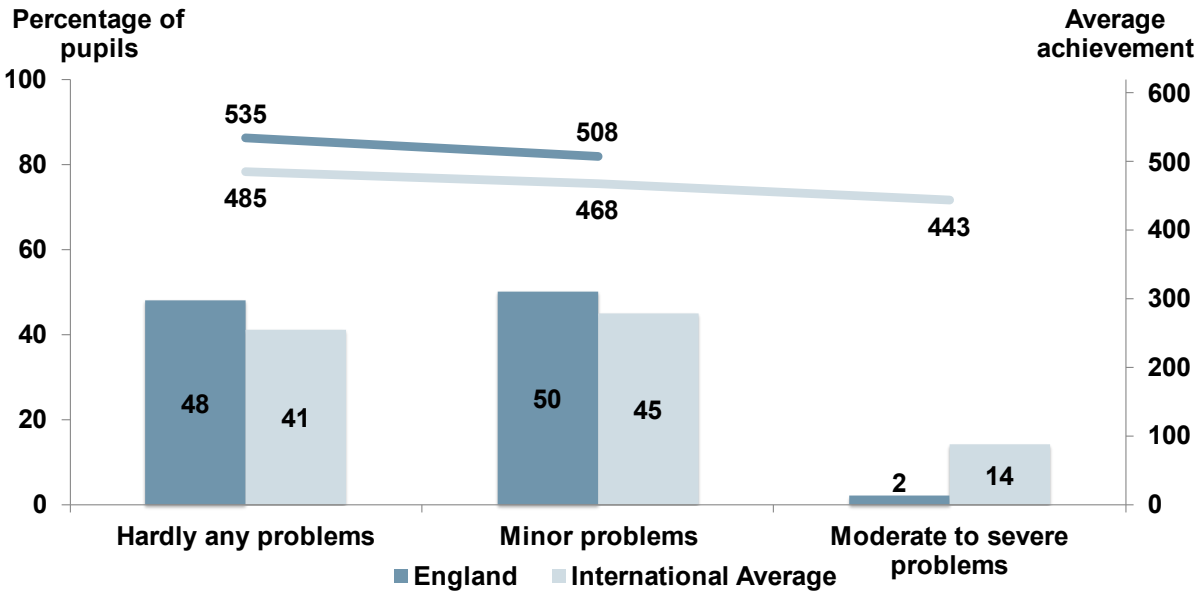
As shown in Figure 54 and Table 55 below[30], in 2023, around half of year 9 pupils in England were taught mathematics and science in schools where there were hardly any discipline problems (48%): above the international average (41%). Two per cent of year 9 pupils in England were reported to be taught in schools where there were moderate to severe discipline problems, below the international average (14%). A larger percentage of year 9 pupils in England were taught mathematics and science in schools where there were more minor discipline problems than the international average (50% compared with 45%).

For year 9 pupils in England, there was a significant positive association between being taught mathematics in schools with fewer discipline problems and higher average scores. Pupils taught in schools where there were hardly any problems had a significantly higher average score than those taught in schools with minor problems. The differences between the average scores in mathematics and science of those taught in schools where there were hardly any problems (535 and 541 respectively) and those taught in

[30] Figures are for mathematics only.

schools with minor problems (508 and 514 respectively) were 27 scale points in both subjects. These scale point differences were above the differences between the international average scores (27 scale points for both subjects).

Figure 54: The percentage of year 9 pupils taught in schools in which the headteacher reported the extent of school discipline problems and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: No average score was provided for year 5 pupils taught in schools with moderate to severe problems in England.

Table 55: The percentage of year 9 pupils taught in schools in which the headteacher reported the extent of school discipline problems and their average score in mathematics (England and international average)

Extent of problems	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Hardly any problems	535	485	48	41
Minor problems	508	468	50	45
Moderate to severe problems	No data	443	2	14

Source: IEA TIMSS International Report 2023

Note 1: No average score was provided for year 5 pupils taught in schools with moderate to severe problems in England.

In 2023, a smaller percentage of year 9 pupils in England were taught mathematics in schools with hardly any reported discipline problems compared with their peers in each of the highest-performing comparator countries. Compared with their peers in the other

English-speaking countries, a larger percentage of pupils in England were taught in schools with hardly any discipline problems compared with their peers in Australia and the United States; the reverse was the case in comparison to pupils in Ireland. A larger percentage of pupils in England were taught in schools with hardly any discipline problems compared with their peers in each of the European comparator countries.

9.3.2 To what extent were pupils taught in schools that were safe and orderly?

Teachers responded to the following statements using a 4 point rating scale from 'Agree a lot' to 'Disagree a lot'. The statements set out below were consistent with those from the 2019 TIMSS study, except for the removal of 'This school is located in a safe neighbourhood'.

1. I feel safe at this school
2. This school's security policies and practices are sufficient
3. The students behave in an orderly manner
4. The students are respectful of the teachers
5. The students respect school property
6. This school has clear rules about student conduct
7. This school's rules are enforced in a fair and consistent manner

Based on teachers' responses, scores were calculated that assigned pupils into 1 of 3 categories. These related to the extent to which the schools in which they were taught mathematics or science were safe and orderly:

- very safe and orderly
- somewhat safe and orderly
- less than safe and orderly[31]

This section focuses on mathematics, making reference to science only where there are notable differences between the 2 subjects. Full findings can be found in the *TIMSS 2023 International Report*.

Year 5

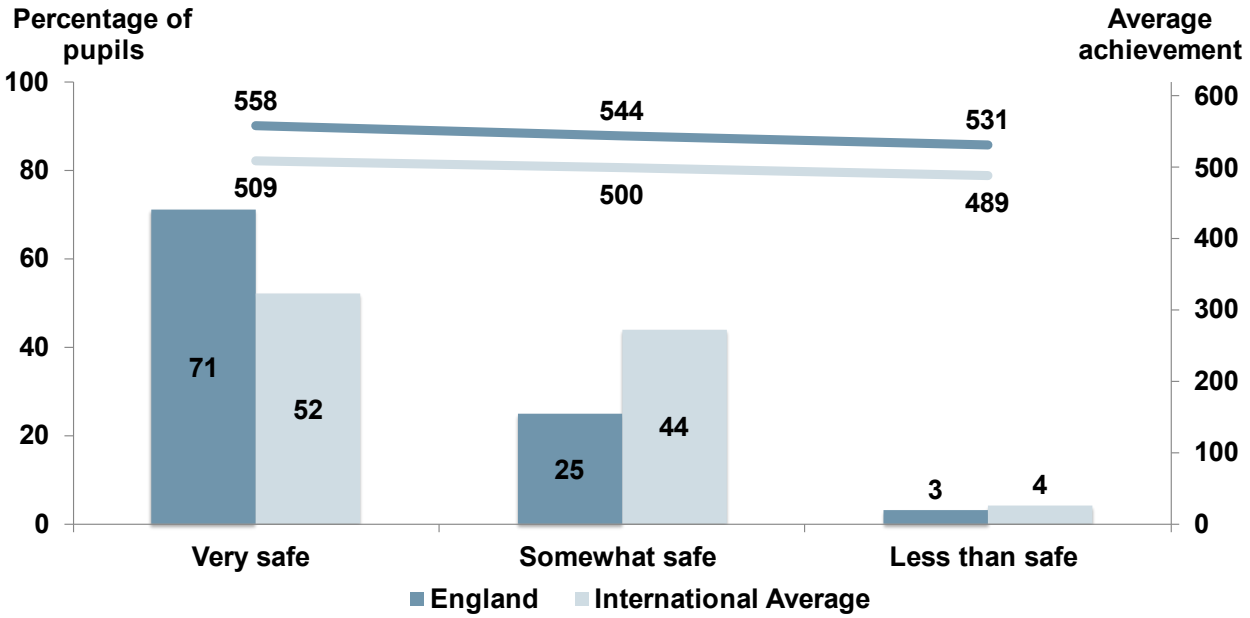
In 2023, the majority of year 5 pupils in England were taught mathematics in schools that were reported to be very safe and orderly (71%), above the international average (52%). This percentage of pupils in England in 2023 (71%) was also above that recorded in

[31] For full methodological explanations see the *TIMSS 2023 International Report*.

2019 (55%). Figure 55 and Table 56 below show that 3% of year 5 pupils in England were taught in schools that were less than safe and orderly, this was 1 percentage point below the international average (4%).

The differences between the average mathematics and science scores for pupils in England who were taught in schools that were very, somewhat and less than safe were not significant. The differences between the average mathematics and science scores of those taught in schools that were very safe (558 and 561 respectively) and those taught in schools that were less than safe (531 and 534 respectively) were 27 scale points in both subjects. These were above the differences between the international average scores (20 and 13 scale points respectively).

Figure 55: The percentage of year 5 pupils in schools for which teachers reported on the extent of their safety and orderliness and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 56: The percentage of year 5 pupils in schools for which teachers reported on the extent of their safety and orderliness and their average score in mathematics (England and international average)

Extent of safety and orderliness	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very safe and orderly	558	509	71	52
Somewhat safe and orderly	544	500	25	44

Extent of safety and orderliness	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Less than safe and orderly	531	489	3	4

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

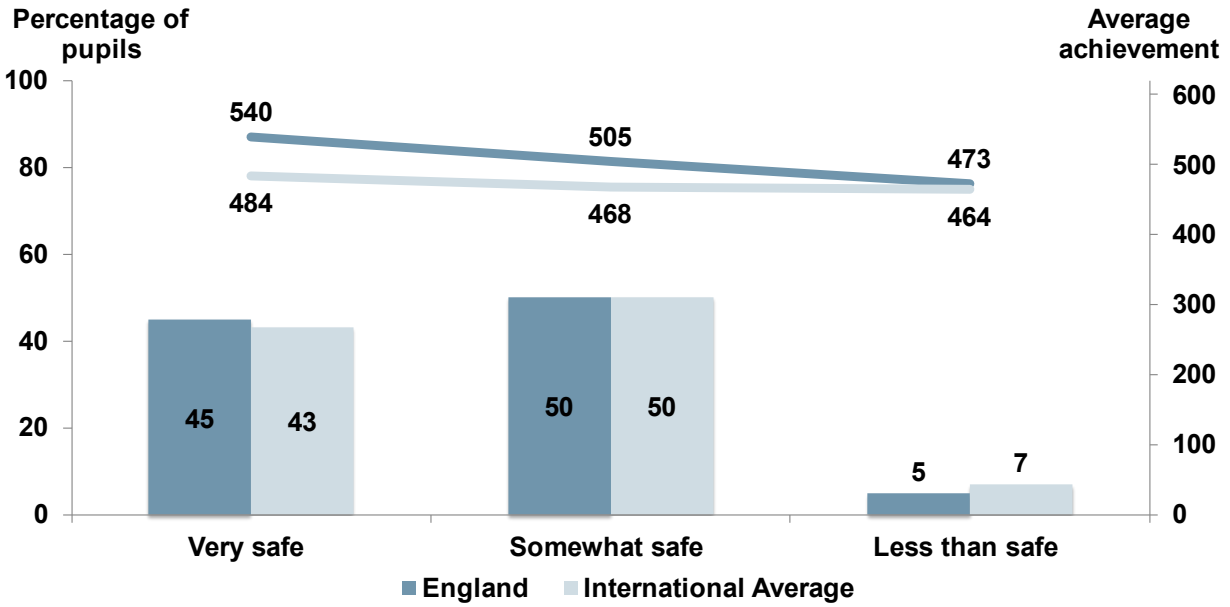
In 2023, a larger percentage of year 5 pupils in England were taught mathematics in schools that were reported to be very safe and orderly compared with their peers in each of the highest-performing comparator countries. Compared with pupils in each of the English-speaking countries, a larger percentage of year 5 pupils in England were taught in schools that were very safe except in Ireland. A larger percentage of year 5 pupils in England were taught in schools that were very safe and orderly compared with their peers in each of the European comparator countries.

Year 9

Figure 56 and Table 57 below show that, in 2023, fewer than half of year 9 pupils in England were taught mathematics in schools that were reported to be very safe and orderly (45%) and 5% in schools that were less than safe and orderly. The percentages of year 9 pupils in England in each of the 3 categories were similar to the corresponding international averages.

The differences between the average mathematics score for year 9 pupils in England who were taught in schools that were very, somewhat or less than safe were significant. In science, they were not significant. The differences between the average mathematics and science scores of those taught in schools that were very safe (540 and 533 respectively) and those taught in schools that were less than safe (473 and 513 respectively) were 67 and 20 scale points respectively. This scale point difference of 67 in mathematics was more than 3 times the difference between the international average scores (20 scale points), while in science it was below the corresponding difference between international average scores: 21 scale points.

Figure 56: The percentage of year 9 pupils in schools for which teachers reported on the extent of their safety and orderliness and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 57: The percentage of year 9 pupils in schools for which teachers reported on the extent of their safety and orderliness and their average score in mathematics (England and international average)

Extent of safety and orderliness	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very safe and orderly	540	484	45	43
Somewhat safe and orderly	505	468	50	50
Less than safe and orderly	473	464	5	7

Source: IEA TIMSS International Report 2023

In 2023, a larger percentage of year 9 pupils in England were taught mathematics in schools that were reported to be very safe and orderly compared with their peers in Chinese Taipei, Japan and the Republic of Korea from the highest-performing comparator countries. The reverse was the case in comparison with peers from Hong Kong and Singapore. A larger percentage of year 9 pupils in England were taught mathematics in schools that were very safe and orderly compared with their peers in 2 of the other English-speaking countries (Australia and the United States), while the reverse was the case compared with pupils in Ireland (55%). A larger percentage of year 9 pupils

in England were taught in schools that were very safe and orderly compared with their peers in each of the European comparator group countries, with the exception of Lithuania where the percentage was the same as for England's pupils in science only.

9.3.3 To what extent did pupils experience bullying behaviours?

Pupils responded to the following statements using a 4 point rating scale from 'Never' to 'At least once a week'. There were some variations in the number and phrasing of statements between year groups. Statements were consistent with those from the 2019 study except for the replacement of 'Insulted a member of my family' from the year 9 questionnaire with 'Said hurtful things to or about me because of my cultural background (e.g. ethnicity, race, religion)'.

Year 5:

1. Made fun of me or called me names
2. Left me out of their games or activities
3. Spread lies about me
4. Stole something from me
5. Damaged something of mine on purpose
6. Hit or hurt me (e.g. shoving, hitting, kicking)
7. Made me do things I didn't want to do
8. Sent me nasty or hurtful messages online
9. Shared nasty or hurtful messages about me online
10. Shared embarrassing photos of me online
11. Threatened me

Year 9:

1. Said mean things about my physical appearance (e.g. my hair, my size)
2. Spread lies about me
3. Shared my secrets with others
4. Refused to talk to me
5. Said hurtful things to or about me because of my cultural background (e.g. ethnicity, race, religion)
6. Stole something from me
7. Made me do things I didn't want to do

8. Sent me nasty or hurtful messages online
9. Shared nasty or hurtful things about me online
10. Shared embarrassing photos of me online
11. Threatened me
12. Physically hurt me
13. Excluded me from their group (e.g. parties, messaging)
14. Damaged something of mine on purpose

Based on their responses, scores were calculated and pupils assigned to 1 of 3 categories. These related to the extent to which they reported experiencing bullying behaviours:

- never or almost never
- about monthly
- about weekly[32]

This section focuses on mathematics, making reference to science only where there are notable differences between the 2 subjects. Full findings can be found in the *TIMSS 2023 International Report*.

Year 5

In 2023, around half of year 5 pupils in England (51%) never or almost never experienced bullying behaviours, just below the international average (53%). As Figure 57 and Table 58 show, a larger percentage of pupils in England (38%) than the international average (31%) experienced such behaviours about monthly, while a smaller percentage of pupils (12%) experienced these about weekly, similar to the international average (15%). However, the percentage of pupils in England that experienced these weekly in 2023 (12%) was double that reported in 2019 (6%).

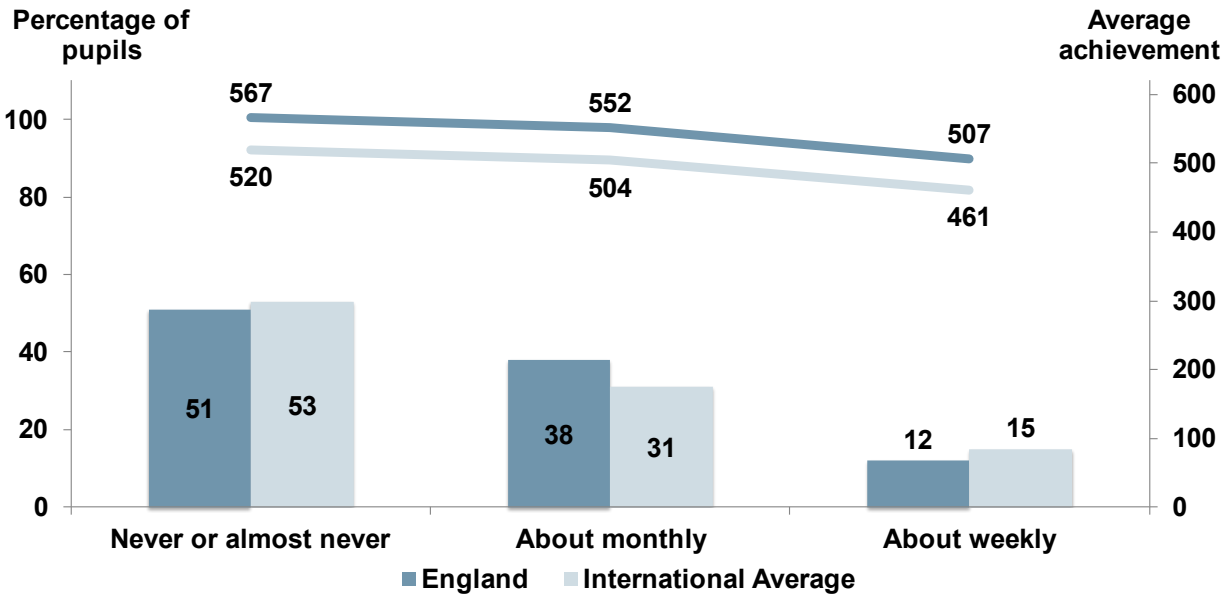
For year 5 pupils in England, there was a significant positive association between pupils not experiencing bullying behaviours and higher average scores. Pupils who never or almost never experienced bullying behaviours had a significantly higher average score than those who experienced these about monthly or about weekly, while pupils who experienced bullying behaviours about monthly had a significantly higher average score than those who experienced bullying behaviours about weekly.

The differences between the average mathematics and science scores of pupils who never or almost never experienced bullying behaviours (567 and 569 respectively) and

[32] For full methodological explanations see the *TIMSS 2023 International Report*.

those who experienced bullying behaviours about weekly (507 and 520 respectively) were 60 and 49 scale points. These were similar to the international average for mathematics (59) and below that for science (63).

Figure 57: The percentage of year 5 pupils who experienced bullying behaviours and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 58: The percentage of year 5 pupils who experienced bullying behaviours and their average score in mathematics (England and international average)

Extent of bullying behaviours experienced	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Never or almost never	567	520	51	53
About monthly	552	504	38	31
About weekly	507	461	12	15

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

A smaller percentage of year 5 pupils in England compared with their peers in each of the highest-performing comparator countries never or almost never experienced bullying behaviours. A larger percentage of pupils in England never or almost never experienced bullying behaviours compared with their peers in each of the English-speaking countries except in Ireland. A larger percentage of year 5 pupils in England never or almost never experienced bullying behaviours compared with their peers in Italy and Lithuania from the

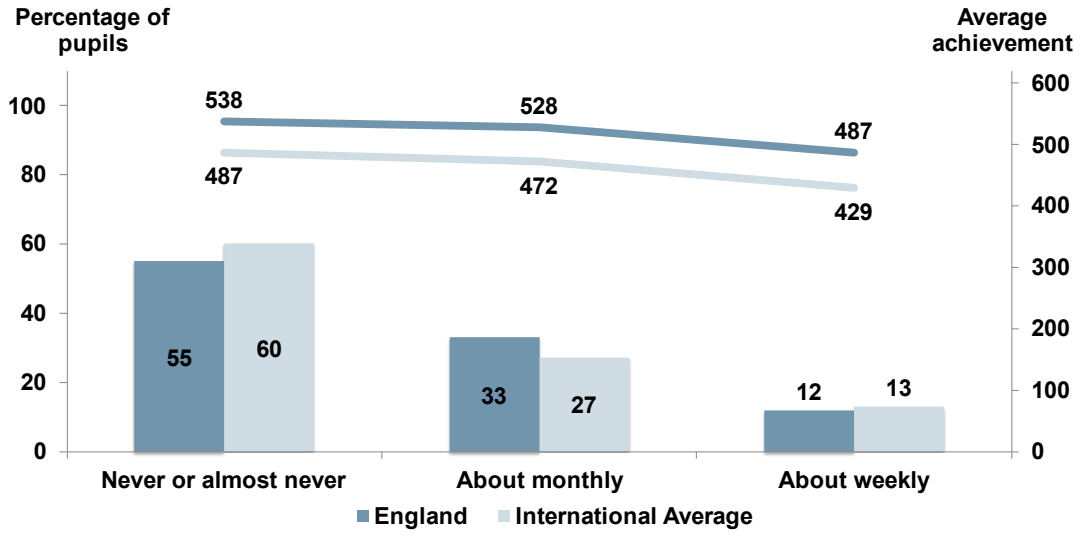
European comparator countries, while the reverse was the case compared with peers in Finland and France.

Year 9

In 2019, the majority of year 9 pupils (55%) reported never or almost never experiencing bullying behaviours, below the international average (60%). Figure 58 and Table 59 below show that a larger percentage of pupils in England (33%) reported experiencing bullying behaviours about monthly than the international average (27%), while those who experienced these about weekly was similar to the international average. However, as with year 5, the percentage of pupils in England that experienced these weekly in 2023 (12%) was double that reported in 2019 (6%). The percentage of year 9 pupils who never or almost never experienced bullying behaviours was higher in comparison to year 5 pupils.

For year 9 pupils in England, there was also a significant positive association between pupils not experiencing bullying behaviours and higher average scores. Pupils who never or almost never experienced bullying behaviours had a significantly higher average score than those who experienced these about monthly or about weekly, while pupils who experienced bullying behaviours about monthly had a significantly higher average score than those who experienced bullying behaviours about weekly. The differences between the average mathematics and science scores of those who never or almost never experienced bullying behaviours (538 and 545 respectively) and those who experienced bullying behaviours about weekly (487 and 491 respectively) were 51 and 54 scale points respectively. These were below the international averages for mathematics (58) and science (68).

Figure 58: The percentage of year 9 pupils who experienced bullying behaviours and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 59: The percentage of year 9 pupils who experienced bullying behaviours and their average score in mathematics (England and international average)

Extent of bullying behaviours experienced	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Never or almost never	538	487	55	60
About monthly	528	472	33	27
About weekly	487	429	12	13

Source: IEA TIMSS International Report 2023

A smaller percentage of year 9 pupils in England never or almost never experienced bullying behaviours compared with their peers in each of the highest-performing comparator countries. A larger percentage of pupils in England never or almost never experienced bullying behaviours compared with their peers in Australia from the 3 English-speaking countries. A smaller percentage never or almost never experienced bullying behaviours compared with their peers in Ireland and the United States. A smaller percentage of year 9 pupils in England never or almost never experienced bullying behaviours compared with their peers in each of the European comparator countries.

9.3.4 To what extent did pupils report disorderly behaviour in their lessons?

Pupils were asked to rate the extent to which they experienced the conditions described in each statement on disorderly behaviour in their mathematics and science lessons[33]. Some statements were phrased differently in 2019 and these are shown below in brackets. Responses were made using a 4 point rating scale from ‘Never’ to ‘Every or almost every lesson’.

1. Students don’t listen to what the teacher says
2. There is too much noise for students to work well (2019: There is disruptive noise)
3. My teacher has to wait a long time for students to be quiet (2019: My teacher has to wait a long time for students to quiet down)
4. Students interrupt the teacher

[33] Pupils in Singapore did not participate in this questionnaire survey; this was the case also for year 9 pupils only in Finland, France and Lithuania.

5. Students do not follow the classroom rules (2019: My teacher has to keep telling us to follow the classroom rules)

6. Other students' behaviour makes it hard for me to concentrate (2019: It is too disorderly for students to work well)

Based on their responses, scores were calculated which assigned pupils into 1 of 3 categories. These related to the extent to which they reported disorderly behaviour in:

- few or no lessons
- some lessons
- most lessons[34]

This section focuses on mathematics, making reference to science only where there are notable differences between the 2 subjects. Full findings can be found in the *TIMSS 2023 International Report*.

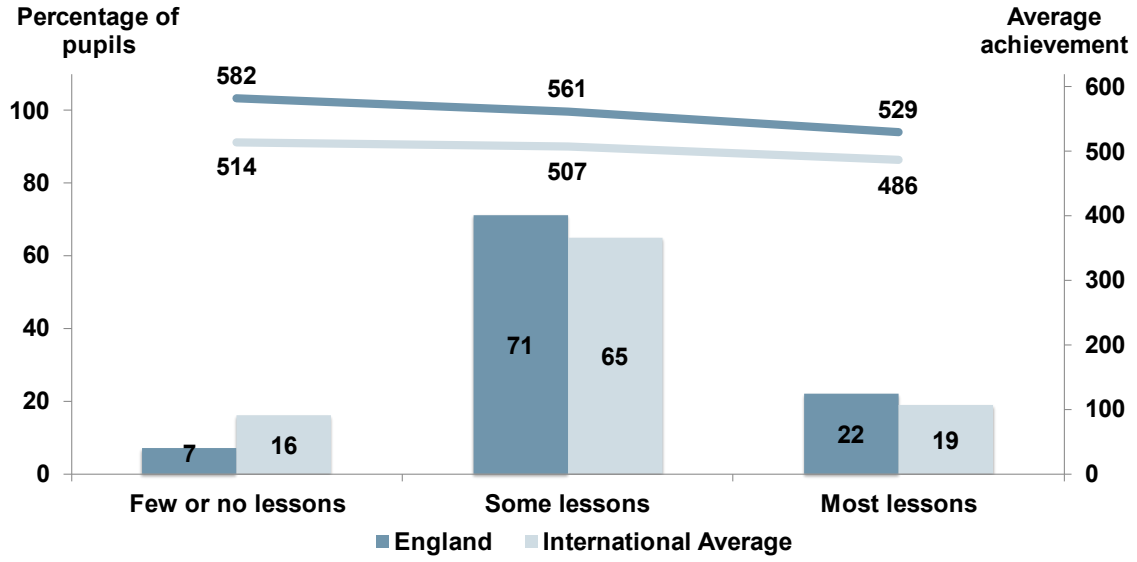
Year 5

As shown in Figure 59 and Table 60 below, in 2023, the majority (71%) of year 5 pupils reported disorderly behaviour in some mathematics lessons, above the international average (65%). A smaller percentage of year 5 pupils in England reported disorderly behaviour in few or no lessons than the international average (7% compared with 16%), while a larger percentage of pupils reported disorderly behaviour in most lessons (22%) compared with the international average (19%). In science, a larger percentage of pupils in England reported disorderly behaviour in few or no lessons in 2023 (13% compared with 7% in mathematics). However, this was still below the international average in science (13% compared with 21%).

For year 5 pupils in England, there was a significant positive association between pupils reporting disorderly behaviour to be less frequent and higher average mathematics scores. Pupils who reported disorderly behaviour in few or no lessons had a significantly higher average score than those who reported disorderly behaviour in some lessons or most lessons, while pupils who reported disorderly behaviour in some lessons had a significantly higher average score than those who reported disorderly behaviour in most lessons. The difference between the average mathematics score of those who reported disorderly behaviour in few or no lessons (582) and those who reported disorderly behaviour in most lessons (529) was 53 scale points, almost double the international average (28).

[34] For full methodological explanations see the *TIMSS 2023 International Report*.

Figure 59: The percentage of year 5 pupils who reported disorderly behaviour during mathematics lessons and their average score (England and international average)



Source: IEA TIMSS International Report 2023

Table 60: The percentage of year 5 pupils who reported disorderly behaviour during mathematics lessons and their average score (England and international average)

Frequency of disorderliness	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Few or no lessons	582	514	7	16
Some lessons	561	507	71	65
Most lessons	529	486	22	19

Source: IEA TIMSS International Report 2023

A smaller percentage of year 5 pupils in England reported disorderly behaviour in few or no mathematics lessons compared with their peers in each of the highest-performing comparator countries[35]. Among their English-speaking peers, a smaller percentage of pupils in England reported disorderly behaviour in few or no lessons compared those in Ireland and the United States. The reverse was the case in comparison with pupils in Australia and New Zealand. The percentage of pupils in Canada was the same as in

[35] Pupils in Singapore did not participate in this questionnaire survey

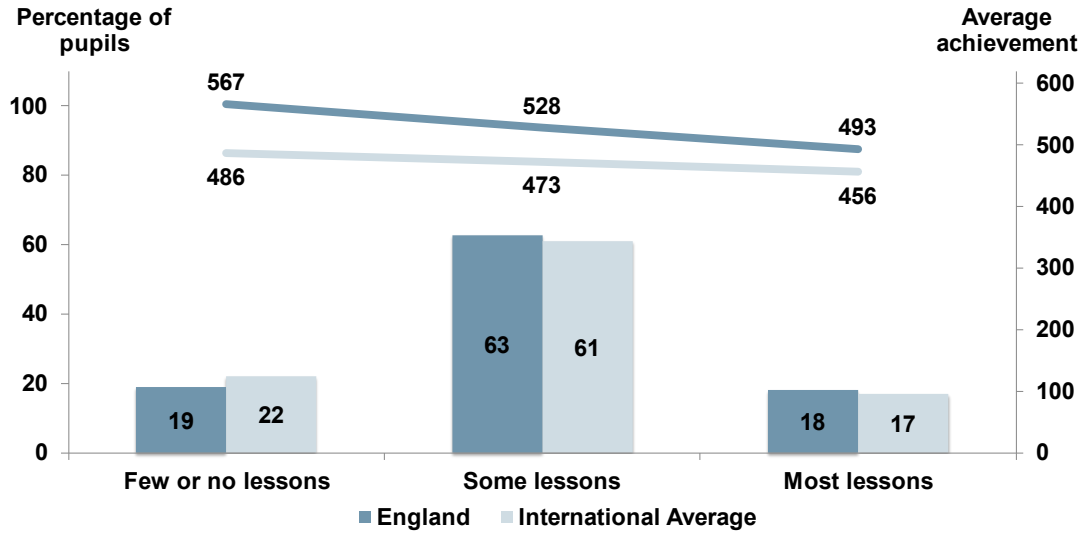
England. A smaller percentage of pupils in England reported disorderly behaviour in few or no lessons compared with their peers in each of the European comparator countries.

Year 9

In 2023, the majority of year 9 pupils in England reported that disorderly behaviour happened in some mathematics lessons, above the international average (63% compared with 61%). Figure 60 and Table 61 show that a smaller percentage of year 9 pupils in England reported disorderly behaviour in few or no lessons, than the international average (19% compared with 22%), while a similar percentage reported this in most lessons (18% compared with 17%). In science, the percentage of pupils in England who reported disorderly behaviour in few or no lessons in 2023 (22%) was higher than in mathematics (19%). In science, the percentage that reported this in most lessons (11%) was below the corresponding percentage for mathematics (18%).

For year 9 pupils in England, there was also a significant positive association between pupils reporting less frequent disorderly behaviour and higher average mathematics scores. Pupils who reported disorderly behaviour in few or no lessons had a significantly higher average score than those who reported disorderly behaviour in some lessons or most lessons, while pupils who reported disorderly behaviour in some lessons had a significantly higher average score than those who reported disorderly behaviour in most lessons. The difference between the average mathematics score of those who reported disorderly behaviour in few or no lessons (567) and those who reported disorderly behaviour in most lessons (493) was 74 scale points compared to the international average of 30.

Figure 60: The percentage of year 9 pupils who reported disorderly behaviour during mathematics lessons and their average score (England and international average)



Source: IEA TIMSS International Report 2023

Table 61: The percentage of year 9 pupils who reported disorderly behaviour during mathematics lessons and their average score (England and international average)

Frequency of disorderliness	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Few or no lessons	567	486	19	22
Some lessons	528	473	63	61
Most lessons	493	456	18	17

Source: IEA TIMSS International Report 2023

A smaller percentage of year 9 pupils in England reported disorderly behaviour in few or no mathematics lessons compared with their peers in each of the highest-performing comparator countries[36]. A larger percentage of pupils in England reported disorderly behaviour in few or no lessons than in Australia from the English-speaking countries, while the reverse was the case compared with pupils in Ireland in both mathematics and science. Compared with pupils in the United States, this percentage was the same in mathematics but smaller in science. A larger percentage of pupils in England reported disorderly behaviour in few or no lessons compared with their European comparator peers in Finland and Italy, with the reverse being the case compared with pupils in France and Lithuania (and Italy for science only).

9.4 To what extent did pupils agree they felt a sense of school belonging?

Pupils were asked to rate the extent to which they felt a sense of school belonging in their mathematics and science lessons using the set of statements below.

1. I like being in school
2. I feel safe when I am at school
3. I feel like I belong at this school
4. Teachers at this school care about me
5. I am proud to go to this school
6. Students in this school respect me (year 9 only)

[36] Pupils in Singapore did not participate in this questionnaire survey; this was the case also for year 9 pupils only in Finland, France and Lithuania.

7. Students at this school like me the way I am

Responses were made using a 4 point rating scale from ‘Agree a lot’ to ‘Disagree a lot’.

Based on their responses, scores were calculated that assigned pupils into 1 of 3 categories. These related to the extent to which they felt a sense of school belonging:

- high sense
- some sense
- little sense[37]

This section focuses on mathematics, making reference to science only where there are notable differences between the 2 subjects. It also presents the findings for England compared with the international average only. Full findings can be found in the *TIMSS 2023 International Report*.

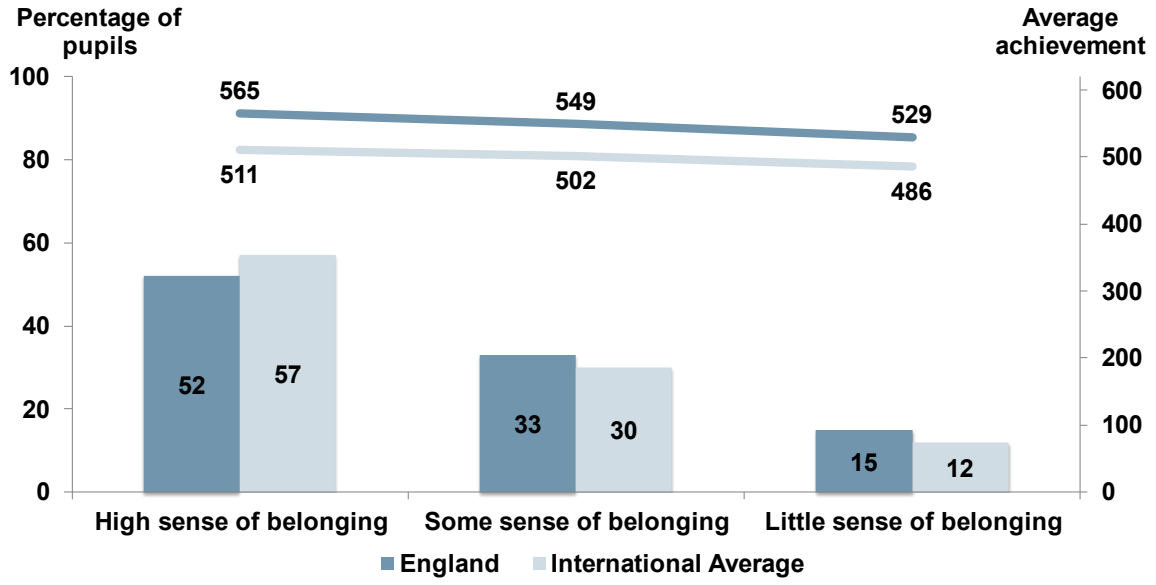
As shown in Figure 61 and Table 62 below, just over half of year 5 pupils in England (52%) felt a high sense of school belonging, below the international average (57%). Correspondingly, a larger percentage of pupils felt little sense of belonging (15%) compared with the international average (12%).

For year 5 pupils in England, there was a significant positive association between pupils agreeing they felt a greater sense of school belonging and higher average mathematics scores. The average score in mathematics for year 5 pupils who felt a high sense of school belonging was significantly above the average score for pupils who felt some or little sense of belonging. In turn, the average score for pupils who felt some sense of belonging was significantly above the average score for pupils who felt little sense of belonging. The same findings applied to year 5 science.

The difference between the average score for pupils who felt a high sense of school belonging and those who felt little sense of school belonging was 36 scale points, above the international average (25).

[37] For full methodological explanations see the *TIMSS 2023 International Report*.

Figure 61: Percentages of year 5 pupils who agreed they felt a sense of school belonging and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 62: Percentages of year 5 pupils who agreed they felt a sense of school belonging and their average score in mathematics (England and international average)

Extent of sense of belonging	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
High sense	565	511	52	57
Some sense	549	502	33	30
Little sense	529	486	15	12

Source: IEA TIMSS International Report 2023

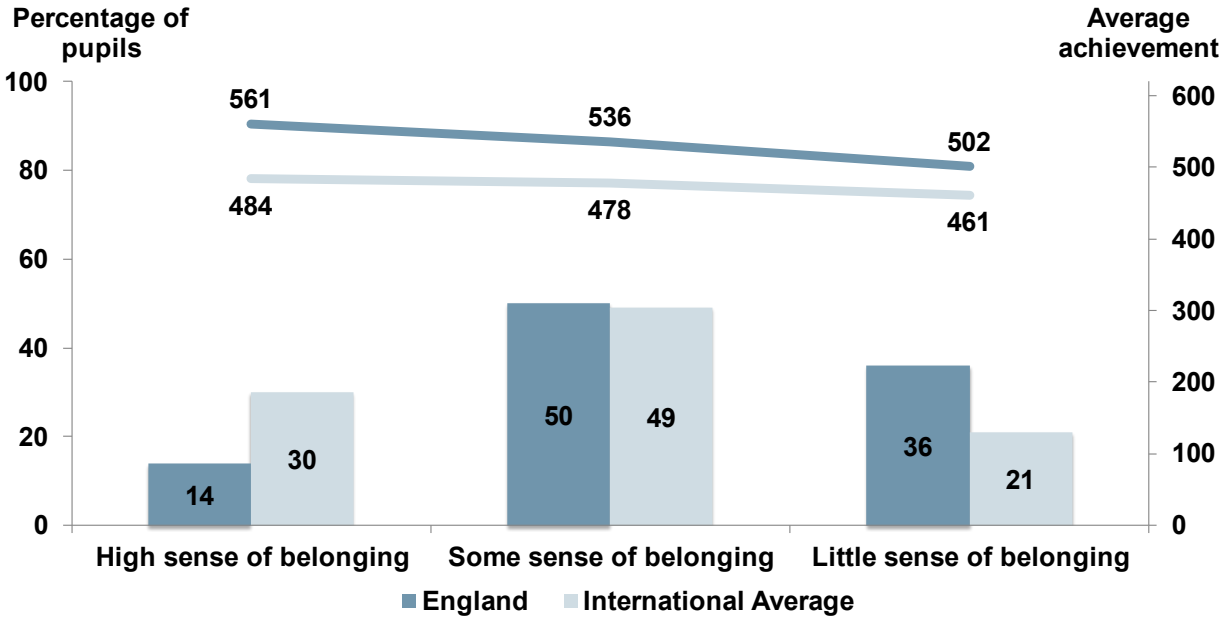
As shown in Figure 62 and Table 63 below, half of year 9 pupils in England felt some sense of school belonging, similar to the international average (49%). However, a smaller percentage of pupils in England felt a high sense of school belonging compared with the international average (14% and 30% respectively). Correspondingly, a larger percentage of pupils felt little sense of belonging (36%) compared with the international average 21%).

For year 9 pupils in England, there was a significant positive association between pupils agreeing they felt a greater sense of school belonging and higher average mathematics

scores. The average score in mathematics for year 9 pupils who felt a high sense of school belonging was significantly above the average score for pupils who felt some or little sense of belonging. In turn, the average score for pupils who felt some sense of belonging was significantly above the average score for pupils who felt little sense of belonging. The same findings applied to year 9 science.

The difference between the average score for pupils who felt a high sense of school belonging and those who felt little sense of school belonging was 59 scale points, more than double the international average (23).

Figure 62: Percentages of year 9 pupils who agreed they felt a sense of school belonging and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 63: Percentages of year 9 pupils who agreed they felt a sense of school belonging and their average score in mathematics (England and international average)

Extent of sense of belonging	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
High sense	561	484	14	30
Some sense	536	478	50	49
Little sense	502	461	36	21

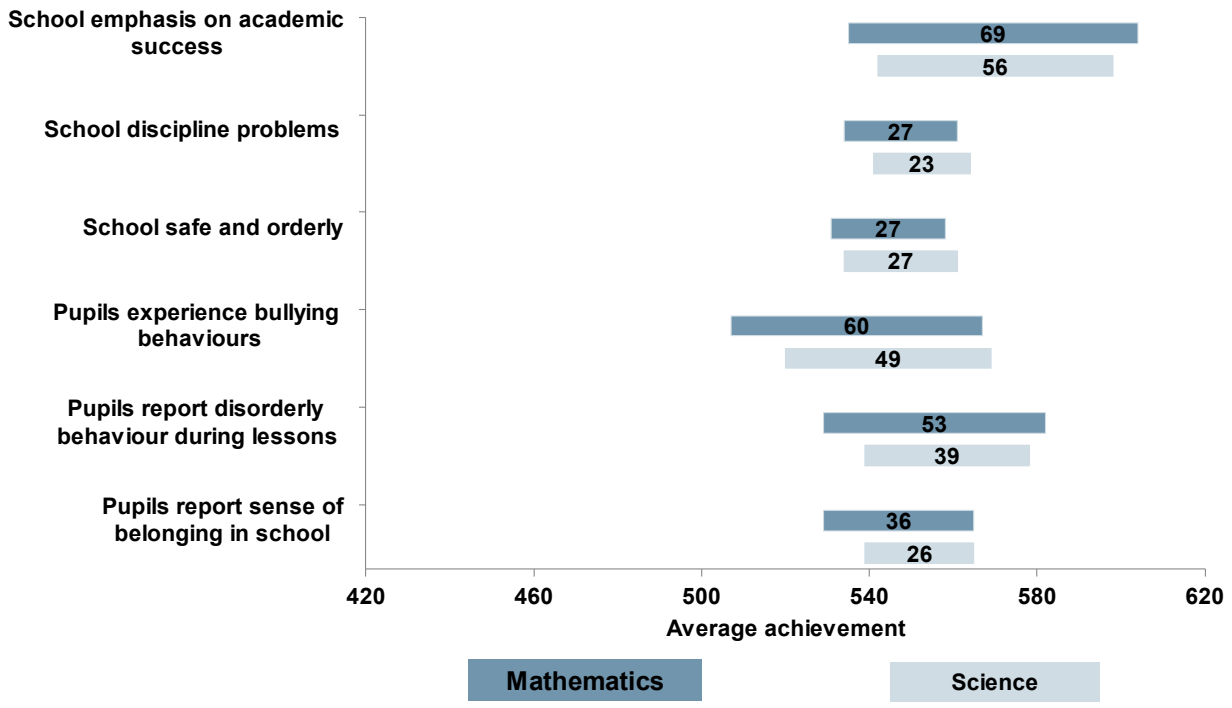
Source: IEA TIMSS International Report 2023

9.5 To what extent were the school-related factors associated with pupils' performance?

Figures 63 and 64 and Tables 64 and 65 below compare the school-related factors from this chapter and the extent to which they were associated with pupils' average scores in England. This was achieved through comparing the average score for pupils in the highest and lowest categories to calculate a range (shown by the bars). It should be reiterated that while associations between different factors and average scores can be made, this does not mean the differences are causal.

Figure 63 and Table 64 show that 3 factors were more strongly associated with year 5 pupils' performance in both subjects: schools' emphasis on academic success; pupils' experience of bullying behaviours; and pupils' reporting of disorderly behaviour. These were also most associated with year 5 pupils' performance in 2019. The differences for pupils' experience of bullying behaviours and average scores in mathematics and science in 2023 were larger than in 2019 (6 and 9 scale points respectively). While the average score difference in mathematics in 2023 was similar to 2019 (69 and 71 scale points respectively), the difference for science was smaller in 2023 (56 scale points compared with 69 in 2019). As in 2019, the largest differences in combination in year 5 pupils' performance were associated with schools' emphasis on academic success. For all the factors considered, the lowest average scores were for pupils who experienced bullying behaviours most frequently.

Figure 63: Differences in pupil and school characteristics and average score in mathematics and science (England, year 5)



Source: IEA TIMSS International Report 2023

Table 64: Differences in pupil and school characteristics and average score in mathematics and science (England, year 5)

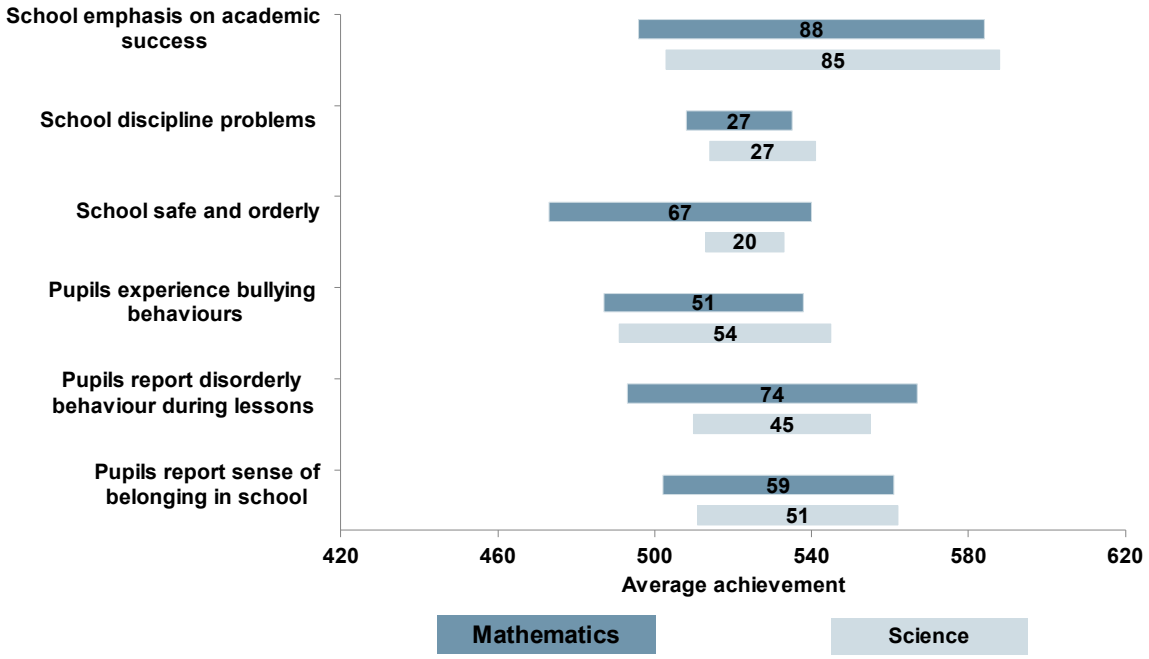
Factor	Range in mathematics (average score)	Range in science (average score)
School emphasis on academic success	69	56
School discipline problems	27	23
Schools safe and orderly	27	27
Pupils experience bullying behaviours	60	49
Pupils report disorderly behaviour in class	53	39
Pupils report a sense of belonging	36	26

Source: IEA TIMSS International Report 2023

In year 9, the factors most associated with year 9 pupils' performance included the same 3 as for year 5 pupils: schools' emphasis on academic success; pupils experiencing bullying behaviours; and pupils reporting disorderly behaviour. However, in contrast to year 5, the ranges for pupils reporting a sense of school belonging were comparable with those for experiencing bullying behaviours. In mathematics, there was also a large difference of 67 scale points with respect to teachers' reporting of schools being safe and orderly: 53 scale points larger than in 2019 (14 scale points).

As in 2019, the largest difference in year 9 pupils' performance in 2023 was associated with schools' emphasis on academic success. However, both the difference for mathematics (88 scale points) and science (85 scale points) were smaller than in 2019 (102 and 97 respectively).

Figure 64: Differences in pupil and school characteristics and average score in mathematics and science (England, year 9)



Source: IEA TIMSS International Report 2023

Table 65: Differences in pupil and school characteristics and average score in mathematics and science (England, year 9)

Factor	Range in mathematics (average score)	Range in science (average score)
School emphasis on academic success	88	85
School discipline problems	27	27
Schools safe and orderly	67	20
Pupils experience bullying behaviours	51	54
Pupils report disorderly behaviour in class	74	45
Pupils report a sense of belonging	59	51

Source: IEA TIMSS International Report 2023

Chapter 10. Teachers and teaching

This chapter summarises findings from headteacher, teacher and pupil questionnaires on aspects of teaching and learning.

In section 10.13, headteachers' responses were used for an England-only question on GCSE provision.

Chapter sections below focus on the responses:

- from teacher questionnaires on the extent to which year 5 and year 9 pupils were taught by teachers with different:
    - levels of experience
    - subject specialisms
    - levels of job satisfaction
    - professional development needs
    - levels of digital device use with pupils
    - views on teaching demands
- from pupil questionnaires on how:
    - frequently pupils were asked by their teacher to conduct science experiments
    - highly pupils reported their digital self-efficacy
- to 2 England-only questions:
    - How confident were teachers to teach the national curriculum and assess pupils' progress and attainment (teacher responses)
    - To what extent do schools in England start GCSE provision for mathematics and science in year 9 (headteacher responses)

Where there were valuable comparisons to be drawn between pupils in England and their peers in other comparator group countries, these are discussed.

The chapter also describes, in several sections, whether or not these factors are associated with higher or lower performance in the TIMSS assessments. However, it is important to note that an association (or correlation) between 2 variables (such as level of engagement and average scores) is not the same as causation (i.e. that one thing causes the other).

The comparator countries referred to in this chapter are listed in section 1.5 of Volume 1.

10.1 Main findings

- In year 5, 45% of England's pupils were taught mathematics by teachers with fewer than 10 years' experience, above the international average. The percentage of pupils in England taught by teachers with more than 20 years' experience was below the international average. The same findings applied to year 5 science in 2023: the percentages of England's pupils were the same and they were also below the corresponding international averages. However, there was no significant difference in average mathematics and science performance for different levels of teacher experience.
- The largest percentage of year 9 pupils were taught mathematics by teachers with at least 10 but fewer than 20 years' experience; almost a fifth (19%) were taught by teachers with 20 or more years' experience. There was no significant difference between the average score for pupils taught by teachers with 20 or more years' experience compared with those taught by teachers with fewer than 5 years' experience, in contrast to 2019 when pupils taught by teachers with 20 or more years' experience had an average score 55 scale points above those taught by teachers with fewer than 5 years' experience.
- The largest percentage of year 9 pupils were taught science by teachers with at least 10 but fewer than 20 years' experience. Year 9 pupils taught science by teachers with at least 5 years but fewer than 10 years' experience had a significantly higher average score than their peers taught by teachers with 20 years' more experience.
- The largest percentage of year 5 pupils were taught by teachers with primary education but not mathematics or science as their main area of study. There were no significant differences between average scores in any of the teacher education categories.
- Larger percentages of year 9 pupils were taught by teachers with either a main area of study in mathematics and mathematics education or in mathematics only. None of the average scores for pupils taught by teachers in the different categories were significantly different from one another.
- Year 9 science patterns were similar to those of year 9 mathematics regarding teachers' areas of study. As with year 9 mathematics, none of the average scores for pupils taught by teachers in the different categories were significantly different from one another.
- Year 5 and year 9 pupils were taught mathematics and science by teachers who considered their professional development needs to be primarily improving pupils' critical thinking or problem solving skills and integrating technology into

mathematics or science instruction. The third area of need in science represented the introduction of a new category for 2023: environmentalism.

- The largest percentage of year 5 pupils were taught by teachers who agreed a lot that they had the knowledge and skills to teach the national curriculum in mathematics and science and ability to assess pupils' progress in those subjects. Average scores were not significantly different between teachers who agreed a lot and those who agreed a little.
- The largest percentage of year 9 pupils were taught by teachers who agreed a lot that they had confidence in their ability to assess pupils' progress and attainment in mathematics. There was a significant positive association between greater teacher confidence and higher average scores.
- The largest percentages of year 9 pupils were taught by teachers who agreed a lot that they had the confidence to assess pupils' progress and attainment in physics, chemistry and biology; there were mixed relationships between different teachers' ratings of their confidence and pupils' average science scores.
- In year 5, 39% of pupils were taught mathematics by teachers who were very satisfied with their jobs; 11% were taught by teachers who were less than satisfied with their jobs, compared with 1% in 2019. There were no significant differences between pupils' average scores taught by teachers in the different categories.
- In year 9, 48% of pupils were taught mathematics by teachers who were very satisfied with their job; 13% were taught by teachers who were less than satisfied with their job, compared with 6% in 2019.
- The average score for year 9 pupils taught mathematics by teachers who were very satisfied with their job was significantly above the score for pupils taught by teachers who were less than satisfied with their job.
- In year 9, 41% of pupils were taught science by teachers who were very satisfied with their job; 19% were taught by teachers who were less than satisfied with their job. There were no significant differences between pupils' average scores taught by teachers in the different categories.
- More than 80% of year 5 pupils were taught by teachers who reported they were affected either a lot or a little by: needing more time to assist individual pupils; too much material to cover in class; needing more time to prepare for class; and having too many administrative tasks.
- More than 80% of year 9 pupils were taught mathematics by teachers who reported they were affected either a lot or a little by: needing more time to assist individual pupils and having too many administrative tasks.
- More than 80% of year 9 pupils were taught science by teachers who reported they were affected either a lot or a little by: needing more time to assist individual

pupils; having too many students in class; having too much material to cover in class; having too many administrative tasks; or needing more time to prepare for class.

- In years 5 and 9 mathematics and year 9 science, the percentages of pupils who had access to digital devices (computers, tablets or smartphones) in lessons were below the international averages. In year 5 science, pupils' access to devices was above the international average.
- A larger percentage of year 5 pupils used digital devices at least monthly to support learning in mathematics in 2023 than the international average. A smaller percentage of year 5 pupils used digital devices at least monthly to support learning in science than the international average. A similar percentage of year 9 pupils used digital devices at least monthly to support learning in mathematics and science to the international average.
- For teachers of year 5 and year 9 pupils, the main barrier preventing them from incorporating devices to support learning in mathematics and science was a lack of access to devices
- Half of year 5 pupils reported they had high digital self-efficacy. There was a significant positive association between higher levels of digital self-efficacy and pupils' performance. The same significant association was found for science.
- Almost three quarters of year 9 mathematics pupils reported they had high digital self-efficacy. There was a significant positive association between higher levels of digital self-efficacy and pupils' performance. The same significant association was found for science.
- Smaller percentages of year 5 and year 9 pupils than the international average were asked to conduct science experiments at least once a week, although the percentage who were asked to conduct experiments once or twice a month was above the international average.
- In year 9, 41% of pupils were taught mathematics in schools that started GCSE provision in year 9. Their average score was 555, significantly higher than the average score for pupils in schools that did not start such provision in year 9 (510).
- In year 9, 59% of pupils were taught science in schools that started GCSE provision in year 9. Their average score was 541, not significantly different from the average score for pupils in schools that did not start such provision (528).

10.2 How experienced were teachers in England and how did this compare to other TIMSS participants?

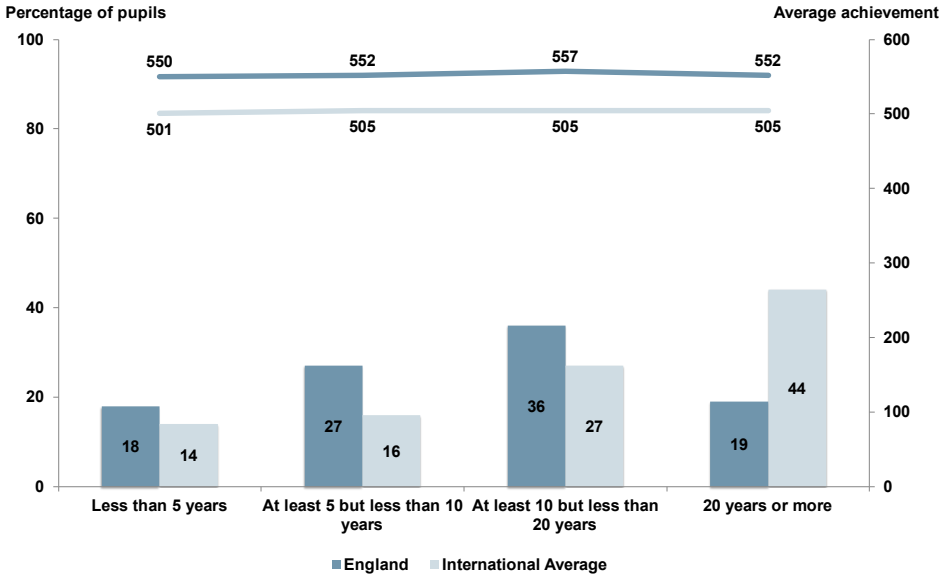
Teachers were asked ‘By the end of this school year, how many years will you have been teaching altogether.’ Based on teachers’ responses, pupils they were taught by were assigned to 1 of 4 IEA-defined categories reflecting their teachers’ experience in years:

- 20 years or more
- at least 10 but less than 20 years
- at least 5 but less than 10 years
- less than 5 years

Year 5 mathematics

As shown in Figure 65 and Table 66 below, in 2023, 45% of England’s year 5 pupils were taught mathematics by teachers with fewer than 10 years’ experience, above the international average (30%). Similarly, the percentage of pupils in England taught by teachers with more than 20 years’ experience (19%) was below the international average (44%), but above the comparative percentage of pupils in England in 2019 (13%). The same findings applied to year 5 science in 2023: the percentages of England’s pupils were the same and they were also below the corresponding international averages. For year 5 pupils in England, there was no significant difference in average mathematics and science achievement for different levels of teacher experience.

Figure 65: Percentage of year 5 pupils taught by teachers with different years of experience and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 66: Percentage of year 5 pupils taught by teachers with different years of experience and their average achievement in mathematics (England and international average)

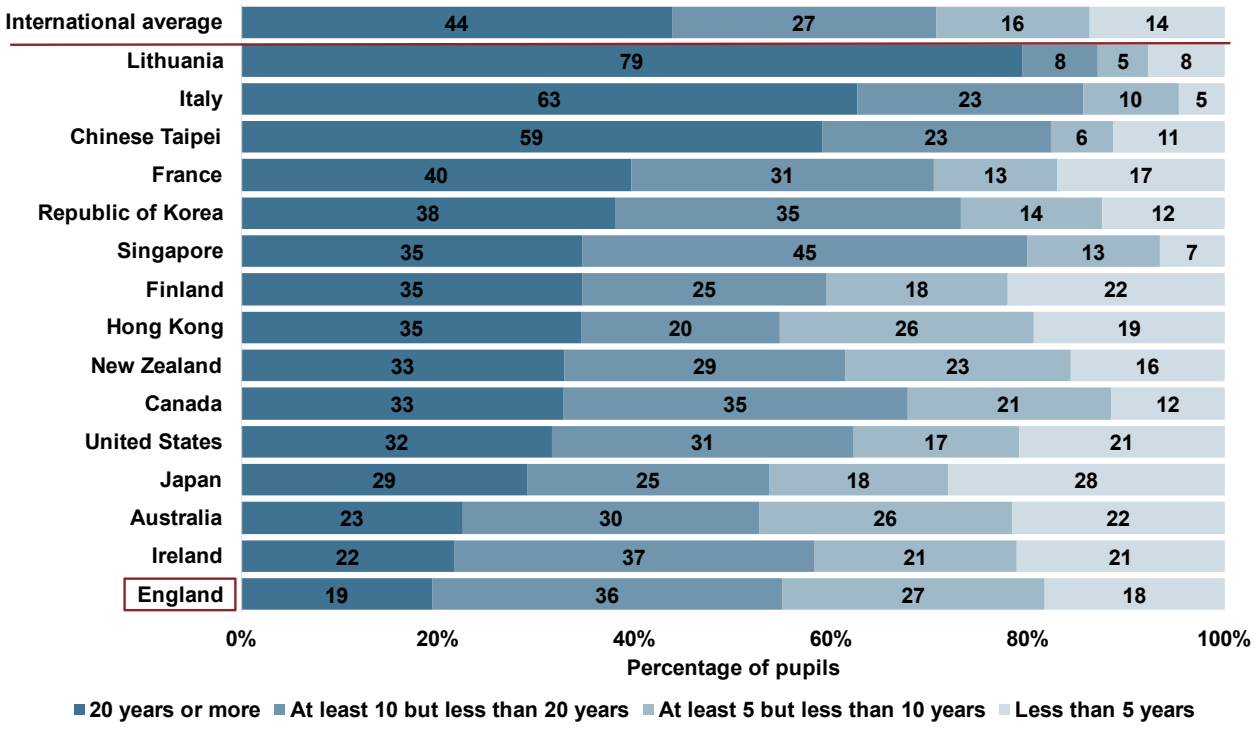
Category	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Less than 5 years	550	501	18	14
At least 5 but less than 10 years	552	505	27	16
At least 10 but less than 20 years	557	505	36	27
20 years or more	552	505	19	44

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

As shown in Figure 66 and Table 67 below, in 2023, a smaller percentage of year 5 pupils in England were taught mathematics by teachers with 20 years' or more experience compared with their peers in each of the comparator group countries. This percentage (19%) was also below the international average (44%). Apart from pupils in Japan, larger percentages of pupils from the English-speaking countries were taught mathematics by teachers with 20 years' or more experience compared with their peers from the highest-performing and European comparator groups. In year 5 science, a smaller percentage of pupils in England were taught by teachers with 20 years' or more experience compared with their peers in each of the comparator group countries, except Ireland where the difference was not significant.

Figure 66: Percentages of year 5 pupils taught mathematics by teachers with different years of experience (England and comparator countries)



Source: IEA TIMSS International Report 2023

Table 67: Percentages of year 5 pupils taught mathematics by teachers with different years of experience (England and comparator countries)

Country	20 years or more	At least 10 but less than 20 years	At least 5 but less than 10 years	Less than 5 years
International average	44	27	16	14
Lithuania	79	8	5	8
Italy	63	23	10	5
Chinese Taipei	59	23	6	11
France	40	31	13	17
Republic of Korea	38	35	14	12
Singapore	35	45	13	7
Finland	35	25	18	22
Hong Kong	35	20	26	19
New Zealand	33	29	23	16

Country	20 years or more	At least 10 but less than 20 years	At least 5 but less than 10 years	Less than 5 years
Canada	33	35	21	12
United States	32	31	17	21
Japan	29	25	18	28
Australia	23	30	26	22
Ireland	22	37	21	21
England	19	36	27	18

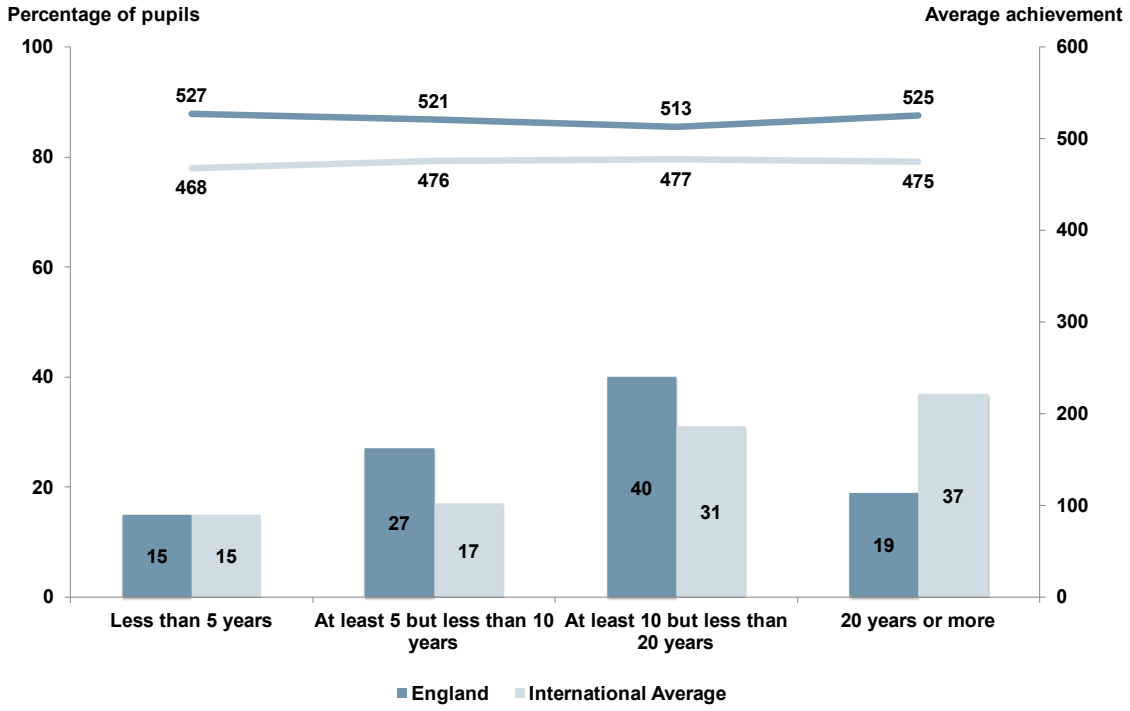
Source: IEA TIMSS International Report 2023

Year 9 mathematics

As shown in Figure 67 and Table 68 below, in 2023, the largest percentage of year 9 pupils were taught mathematics by teachers with at least 10 but fewer than 20 years' experience (40%). This was the same percentage as in 2019. Nineteen per cent were taught by teachers with 20 or more years' experience in 2023, which was below the same cycle's international average (37%), and the 2019 percentage for England (27%). The percentage of pupils taught by teachers with fewer than 5 years' experience was the same as the international average (15%) but below the 2019 percentage for England's pupils (19%).

In England, there was no significant difference between the average score for pupils taught by teachers with 20 or more years' experience (525) compared with those taught by teachers with fewer than 5 years' experience (527). This was in contrast to 2019 when pupils taught by teachers with 20 or more years' experience had an average score 55 scale points above those taught by teachers with fewer than 5 years' experience. There were similarly no significant differences between the average scores for pupils in England across any of the other categories.

Figure 67: Percentage of year 9 pupils taught by teachers with different years of experience and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 68: Percentage of year 9 pupils taught by teachers with different years of experience and their average achievement in mathematics (England and international average)

Category	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Less than 5 years	527	468	15	15
At least 5 but less than 10 years	521	476	27	17
At least 10 but less than 20 years	513	477	40	31
20 years or more	525	475	19	37

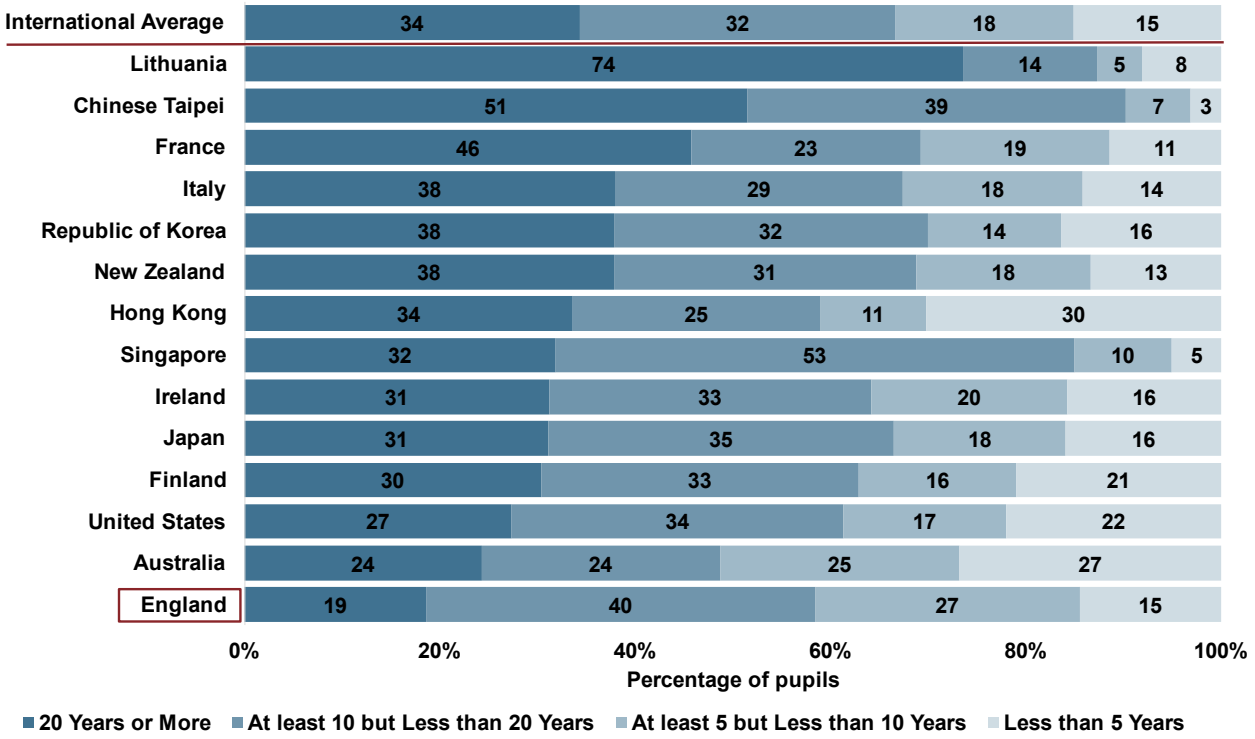
Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

In 2023, a significantly smaller percentage of year 9 pupils in England were taught mathematics by teachers with 20 or more years' experience compared to their peers in each of the comparator countries. However, the percentage of pupils taught by teachers

with at least 10 but less than 20 years' experience was the second largest after their peers in Singapore. See Figure 68 and Table 69 below.

Figure 68: Percentages of year 9 pupils taught mathematics by teachers with different years of experience (England and comparator countries)



Source: IEA TIMSS International Report 2023

Table 69: Percentages of year 9 pupils taught mathematics by teachers with different years of experience (England and comparator countries)

Country	20 years or more	At least 10 but less than 20 years	At least 5 but less than 10 years	Less than 5 years
International average	34	32	18	15
Lithuania	74	14	5	8
Chinese Taipei	51	39	7	3
France	46	23	19	11
Italy	38	29	18	14
Republic of Korea	38	32	14	16
New Zealand	38	31	18	13
Hong Kong	34	25	11	30
Singapore	32	53	10	5

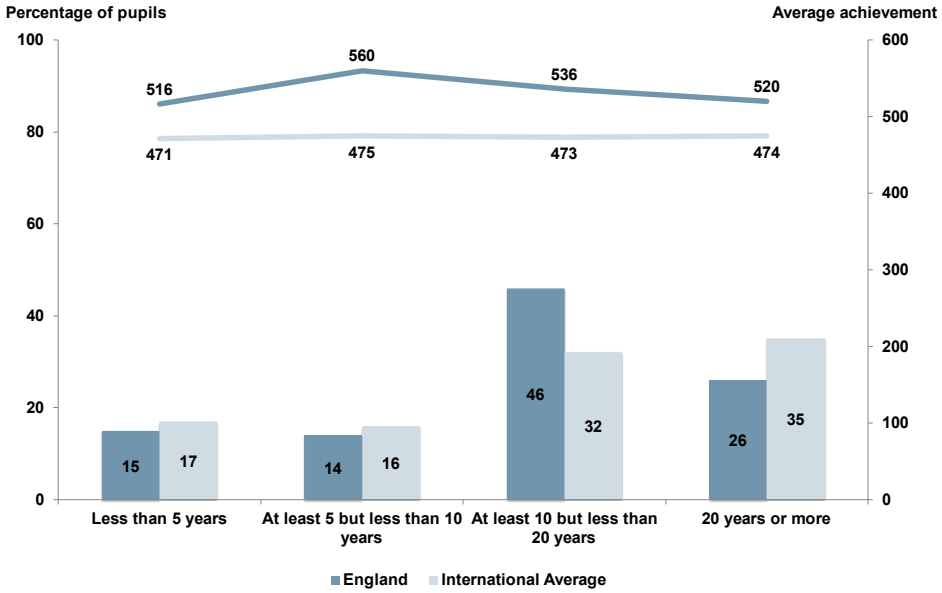
Country	20 years or more	At least 10 but less than 20 years	At least 5 but less than 10 years	Less than 5 years
Ireland	31	33	20	16
Japan	31	35	18	16
Finland	30	33	16	21
United States	27	34	17	22
Australia	24	24	25	27
England	19	40	27	15

Source: IEA TIMSS International Report 2023

Year 9 science

In 2023, as shown in Figure 69 and Table 70 below, the largest percentage of year 9 pupils in England were taught science by teachers with at least 10 but fewer than 20 years' experience (46%). Twenty-six per cent of pupils were taught by those with 20 or more years' experience, below the international average (35%), while 15% were taught by teachers with fewer than 5 years' experience, also below the international average (17%). In 2023, pupils taught by teachers with at least 5 years but less than 10 years' experience had a significantly higher average score than their peers taught by teachers with 20 years' or more experience. No other differences were significant.

Figure 69: Percentage of year 9 pupils taught by teachers with different years of experience and their average achievement in science (England and international average)



Source: IEA TIMSS International Report 2023

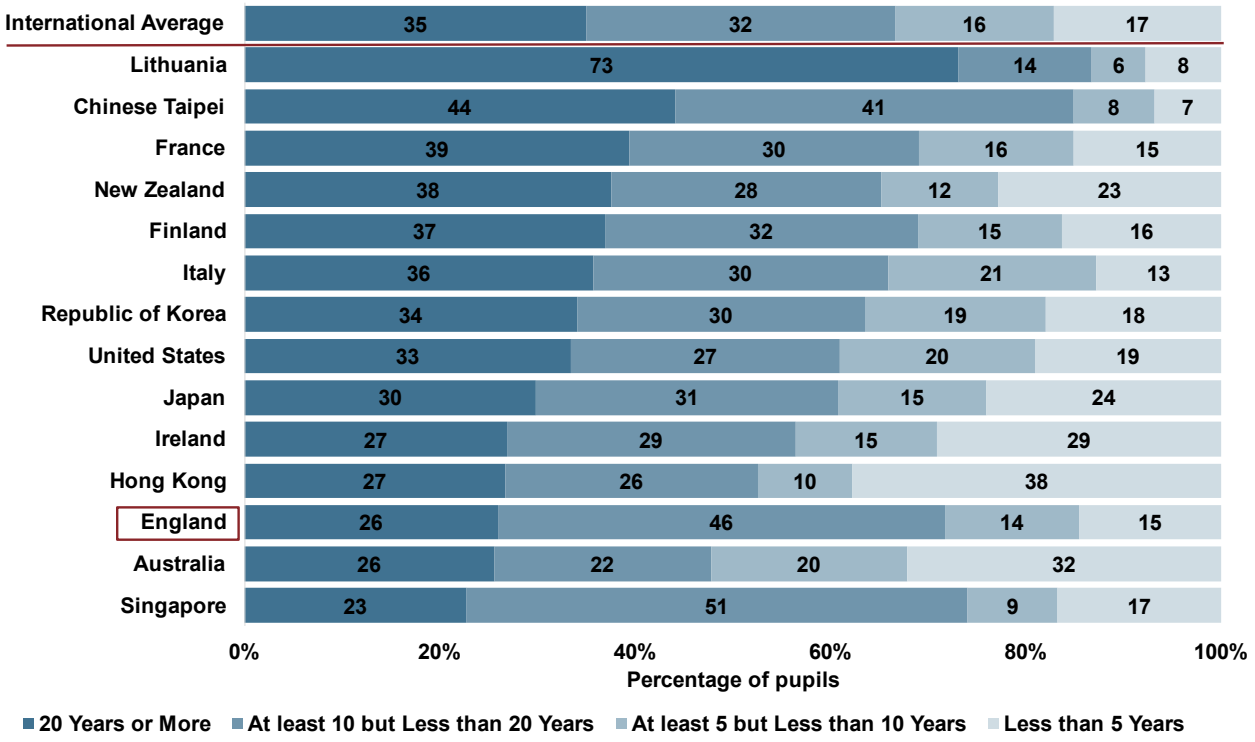
Table 70: Percentage of year 9 pupils taught by teachers with different years of experience and their average achievement in science (England and international average)

Category	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Less than 5 years	516	471	15	17
At least 5 but less than 10 years	560	475	14	16
At least 10 but less than 20 years	536	473	46	32
20 years or more	520	474	26	35

Source: IEA TIMSS International Report 2023

In 2023, a significantly smaller percentage of year 9 pupils in England were taught science by teachers with 20 or more years' experience compared to their peers in 3 of the highest-performing countries (Chinese Taipei, Japan and the Republic of Korea). The percentage was not significantly different from their peers in Hong Kong and Singapore. Similarly, the percentage of pupils in England taught by this category of teachers was significantly smaller than for their peers in New Zealand and the United States but not significantly different compared with pupils in Australia and Ireland. However, this percentage was significantly smaller than for their peers in each of the European comparator countries. See Figure 70 and Table 71 below.

Figure 70: Percentage of year 9 pupils taught science by teachers with different years of experience (England and comparator countries)



Source: IEA TIMSS International Report 2023

Table 71: Percentage of year 9 pupils taught science by teachers with different years of experience (England and comparator countries)

	20 years or more	At least 10 but less than 20 years	At least 5 but less than 10 years	Less than 5 years
International average	35	32	16	17
Lithuania	73	14	6	8
Chinese Taipei	44	41	8	7
France	39	30	16	15
New Zealand	38	28	12	23
Finland	37	32	15	16
Italy	36	30	21	13
Republic of Korea	34	30	19	18
United States	33	27	20	19

	20 years or more	At least 10 but less than 20 years	At least 5 but less than 10 years	Less than 5 years
Japan	30	31	15	24
Ireland	27	29	15	29
Hong Kong	27	26	10	38
England	26	46	14	15
Australia	26	22	20	32
Singapore	23	51	9	17

Source: IEA TIMSS International Report 2023

10.3 To what extent were pupils taught by specialist mathematics and science teachers?

This section identifies the percentage of pupils in England who were taught by teachers who studied mathematics and science at a post-secondary level[38] and compares these pupils' overall average achievement. Based on their teachers' responses, year 5 pupils were allocated into 5 categories according to their teachers' main area(s) of study:

1. Primary education and mathematics (or science)
2. Primary education but not mathematics (or science)
3. Mathematics (or science) but not primary education
4. All other areas of study
5. No formal education beyond upper secondary

Year 9 pupils were also allocated into 5 categories, based on their teachers' main area(s) of study:

1. Mathematics and mathematics education (or science equivalent)
2. Mathematics (or science) but not mathematics education (or science education)
3. Mathematics (or science) education but not mathematics (or science)
4. All other areas of study
5. No formal education beyond upper secondary

[38] Post-18 Higher Education.

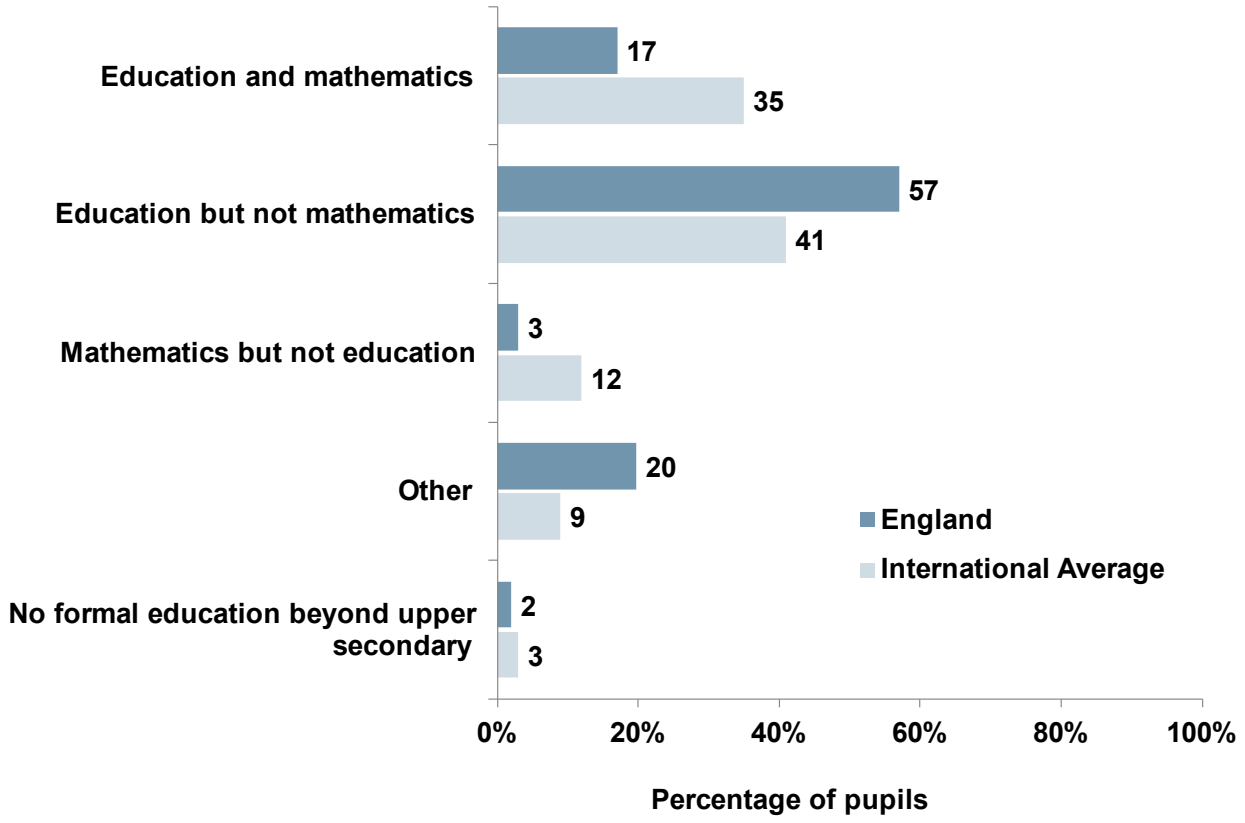
In the context of England, teachers' main area of study can be interpreted as their main degree subject. Where a teacher has studied another subject in addition to their main area of study this was considered to be an additional subject specialism.

Year 5 mathematics

Figure 71 and Table 72 below show that 57% of year 5 pupils in England were taught by teachers with primary education, but not mathematics, as their main area of study, above the international average (41%). A smaller percentage of pupils in England were taught by teachers with specialisms in both primary education and mathematics (17%) compared with the international average (35%).

Across all countries as a whole, pupils taught by teachers with either primary education and mathematics or primary education but not mathematics as their main area of study recorded the highest average scores (both 504). In England, there were no significant differences between average scores in any of the categories.

Figure 71: Percentages of year 5 pupils taught by teachers with different main areas of study in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 72: Percentages of year 5 pupils taught by teachers with different main areas of study in mathematics (England and international average)

Category	Percentage of pupils – England	Percentage of pupils – international
Primary education and mathematics	17	35
Primary education but not mathematics	57	41
Mathematics but not primary education	3	12
All other areas of study	20	9
No formal education beyond upper secondary	2	3

Source: IEA TIMSS International Report 2023

In some of the highest-performing countries, higher percentages of year 5 pupils, compared to those in other comparator group countries, were taught by teachers with primary education and mathematics as their main areas of study (Chinese Taipei – 37%; Hong Kong – 62%; Singapore – 61%). However, a larger percentage of pupils in England (17%) were taught by teachers with primary education and mathematics as their main areas of study compared with their peers in each of the remaining comparator countries.

There were no clear associations across comparator countries in relation to year 5 pupils' average mathematics scores and categories of teachers' area of study. For example, pupils in Singapore taught by teachers with primary education but not mathematics as a main area of study achieved higher average scores compared to their peers taught by teachers in the other categories. However, in Hong Kong, pupils' average scores were highest for those taught by teachers with other main areas of study. Inconsistency was also found across the other English-speaking countries and the European comparator countries. However, across both these groups of countries, in most cases pupils taught by teachers with primary education and mathematics as a main area of study achieved higher average scores compared to their peers taught by teachers in the other categories.

Year 5 science

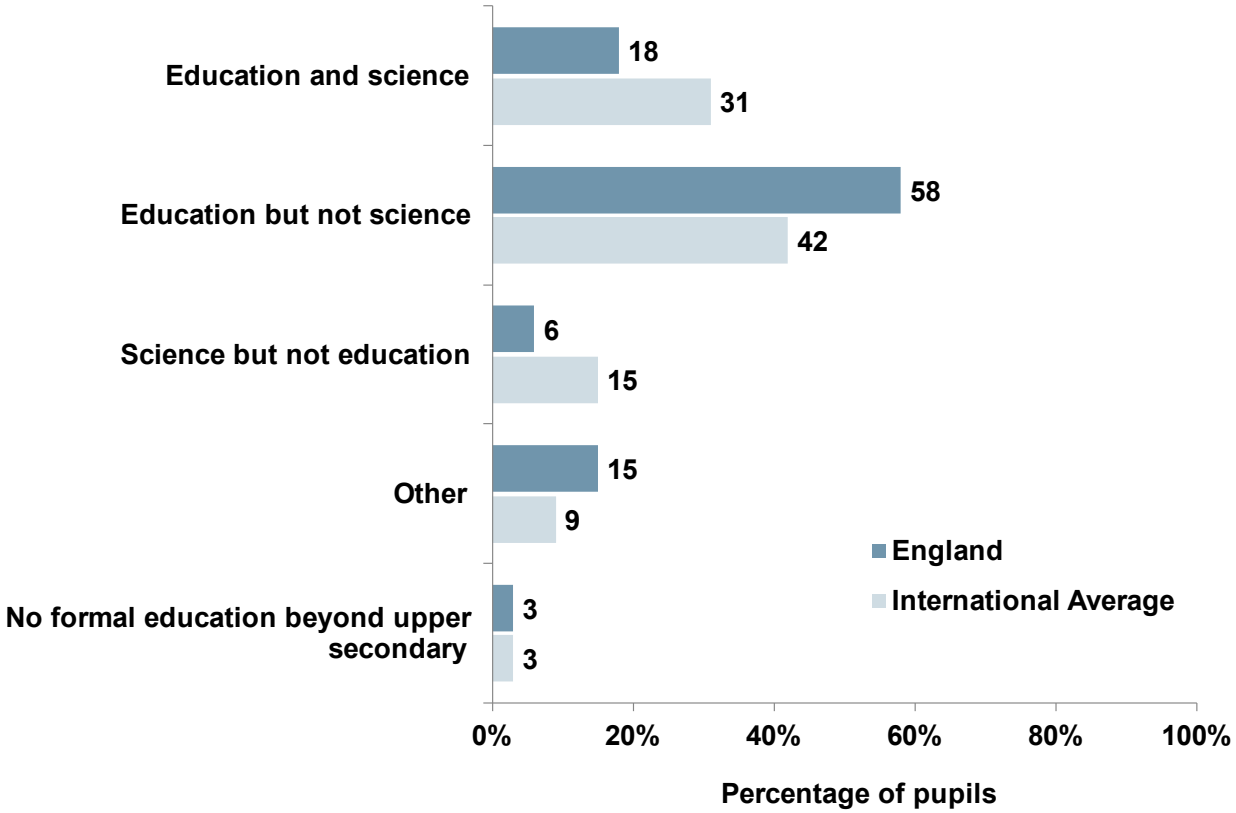
As shown in Figure 72 and Table 73 below, in 2023, the largest percentage of year 5 pupils in England were taught by teachers with primary education but not science as their main area of study (58%) compared with those taught by teachers with primary education and science as their main area of study (18%). The percentage of pupils taught by teachers in the former category (58%) was above the international average (42%), while

those taught by teachers in the latter category (18%) was below the international average (31%).

Across all countries on average, pupils taught by teachers with a main area of study in primary education and science achieved similarly high average scores to those taught by teachers with primary education but not science as their main area of study (495 and 496 respectively). This was different in England where pupils who achieved similarly high average scores were taught by teachers with a main area of study in primary education and science (567) or in science but not primary education (568).

In England, as in mathematics in 2023, there were no significant differences between average scores in any of the categories.

Figure 72: Percentages of year 5 pupils taught by teachers with different main areas of study in science (England and international average)



Source: IEA TIMSS International Report 2023

Table 73: Percentages of year 5 pupils taught by teachers with different main areas of study in science (England and international average)

Category	Percentage of pupils – England	Percentage of pupils – international
Primary education and science	18	31
Primary education but not science	58	42
Science but not primary education	6	15
All other areas of study	15	9
No formal education beyond upper secondary	3	3

Source: IEA TIMSS International Report 2023

As for year 5 mathematics, a relatively high percentage of pupils in Chinese Taipei (35%), Hong Kong (42%) and Singapore (54%) were taught by teachers with specialisms in both primary education and science. However, a larger percentage of pupils in England (18%) were taught by teachers with primary education and science as their main areas of study compared with their peers in each of the English-speaking and European comparator countries.

There was no clear pattern of associations between higher average year 5 pupil scores in science and these categories across the highest-performing countries. For example, in Japan and Singapore, pupils' average scores were highest for those taught by teachers with other main areas of study, while in Hong Kong, pupils taught by teachers with a specialism in science but not primary education had the highest average scores. Across the European comparator countries, there were similarly no clear patterns of association.

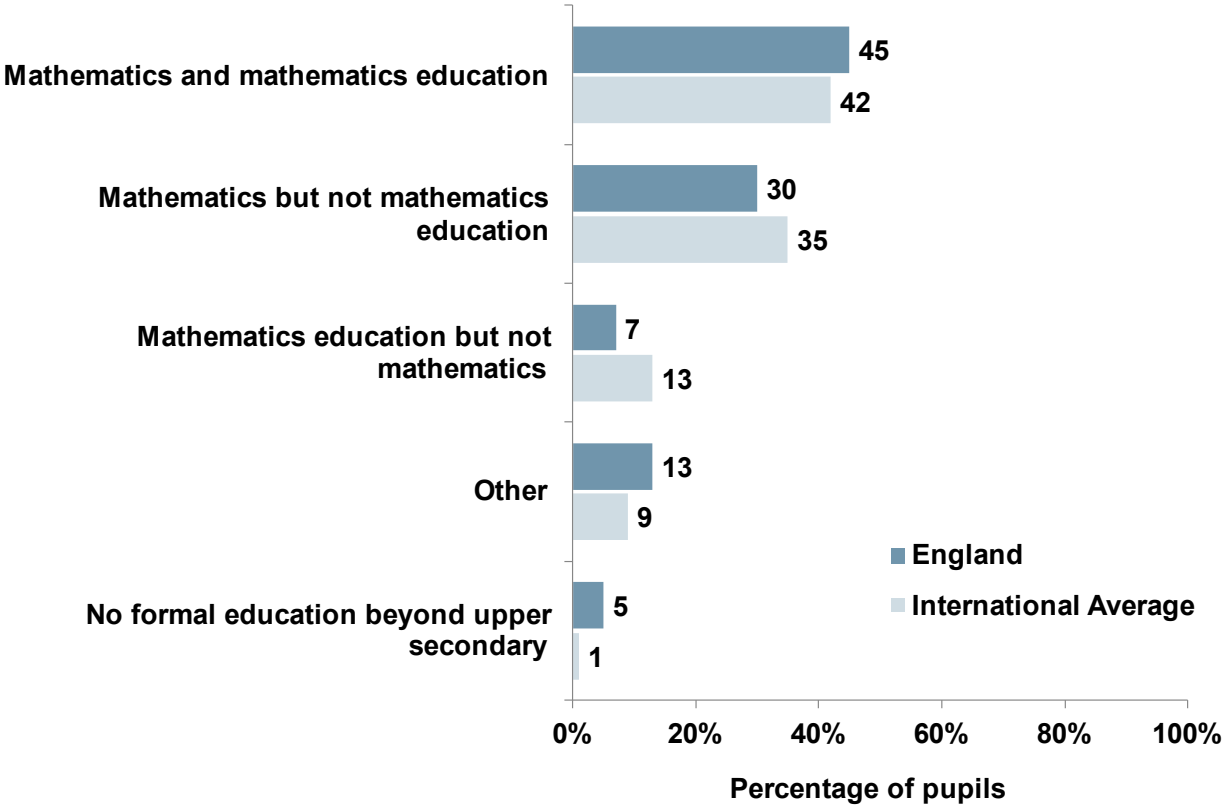
Year 9 mathematics

Figure 73 and Table 74 below shows that, in 2023, larger percentages of year 9 pupils in England were taught by teachers with either a main area of study in mathematics and mathematics education (45%) or in mathematics but not mathematics education (30%). While the former was above the international average (42%), the latter was below it (35%). The latter percentage (30%) was also different from 2019 when 45% of pupils were taught teachers with either a main area of study in mathematics but not mathematics education. None of the average scores for pupils in England taught by teachers in the different categories were significantly different from one another.

Across all countries on average, pupils taught by teachers with a main area of study in mathematics education but not mathematics achieved the highest average score (483) compared with their peers taught by teachers in the other categories. By contrast, in

England, pupils who achieved similarly high average scores (ranging from 519 to 520) were taught by teachers in each of the other 3 categories.

Figure 73: Percentages of year 9 pupils taught by teachers with different main areas of study in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 74: Percentages of year 9 pupils taught by teachers with different main areas of study in mathematics (England and international average)

Category	Percentage of pupils – England	Percentage of pupils – international
Mathematics and mathematics education	45	42
Mathematics but not mathematics education	30	35
Mathematics education but not mathematics	7	13
All other areas of study	13	9
No formal education beyond upper secondary	5	1

Source: IEA TIMSS International Report 2023

In each of the highest-performing group of countries, except the Republic of Korea, larger percentages of pupils were taught by teachers with mathematics and mathematics education as their main area of study compared with pupils in England. For this same category, findings were mixed when comparing the English-speaking groups' pupils with pupils in England[39]. However, a larger percentage of pupils were taught by teachers in England compared with each of the European comparator countries except Lithuania.

In none of the highest-performing countries were pupils' average scores highest when they were taught by teachers with mathematics and mathematics education as their main area of study. There were no clear associations for pupils across either the English-speaking or European comparator groups of countries.

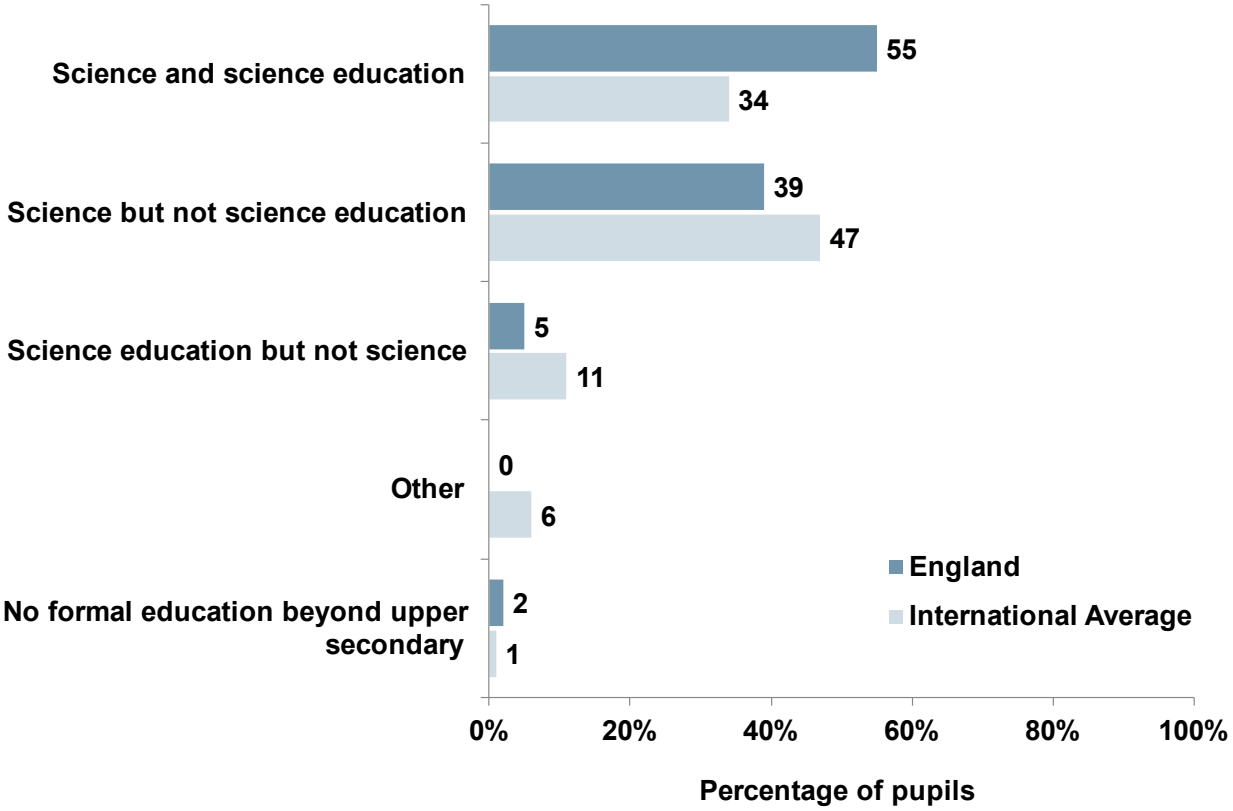
Year 9 science

Figure 74 and Table 75 below show that in 2023, similar to the case for year 9 mathematics, larger percentages of year 9 pupils in England were taught science by teachers with main areas of study either in science and science education (55%, an increase from 2019 when it was 44%) and in science but not science education (39%). The former percentage (55%) was above the international average, while the latter (39%) was below it. As in year 9 mathematics, none of the average scores for pupils in England taught by teachers in the different categories were significantly different from one another.

Across all countries as a whole, pupils taught by teachers with their main area of study in science and science education achieved the highest average score. This was not the case in England. Pupils in England with the highest average score were taught by teachers with science education but not science as their main area of study.

[39] In addition to Canada not participating in the year 9 questionnaires, the IEA exhibits did not include the responses from New Zealand's teachers to this questionnaire.

Figure 74: Percentages of year 9 pupils taught by teachers with different main areas of study in science (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 75: Percentages of year 9 pupils taught by teachers with different main areas of study in science (England and international average)

Category	Percentage of pupils – England	Percentage of pupils – international
Science and science education	55	34
Science but not science education	39	47
Science education but not science	5	11
All other areas of study	0	6
No formal education beyond upper secondary	2	1

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

In Singapore from the highest-performing countries and Australia and Ireland from the English-speaking countries, there were relatively high percentages of pupils taught by teachers with science and science education as their main area of study (61%; 68% and 61% respectively). The percentage of pupils in England taught by teachers in this same category (55%) was larger than for their peers from each of the remaining comparator group countries.

There were no clear associations across countries from the different comparator groups between pupils taught by teachers from the different categories and higher average scores.

10.4 What did year 5 and 9 teachers in England consider to be their future continuing professional development (CPD) needs?

Teachers were asked to identify areas in which they needed future CPD (teachers could indicate needing professional development in more than one area):

1. Mathematics/science content
2. Mathematics/science pedagogy/instruction
3. Mathematics/science curriculum
4. Integrating technology into mathematics/science instruction
5. Improving pupils' critical thinking or problem solving skills (inquiry instead of problem solving in science)
6. Mathematics/science assessment
7. Addressing individual students' needs
8. Integrating science with other subjects (year 5 science teachers only)
9. Integrating environmentalism and sustainability into science instruction (year 5 and 9 science only)

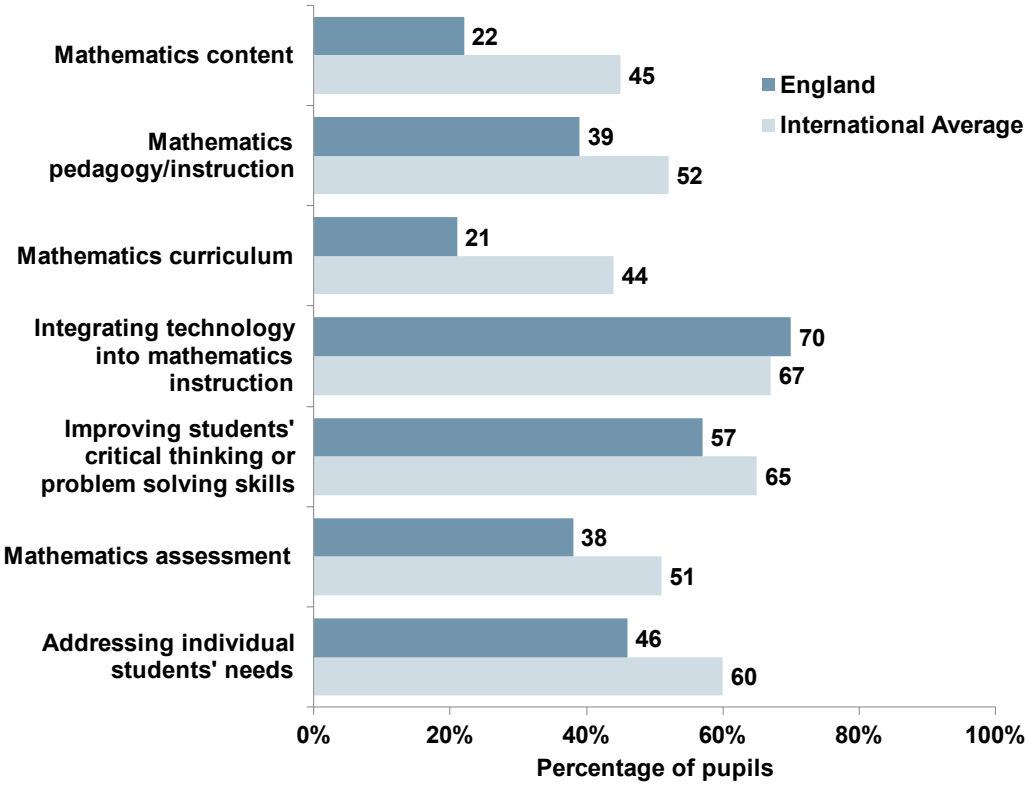
Comparisons with TIMSS 2019 are provided in year 9 but not year 5 as in 2019, the teacher questionnaire response rate was too low to report.

Year 5 mathematics

As shown in Figure 75 and Table 76 below, in 2023, year 5 pupils were taught mathematics by teachers who considered their CPD needs to be primarily in 2 areas: improving pupils' critical thinking or problem solving skills (57%) and integrating

technology into mathematics instruction (70%). Addressing individual pupils' needs was the next most stated area of need (46%), while the areas of least need were mathematics curriculum and content (21% and 22%). The other 2 areas were considered to be of similar importance (assessment: 38% and pedagogy/instruction: 39%). This pattern and prioritisation of needs was mostly mirrored in the international averages.

Figure 75: Percentages of year 5 pupils in schools taught by mathematics teachers with certain CPD needs (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Teachers could indicate need for CPD in more than one area.

Table 76: Percentages of year 5 pupils in schools taught by mathematics teachers with certain CPD needs (England and international average)

CPD need	Percentage of pupils – England	Percentage of pupils – international
Mathematics content	22	45
Mathematics pedagogy/instruction	39	52
Mathematics curriculum	21	44
Integrating technology into mathematics instruction	70	67

CPD need	Percentage of pupils – England	Percentage of pupils – international
Improving students' critical thinking or problem solving skills	57	65
Mathematics assessment	38	51
Addressing individual students' needs	46	60

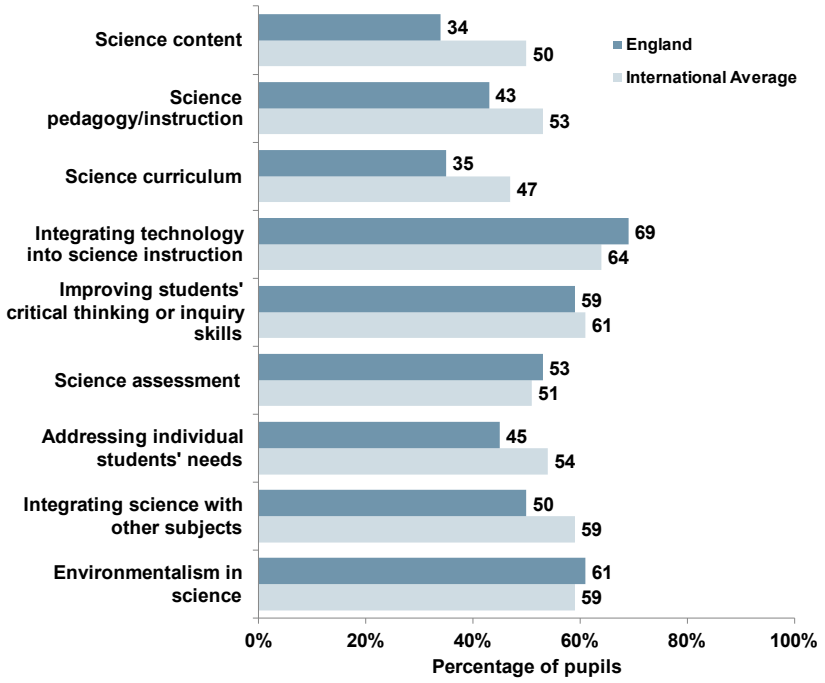
Source: IEA TIMSS International Report 2023

Note 1: Teachers could indicate need for CPD in more than one area.

Year 5 science

A similar pattern of professional development needs was found in science as in mathematics. As shown in Figure 76 and Table 77 below, in 2023, year 5 pupils were taught science by teachers who considered their CPD needs to be primarily in 3 areas. Two of these were the same as for mathematics: improving pupils' critical thinking or problem solving skills (59%) and integrating technology into science instruction (69%). However, the third area of need represented the introduction of a new category for 2023: environmentalism in science (61%). This pattern and prioritisation of needs was mirrored in the international averages.

Figure 76: Percentages of year 5 pupils in schools taught by science teachers with certain CPD needs (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Teachers could indicate need for CPD in more than one area.

Table 77: Percentages of year 5 pupils in schools taught by science teachers with certain CPD needs (England and international average)

CPD need	Percentage of pupils – England	Percentage of pupils – international
Science content	34	50
Science pedagogy/instruction	43	53
Science curriculum	35	47
Integrating technology into science instruction	69	64
Improving students' critical thinking or inquiry skills	59	61
Science assessment	53	51
Addressing individual students' needs	45	54
Integrating science with other subjects	50	59
Integrating environmentalism and sustainability into science instruction	61	59

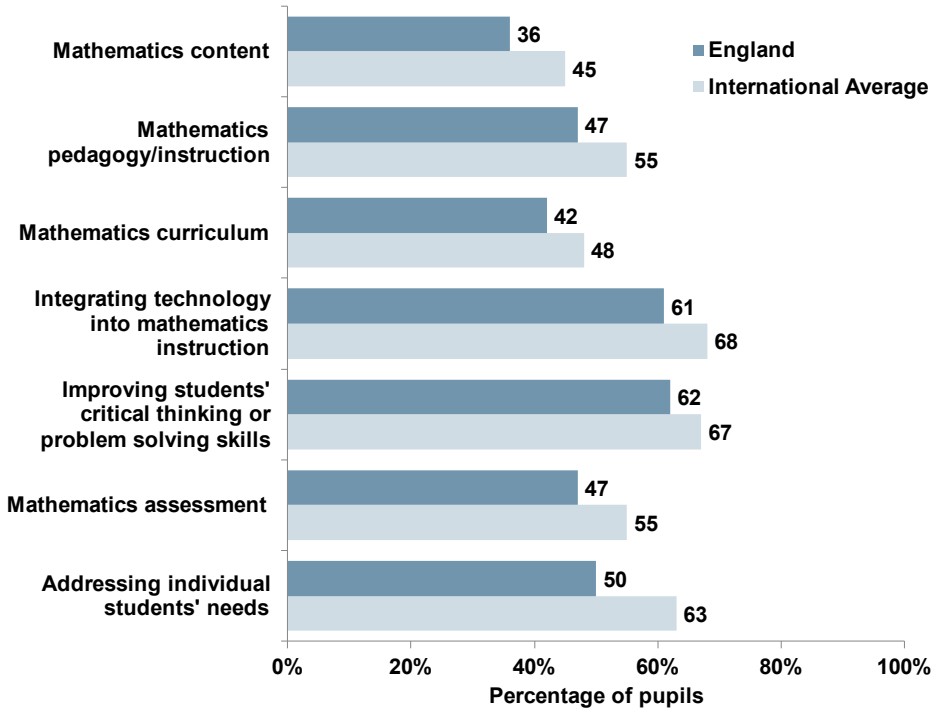
Source: IEA TIMSS International Report 2023

Note 1: Teachers could indicate need for CPD in more than one area.

Year 9 mathematics

As shown in Figure 77 and Table 78 below, in 2023, year 9 pupils were taught mathematics by teachers who considered their CPD needs to be primarily in the same 2 areas stated in 2019: improving pupils' critical thinking or problem solving skills (62%; 61% in 2019) and integrating technology into mathematics instruction (61%, 57% in 2019). Addressing individual pupils' needs was the next most stated area of need (50%), while the area of least need was, as in 2019, mathematics content (36%, 28% in 2019). The other 3 areas were considered to be of similar importance (between 42% and 47%). This pattern and prioritisation of needs was mirrored in the international averages.

Figure 77: Percentages of year 9 pupils in schools taught by mathematics teachers with certain CPD needs (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Teachers could indicate need for CPD in more than one area.

Table 78: Percentages of year 9 pupils in schools taught by mathematics teachers with certain CPD needs (England and international average)

CPD need	Percentage of pupils – England	Percentage of pupils – international
Mathematics content	36	45
Mathematics pedagogy/instruction	47	55
Mathematics curriculum	42	48
Integrating technology into mathematics instruction	61	68
Improving students' critical thinking or problem solving skills	62	67
Mathematics assessment	47	55
Addressing individual students' needs	50	63

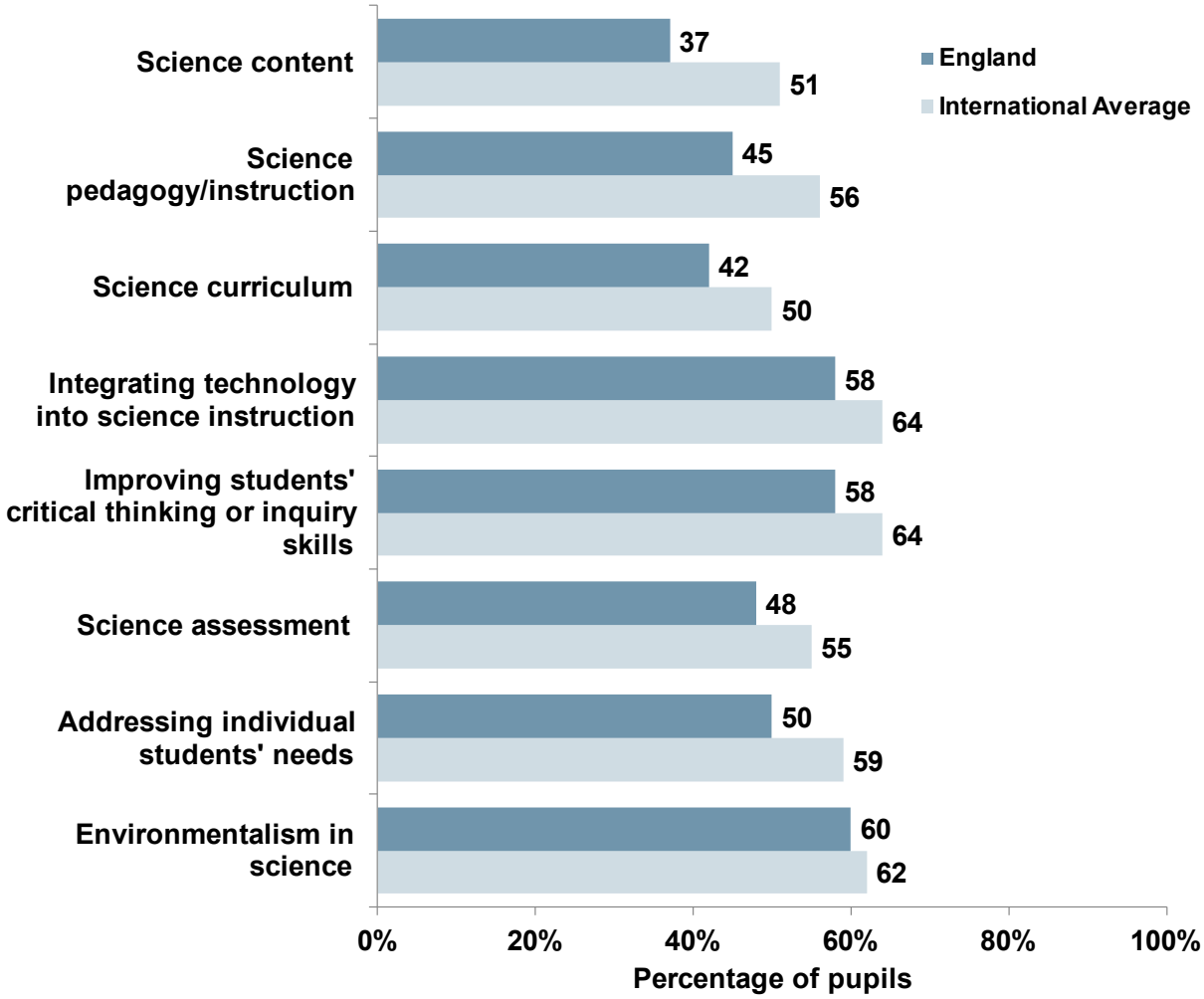
Source: IEA TIMSS International Report 2023

Note 1: Teachers could indicate need for CPD in more than one area.

Year 9 science

A similar pattern of professional development needs was found in science as in mathematics in year 9. As shown in Figure 78 and Table 79 below, in 2023, year 9 pupils were taught science by teachers who considered their CPD needs to be primarily in 3 areas. Two of these were the same as for mathematics and also the same as in science in 2019: improving pupils' critical thinking or problem solving skills (58%, 56% in 2019) and integrating technology into science instruction (58%, 55% in 2019). However, the third area of need was in the new category for 2023: environmentalism in science (60%). Science content (37%, 34% in 2019) and curriculum (42%, 35% in 2019) were the areas of least need. As in mathematics, this pattern and prioritisation of needs was mirrored in the international averages.

Figure 78: Percentages of year 9 pupils in schools taught by science teachers with certain CPD needs (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Teachers could indicate need for CPD in more than one area.

Table 79: Percentages of year 9 pupils in schools taught by science teachers with certain CPD needs (England and international average)

CPD need	Percentage of pupils – England	Percentage of pupils – international
Science content	37	51
Science pedagogy/instruction	45	56
Science curriculum	42	50
Integrating technology into science instruction	58	64
Improving students' critical thinking or inquiry skills	58	64
Science assessment	48	55
Addressing individual students' needs	50	59
Integrating environmentalism and sustainability into science instruction	60	62

Source: IEA TIMSS International Report 2023

Note 1: Teachers could indicate need for CPD in more than one area.

10.5 How confident were teachers to teach the national curriculum and assess pupils’ progress and attainment?

In 2023, year 5 and 9 teachers in England only were asked to respond to statements indicating their confidence in teaching the national curriculum and assessing learning:

- I am confident that I have the knowledge and skills required to teach the national curriculum in mathematics/science to Year 5 pupils
- I am confident in my ability to assess Year 5 pupils' progress and attainment in mathematics/science
- I am confident in my ability to assess Year 9 students’ progress and attainment in mathematics
- I am confident in my ability to assess year 9 students' progress and attainment in (physics, chemistry, biology as relevant)

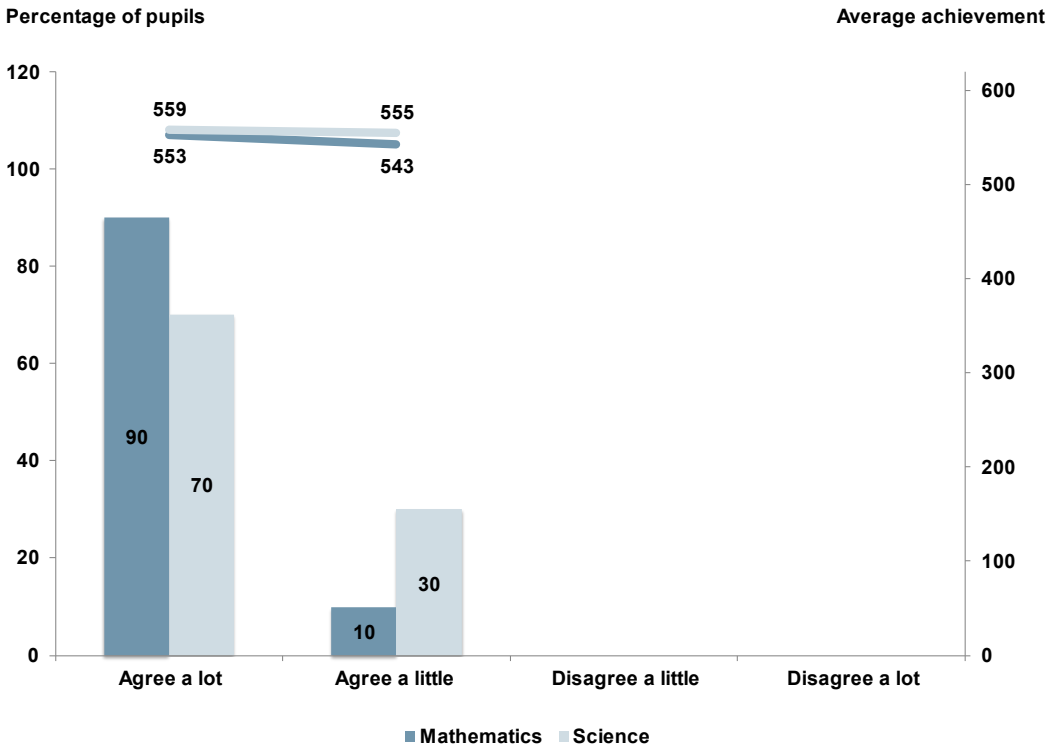
Teachers selected from 1 of 4 options from Agree a lot to Disagree a lot. The findings presented analyse the percentage responses alongside the average scores achieved by pupils taught by teachers in these option categories. Since this was an England only question, there are no comparisons with international averages.

Year 5

As shown in Figure 79 and Table 80 below, a larger percentage of year 5 pupils were taught by teachers who agreed a lot that they had the knowledge and skills required to teach the national curriculum in mathematics and science. The percentage was larger for mathematics than for science (90% compared with 70%). No pupils were taught by teachers who disagreed either a little or a lot with this statement.

Although the average scores for pupils taught by teachers who agreed a lot that they had the knowledge and skills required in both mathematics and science were higher than for pupils whose teachers agreed a little, the differences were not significant.

Figure 79: Percentage of year 5 pupils taught by teachers with different confidence ratings that they have the knowledge and skills required to teach the national curriculum in mathematics and science and their average achievement (England)



Source: IEA TIMSS International Report 2023

Note 1: Where the percentage of pupils is too small to calculate an average score, no data is presented.
Note 2: This was a question asked of teachers of pupils in England only.

Table 80: Percentage of year 5 pupils taught by teachers with different confidence ratings that they have the knowledge and skills required to teach the national curriculum in mathematics and science and their average achievement (England)

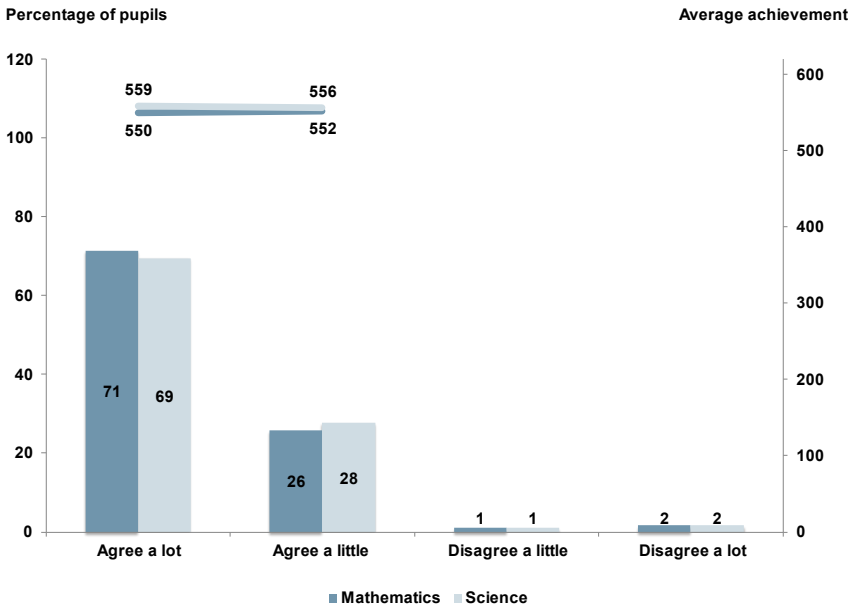
Extent of agreement	Percentage mathematics	Average score mathematics	Percentage science	Average score science
Agree a lot	90	553	70	559
Agree a little	10	543	30	555
Disagree a little	0	No data	0	No data
Disagree a lot	0	No data	0	No data

Source: IEA TIMSS International Report 2023

Note 1: Where the percentage of pupils is too small to calculate an average score, no data is presented.
Note 2: This was a question asked of teachers of pupils in England only.

As shown in Figure 80 and Table 81 below, a larger percentage of year 5 pupils were taught by teachers who agreed a lot that they had the ability to assess year 5 pupils' progress and attainment in mathematics and science. The percentages were similar for both subjects. Very small percentages of pupils were taught by teachers who disagreed either a little or a lot with this statement. The differences between pupils' average scores were not significant.

Figure 80: Percentage of year 5 pupils taught by teachers with different confidence ratings of their ability to assess year 5 pupils' progress and attainment in mathematics and science and their average achievement (England)



Source: IEA TIMSS International Report 2023

Note 1: Where the percentage of pupils is too small to calculate an average score, no data is presented.
Note 2: This was a question asked of teachers of pupils in England only.

Table 81: Percentage of year 5 pupils taught by teachers with different confidence ratings of their ability to assess year 5 pupils' progress and attainment in mathematics and science and their average achievement (England)

Extent of agreement	Percentage mathematics	Average score mathematics	Percentage science	Average score science
Agree a lot	71	550	69	559
Agree a little	26	552	28	556
Disagree a little	1	No data	1	No data
Disagree a lot	2	No data	2	No data

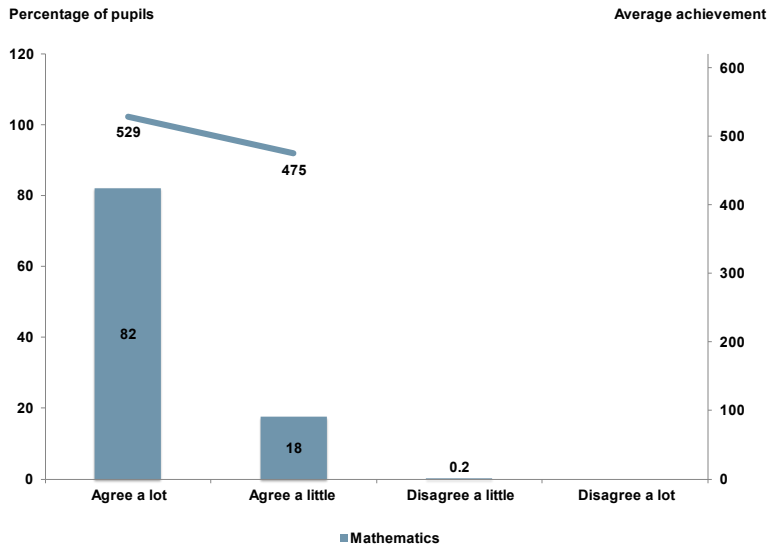
Source: IEA TIMSS International Report 2023

Note 1: Where the percentage of pupils is too small to calculate an average score, no data is presented.
Note 2: This was a question asked of teachers of pupils in England only.

Year 9

As shown in Figure 81 and Table 82 below, a larger percentage of year 9 pupils were taught by teachers who agreed a lot that they had confidence in their ability to assess pupils' progress and attainment in mathematics. Fewer than 1% of pupils were taught by teachers who disagreed a little with this statement and none by those who disagreed a lot with it. There was a significant positive association between greater teacher confidence in their ability and a higher average score for pupils they taught.

Figure 81: The percentage of year 9 pupils taught by teachers with different confidence ratings of their ability to assess pupils' progress and attainment in mathematics and their average achievement in mathematics (England)



Source: IEA TIMSS International Report 2023

Note 1: Where the percentage of pupils is too small to calculate an average score, no data is presented.
Note 2: This was a question asked of teachers of pupils in England only.

Table 82: The percentage of year 9 pupils taught by teachers with different confidence ratings of their ability to assess pupils' progress and attainment in mathematics and their average achievement in mathematics (England)

Extent of agreement	Percentage mathematics	Average score mathematics
Agree a lot	82	529
Agree a little	18	475
Disagree a little	0.2	No data
Disagree a lot	0	No data

Source: IEA TIMSS International Report 2023

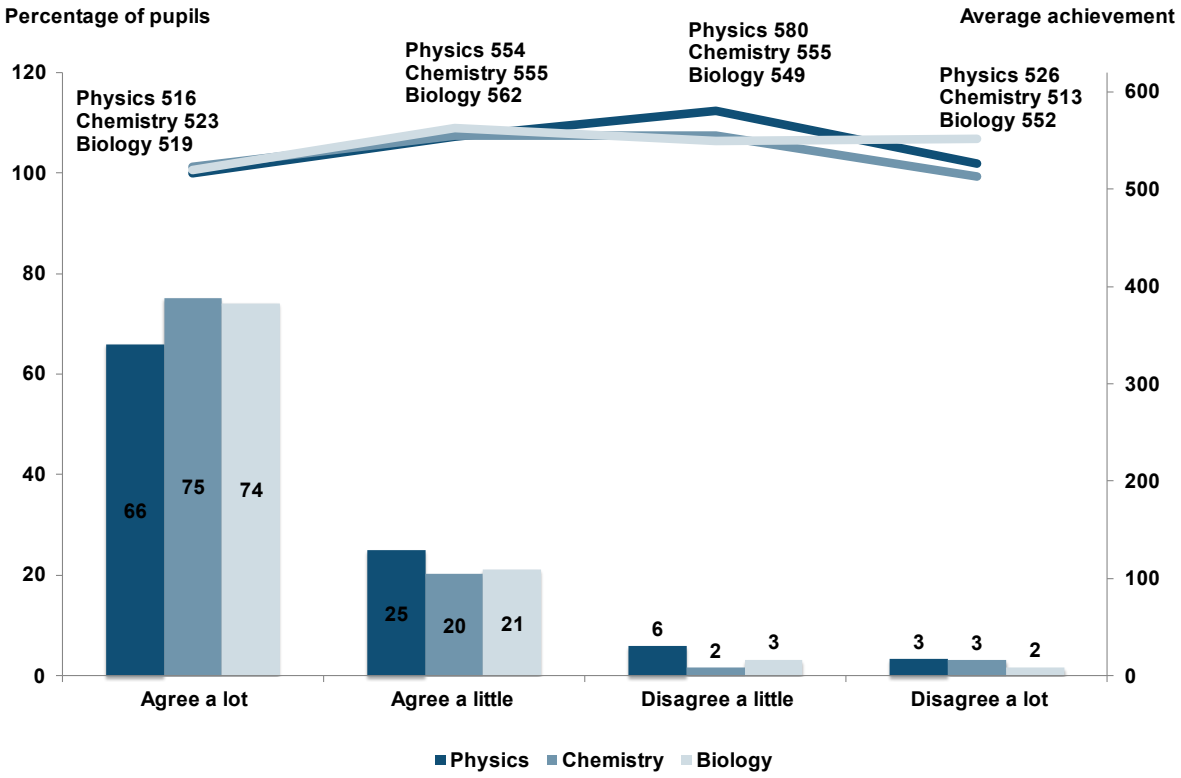
Note 1: Where the percentage of pupils is too small to calculate an average score, no data is presented.
Note 2: This was a question asked of teachers of pupils in England only.

As shown in Figure 82 and Table 83 below, larger percentages of year 9 pupils were taught by teachers who agreed a lot that they had the confidence to assess pupils' progress and attainment in physics, chemistry and biology. Very small percentages of pupils were taught by teachers who disagreed a little or a lot with this statement.

As shown in Figure 82 and Table 83 below, there was no clear relationship between different teachers' ratings of their confidence and pupils' average science scores. However, there were the following significant findings. Year 9 pupils who were taught by teachers who:

- agreed a little (554) in physics had a significantly higher average science score compared with pupils taught by teachers who agreed a lot (516)
- agreed a little or disagreed a little (both 555) in chemistry had a significantly higher average science score compared with pupils taught by teachers who agreed a lot (523)
- agreed a little or disagreed a little (562 and 549) in biology had a significantly higher average science score compared with pupils taught by teachers who agreed a lot (519)

Figure 82: The percentage of year 9 pupils taught by teachers with different ratings of their confidence to assess year 9 pupil's progress and attainment in physics, chemistry and biology and their average achievement in science (England)



Source: IEA TIMSS International Report 2023

Note 1: This was a question asked of teachers of pupils in England only.

Table 83: The percentage of year 9 pupils taught by teachers with different ratings of their confidence to assess year 9 pupil's progress and attainment in physics, chemistry and biology and their average achievement in science (England)

Extent of agreement	Percentage physics	Av. score science	Percentage chemistry	Av. score science	Percentage biology	Av. score science
Agree a lot	66	516	75	523	74	519
Agree a little	25	554	20	555	21	562
Disagree a little	6	580	2	555	3	549
Disagree a lot	3	526	3	513	2	552

Source: IEA TIMSS International Report 2023

Note 1: This was a question asked of teachers of pupils in England only.

10.6 How satisfied were teachers in England with their jobs?

Year 5 and 9 teachers responded to the following statements using a 4 point rating scale from ‘Very often’ to ‘Never or almost never’. Statements 6 and 7 were new for 2023.

1. I am content with my profession as a teacher
2. I find my work full of meaning and purpose
3. I am enthusiastic about my job
4. My work inspires me
5. I am proud of the work I do
6. I feel appreciated as a teacher
7. I enjoy the challenges of teaching

Based on teachers’ responses, scores were calculated that assigned pupils into 1 of 3 categories. These related to the extent to which they were taught by teachers who were:

- very satisfied with their jobs
- somewhat satisfied with their jobs
- less than satisfied with their jobs

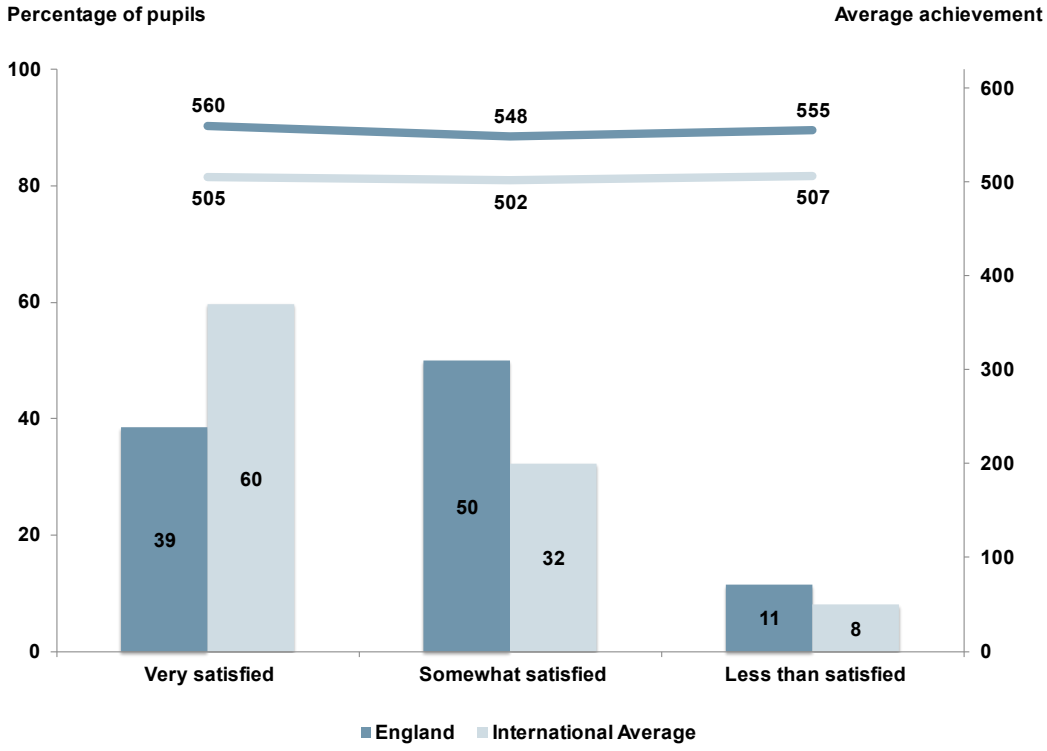
Year 5

This section focuses on mathematics for year 5, making reference to science only where there are notable differences between the 2 subjects. Full findings can be found in the *TIMSS 2023 International Report*.

As shown in Figure 83 and Table 84 below, in 2023, 39% of year 5 pupils in England (41% in 2019) were taught mathematics by teachers who were very satisfied with their jobs, below the international average (60%). The majority of year 5 pupils in England (50%) were taught mathematics by teachers who were somewhat satisfied with their jobs in 2023 (57% in 2019). Eleven per cent of pupils were taught by teachers who were less than satisfied with their jobs in 2023, compared with 1% in 2019. This percentage was above the international average (8%), having been below it in 2019.

In England, there were no significant differences between pupils’ average scores taught by teachers in the different categories.

Figure 83: Percentages of year 5 pupils taught by teachers with different levels of job satisfaction and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 84: Percentages of year 5 pupils taught by teachers with different levels of job satisfaction and their average achievement in mathematics (England and international average)

Extent of job satisfaction	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very satisfied	560	505	39	60
Somewhat satisfied	548	502	50	32
Less than satisfied	555	507	11	8

Source: IEA TIMSS International Report 2023

A smaller percentage of year 5 pupils in England were taught by teachers who were very satisfied with their job compared to their peers in each of the highest-performing countries except Japan (in both mathematics and science). A smaller percentage of pupils in England were taught by teachers who were very satisfied with their job compared to their peers in each of the other English-speaking countries. This was also

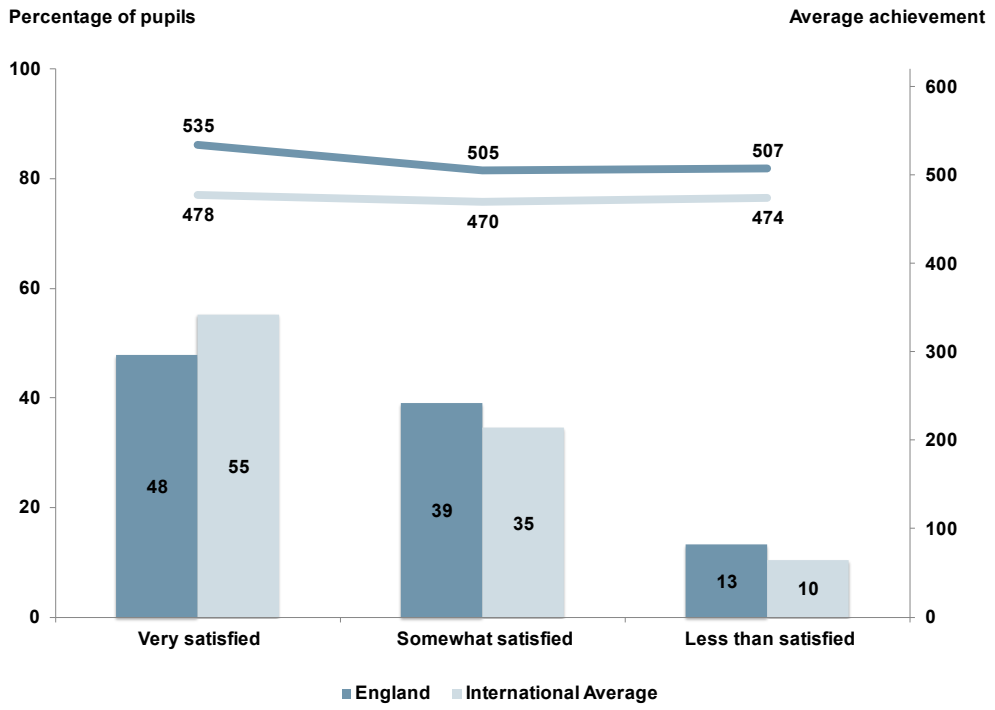
the case in comparison with pupils in Italy and Lithuania from the European comparator countries, with the reverse true for pupils in Finland and France.

Year 9

As shown in Figure 84 and Table 85 below, in 2023, 48% of year 9 pupils in England (37% in 2019) were taught mathematics by teachers who were very satisfied with their job, below the international average (55%). Thirteen per cent were taught by teachers who were less than satisfied with their job, which was above the international average (10%) and above the 6% of England's pupils in 2019.

The average score for England's pupils taught by teachers who were very satisfied with their job (535) was significantly above the score for pupils taught by teachers who were less than satisfied with their job (507). This difference of 28 scale points was greater than the difference across all countries as a whole, which was 4 scale points. The difference in 2019 for the same measure in England was 93 scale points, indicating that the performance gap for pupils taught by teachers who were very satisfied with their job compared with those who were less than satisfied with their job had narrowed in 2023. The difference in pupils' average scores for those taught by teachers who were less than satisfied compared with those who were somewhat satisfied was not significant.

Figure 84: Percentages of year 9 pupils taught by teachers with different levels of job satisfaction and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 85: Percentages of year 9 pupils taught by teachers with different levels of job satisfaction and their average achievement in mathematics (England and international average)

Extent of job satisfaction	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very satisfied	535	478	48	55
Somewhat satisfied	505	470	39	35
Less than satisfied	507	474	13	10

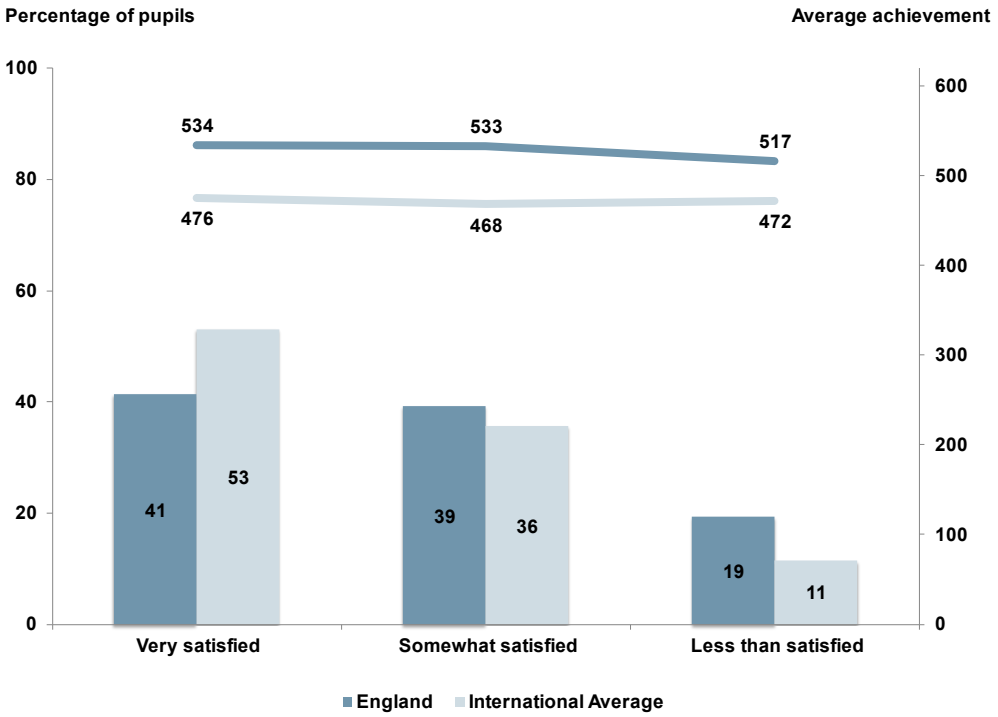
Source: IEA TIMSS International Report 2023

A larger percentage of year 9 pupils in England were taught mathematics by teachers who were very satisfied with their job compared with their peers in the highest-performing countries, except in Hong Kong. A larger percentage of pupils in England were taught by teachers who were very satisfied with their job than pupils in Australia and the United States from the English-speaking countries, with the reverse true compared with Ireland and New Zealand. In comparison with pupils in the European comparator countries, this was also the case for pupils in each country except Italy.

As shown in Figure 85 and Table 86 below, in 2023, 41% of year 9 pupils in England (39% in 2019) were taught science by teachers who were very satisfied with their job, below the international average (53%). Nineteen per cent were taught by teachers who were less than satisfied with their job, above the international average (11%) and above the percentage for England's pupils in 2019 (15%).

In England, there were no significant differences between pupils' average scores taught by teachers in the different categories.

Figure 85: Percentages of year 9 pupils taught by teachers with different levels of job satisfaction and their average achievement in science (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 86: Percentages of year 9 pupils taught by teachers with different levels of job satisfaction and their average achievement in science (England and international average)

Extent of job satisfaction	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very satisfied	534	476	41	53
Somewhat satisfied	533	468	39	36
Less than satisfied	517	472	19	11

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

A larger percentage of year 9 pupils in England were taught science by teachers who were very satisfied with their job compared with pupils in Chinese Taipei, Japan and the Republic of Korea from the highest-performing countries. The reverse was true compared with pupils in Hong Kong and Singapore. A larger percentage of year 9 pupils in England were taught science by teachers who were very satisfied with their job compared with

their peers in each of the other English-speaking countries, except in Ireland. This was also the case compared with pupils in each of the European comparator countries, except Italy.

10.7 To what extent do certain demands affect teachers?

Year 5 and 9 teachers responded to the following statements focused on demands that might affect them using a 4 point rating scale from ‘Agree a lot’ to ‘Disagree a lot’.

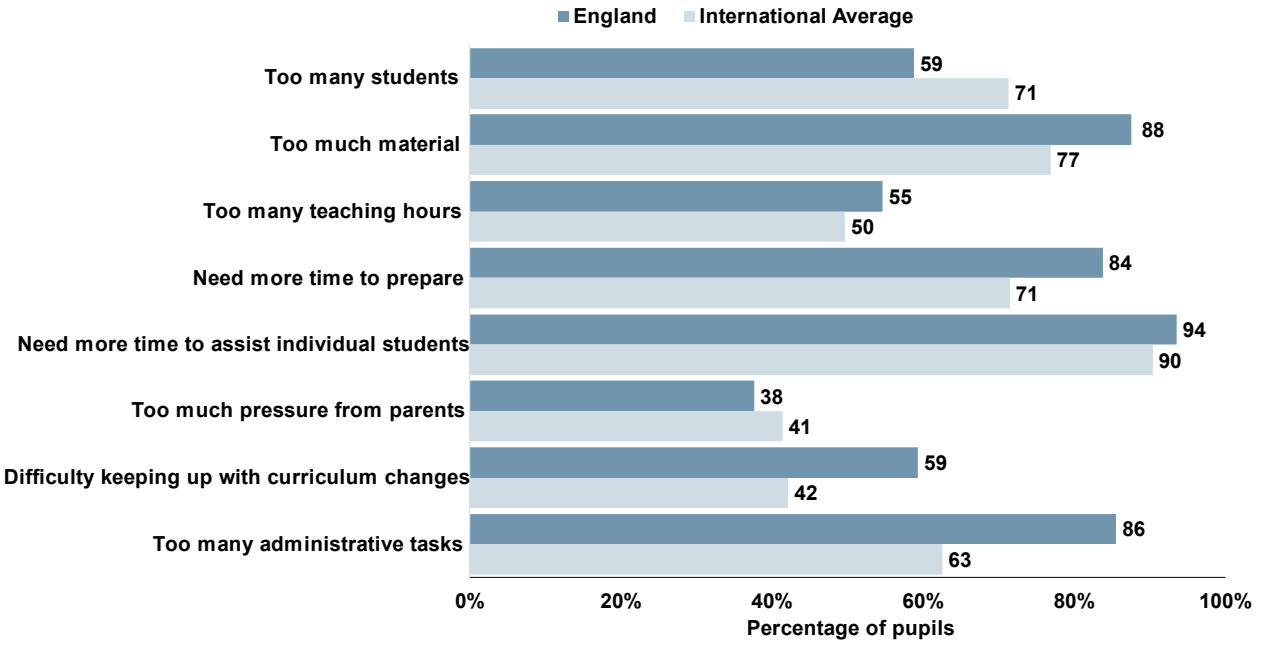
1. There are too many students in the classes
2. I have too much material to cover in class
3. I have too many teaching hours
4. I need more time to prepare for class
5. I need more time to assist individual students
6. I feel too much pressure from parents
7. I have difficulty keeping up with all of the changes to the curriculum
8. I have too many administrative tasks

This section presents the percentages of pupils taught by teachers who considered they agreed either ‘a lot’ or ‘a little’ with the international averages.

Year 5

The largest percentages (more than 80%) of year 5 pupils in England were taught by teachers who reported they were affected either a lot or a little by 4 factors (for both mathematics and science). The largest percentage was for the same factor identified from the international averages: needing more time to assist individual pupils (94% compared with 90%). Of the remaining 3 factors, 2 were also relatively large percentages compared with the international averages (too much material to cover in class: 88%, and needing more time to prepare for class: 84%). However, the size of the percentage of year 5 pupils in England taught by teachers who reported they were affected either a lot or a little by too many administrative tasks (86%) was not mirrored to a similar extent by the international average (63%). Overall, the percentages of pupils in England for most factors which affected their teachers were larger than the comparative international averages, as shown in Figure 86 and Table 87 below.

Figure 86: Percentages of year 5 pupils whose teachers reported they were affected by certain factors either a lot or a little (England and international average)



Source: IEA TIMSS International Report 2023

Table 87: Percentages of year 5 pupils whose teachers reported they were affected by certain factors either a lot or a little (England and international average)

Factor	England	International average
There are too many students in the classes	59	71
I have too much material to cover in class	88	77
I have too many teaching hours	55	50
I need more time to prepare for class	84	71
I need more time to assist individual students	94	90
I feel too much pressure from parents	38	41
I have difficulty keeping up with all of the changes to the curriculum	59	42
I have too many administrative tasks	86	63

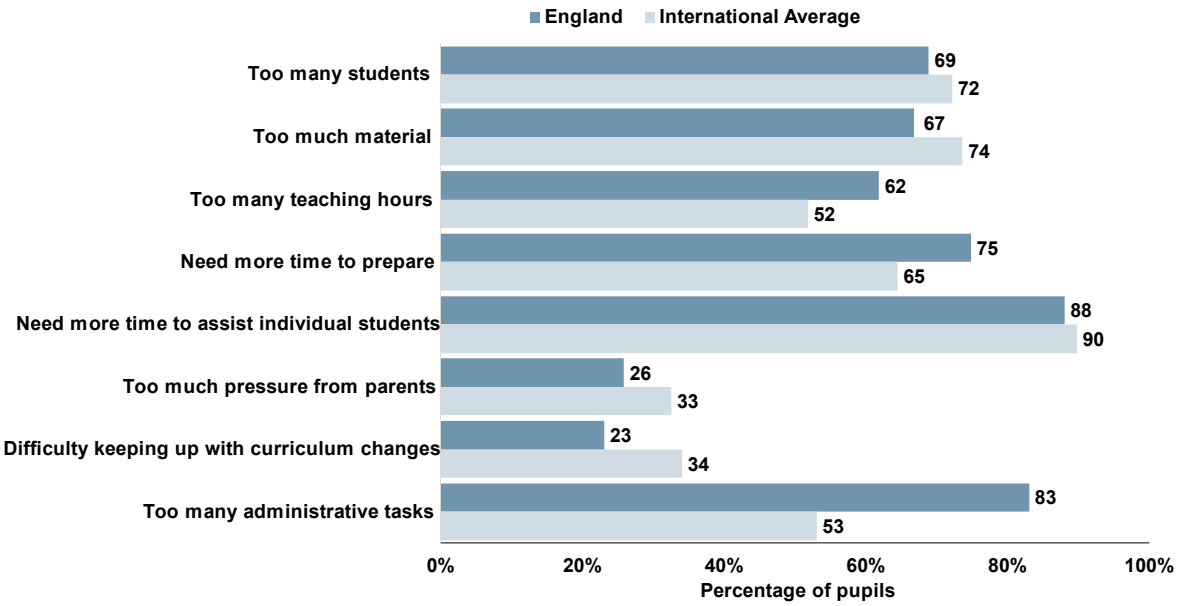
Source: IEA TIMSS International Report 2023

Year 9

The largest percentages (more than 80%) of year 9 pupils in England were taught mathematics by teachers who reported they were affected either a lot or a little by two

factors. The first of these was the same identified from the international averages with similar percentages: needing more time to assist individual pupils (88% compared with 90%). However, the second (too many administrative tasks) was above the international average (83% compared with 53%). Overall, the percentages of pupils in England and the international averages for the remaining factors that affected their teachers mirrored each other in terms of the relative extent of the effects. See Figure 87 and Table 88 below.

Figure 87: Percentages of year 9 pupils whose teachers reported they were affected by certain factors either a lot or a little in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 88: Percentages of year 9 pupils whose teachers reported they were affected by certain factors either a lot or a little in mathematics (England and international average)

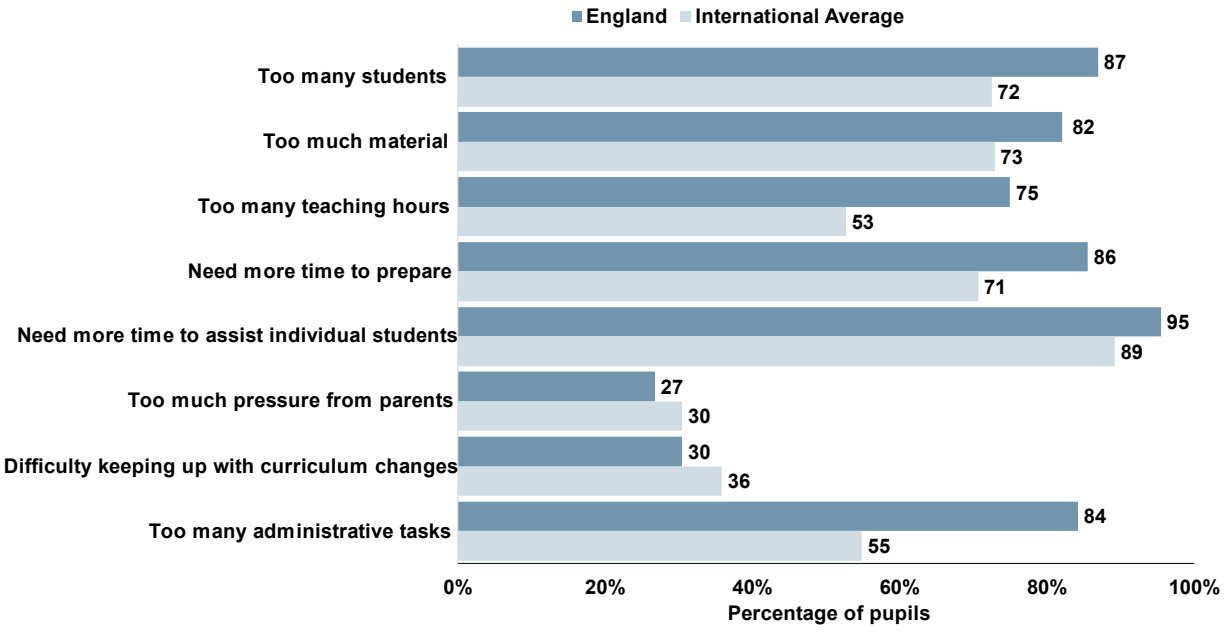
Factor	England	International average
There are too many students in the classes	69	72
I have too much material to cover in class	67	74
I have too many teaching hours	62	52
I need more time to prepare for class	75	65
I need more time to assist individual students	88	90
I feel too much pressure from parents	26	33

Factor	England	International average
I have difficulty keeping up with all of the changes to the curriculum	23	34
I have too many administrative tasks	83	53

Source: IEA TIMSS International Report 2023

In contrast to mathematics, in most cases, larger percentages of year 9 pupils in England (more than 80%) were taught science by teachers who reported they were affected either a lot or a little by 5 factors. The factor which science teachers of pupils in England reported they were most affected either a lot or a little was the same identified in the international averages: needing more time to assist individual pupils (95% compared with 89%). Overall, the percentages of pupils in England and the international averages for the remaining factors that affected their teachers mirrored each other in terms of the relative extent of the effects. However, as in mathematics, a relatively large percentage of pupils in England were taught science by teachers who reported they were affected either a lot or a little by administrative tasks (84% compared with 55%), and to a lesser extent, too many teaching hours (75% compared with 53%). In all but 2 cases, each percentage of pupils in England whose teachers were affected by the listed factors were larger compared with the international averages. These 2 exceptions were: too much pressure from parents and difficulty keeping up with curriculum changes. See Figure 88 and Table 89 below.

Figure 88: Percentages of year 9 pupils whose teachers reported they were affected by certain factors either a lot or a little in science (England and international average)



Source: IEA TIMSS International Report 2023

Table 89: Percentages of year 9 pupils whose teachers reported they were affected by certain factors either a lot or a little in science (England and international average)

Factor	England	International average
There are too many students in the classes	87	72
I have too much material to cover in class	82	73
I have too many teaching hours	75	53
I need more time to prepare for class	86	71
I need more time to assist individual students	95	89
I feel too much pressure from parents	27	30
I have difficulty keeping up with all of the changes to the curriculum	30	36
I have too many administrative tasks	84	55

Source: IEA TIMSS International Report 2023

10.8 To what extent were digital devices used in year 5 and 9 classrooms?

Questions about access to digital devices[40] in lessons were asked of both year 5 and year 9 teachers. Teachers of pupils in both subjects responded yes or no to a question asking whether devices were available for pupils to use in lessons. Those who responded 'yes' were also asked to select 1 option from the following:

- the school has devices that the class can sometimes use
- the class has devices that the pupils can share
- each pupil has a device
- each pupil brings their own device

Year 5

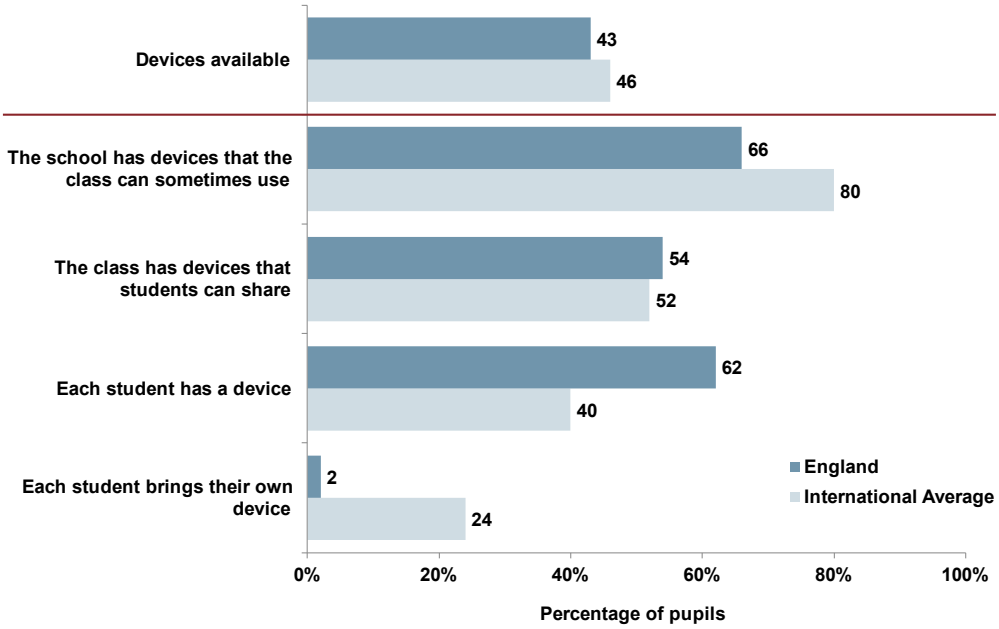
Mathematics

As shown in Figure 89 and Table 90 below, the availability of devices in England was below the international average.

[40] Digital devices (including computers, tablets or smartphones). In 2019, reference was made to computers only.

The percentage of England's year 5 pupils who had access to devices in mathematics lessons that the class could sometimes use (66%) was below the international average (80%). However, the percentages of pupils who could share (54%) or who had individual access (62%) in class were both above international averages (52% and 40% respectively). The percentage of pupils in England who brought their own device was below the international average (2% compared with 24%).

Figure 89: Percentages of year 5 pupils whose teachers reported access to digital devices in mathematics lessons (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 90: Percentages of year 5 pupils whose teachers reported access to digital devices in mathematics lessons (England and international average)

Access to digital devices	Percentage of pupils – England	Percentage of pupils – international
Devices available	43	46
The school has devices that the class can sometimes use	66	80
The class has devices that pupils can share	54	52
Each pupil has a device	62	40
Each pupil brings their own device	2	24

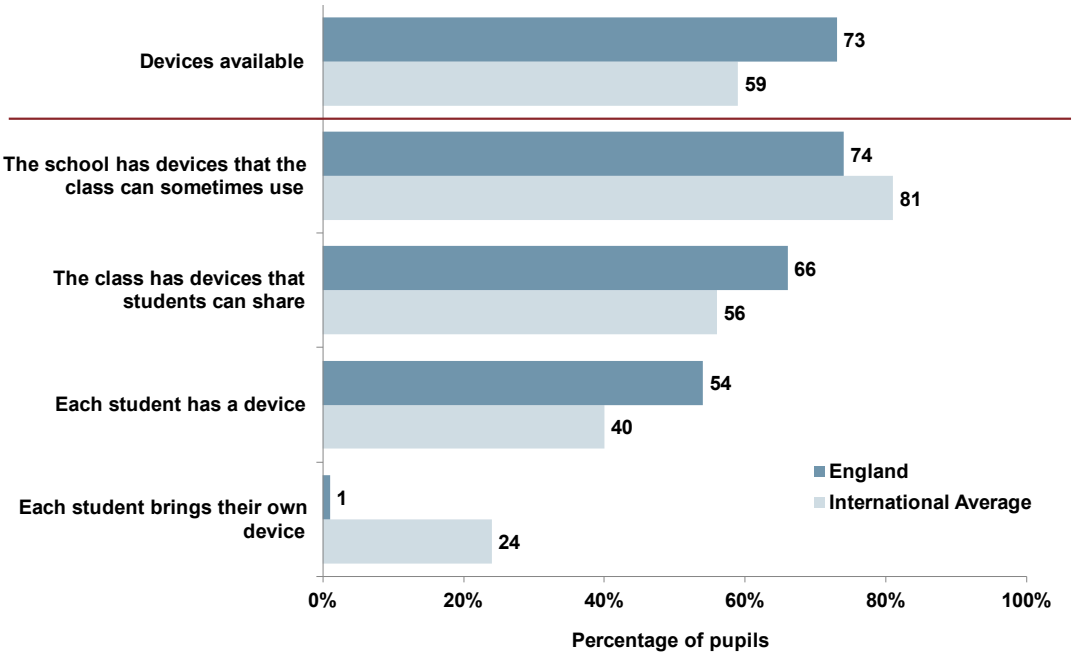
Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Science

As shown in Figure 90 and Table 91 below, the availability of devices in England for year 5 pupils in science was above the international average. The percentage of England's pupils who had access to devices in science lessons that the class could sometimes use (74%) was below the international average (81%). However, the percentages of pupils who could share (66%) or who had individual access (54%) in class were both above international averages (56% and 40%). The percentage of pupils in England who brought their own device was below the international average (1% compared with 24%).

Figure 90: Percentages of year 5 pupils whose teachers reported access to digital devices in science lessons (England and international average)



Source: IEA TIMSS International Report 2023

Table 91: Percentages of year 5 pupils whose teachers reported access to digital devices in science lessons (England and international average)

Access to digital devices	Percentage of pupils – England	Percentage of pupils – international
Devices available	73	59
The school has devices that the class can sometimes use	74	81
The class has devices that pupils can share	66	56
Each pupil has a device	54	40

Access to digital devices	Percentage of pupils – England	Percentage of pupils – international
Each pupil brings their own device	1	24

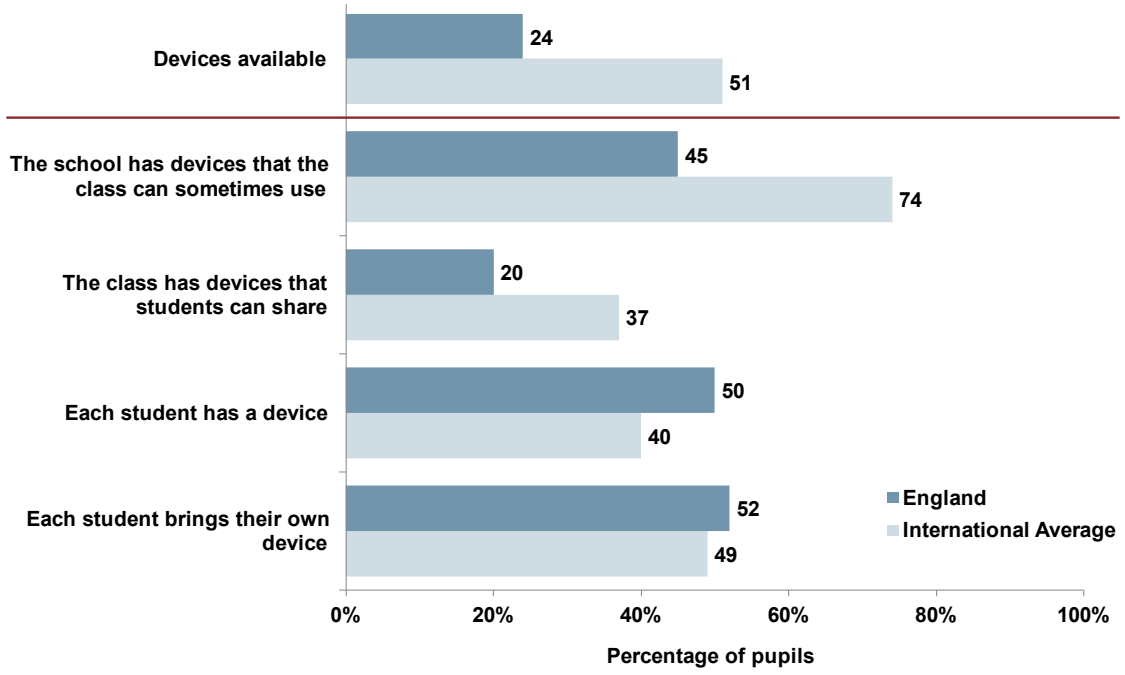
Source: IEA TIMSS International Report 2023

Year 9

Mathematics

As shown in Figure 91 and Table 92 below, the availability of devices for year 9 pupils in mathematics lessons in England was below the international average. The percentages of England's pupils who had access to devices in mathematics lessons that the class could sometimes use (45%) or where pupils could share (20%) were below the international averages (74% and 37%). However, the percentages of pupils who had individual access or brought their own devices (50% and 52%) were above the international averages (40% and 49%).

Figure 91: Percentages of year 9 pupils whose teachers reported access to digital devices in mathematics lessons (England and international average)



Source: IEA TIMSS International Report 2023

Table 92: Percentages of year 9 pupils whose teachers reported access to digital devices in mathematics lessons (England and international average)

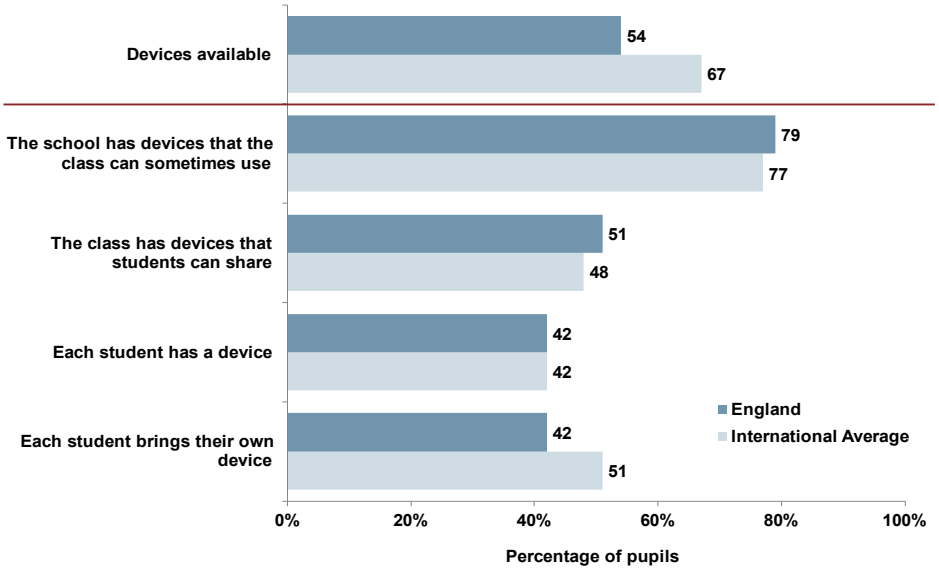
Access to digital devices	Percentage of pupils – England	Percentage of pupils – international
Devices available	24	51
The school has devices that the class can sometimes use	45	74
The class has devices that pupils can share	20	37
Each pupil has a device	50	40
Each pupil brings their own device	52	49

Source: IEA TIMSS International Report 2023

Science

As shown in Figure 92 and Table 93 below, the availability of devices in science lessons for year 9 pupils in England was below the international average. The percentages of England's year 9 pupils who had access to devices in science lessons that the class could sometimes use (79%) or where pupils could share (51%) were above the international averages (77% and 48%). However, the percentage of pupils who brought their own device was below the international average (42% compared with 51%).

Figure 92: Percentages of year 9 pupils whose teachers reported access to digital devices in science lessons (England and international average)



Source: IEA TIMSS International Report 2023

Table 93: Percentages of year 9 pupils whose teachers reported access to digital devices in science lessons (England and international average)

Access to digital devices	Percentage of pupils – England	Percentage of pupils – international
Devices available	54	67
The school has devices that the class can sometimes use	79	77
The class has devices that pupils can share	51	48
Each pupil has a device	42	42
Each pupil brings their own device	42	51

Source: IEA TIMSS International Report 2023

10.9 Year 5 and year 9 pupil use of digital devices to support their learning

Analysis in this section looks at the percentage of year 5 and 9 pupils whose teachers reported pupils' use of digital devices for mathematics activities[41]. Teachers were then able select how frequently[42] their pupils used devices for the following activities:

1. To practise problems and procedures
2. To solve extended or contextualised problems
3. To create graphs, tables, or other data displays
4. To play games involving mathematics/science
5. To read the textbook or watch instructional videos
6. To take a test

In this section analysis is based on the combined percentages for teachers who selected either 'Once or twice a month' or 'At least once a week' to calculate a mean percentage. This is referred to below as 'at least monthly' usage of devices to support learning in both subjects. Focusing on usage that was more frequent in this way better reflected the experience for pupils in England and provided comparisons with the international average.

[41] Digital devices (including computers, tablets or smartphones).
[42] Selecting one of the following for each statement: Never or almost never; A few times a year; Once or twice a month; At least once a week.

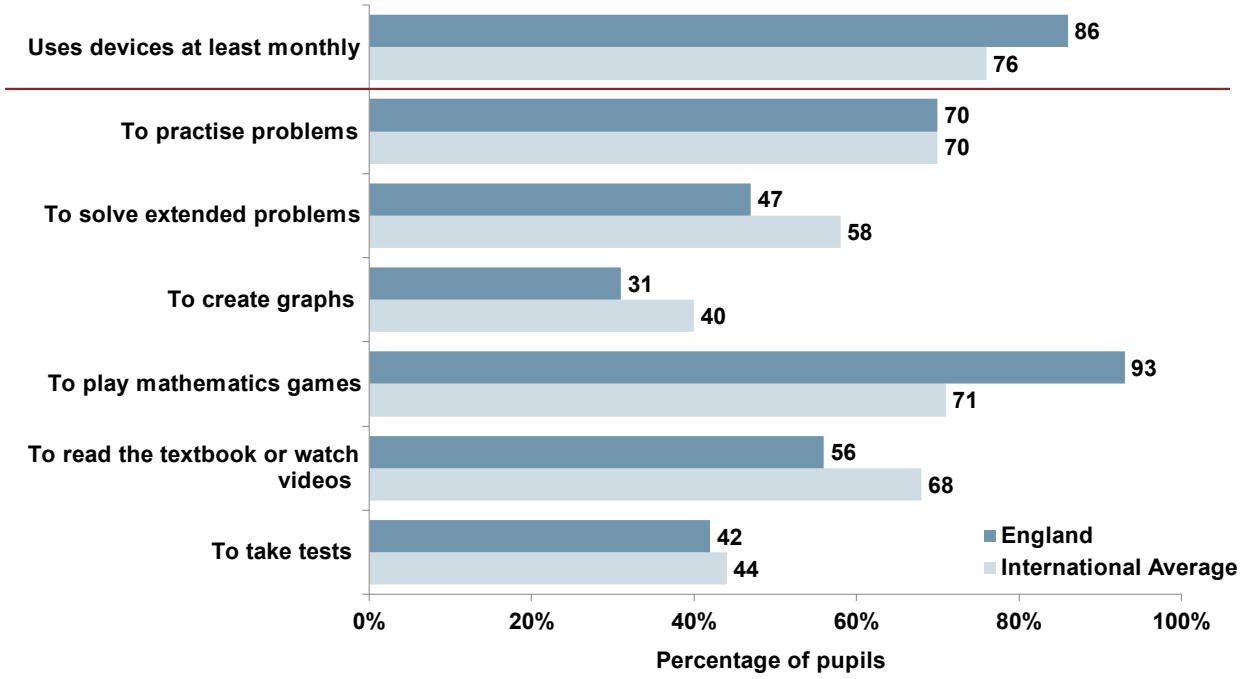
The analysis presents both overall usage of devices for instruction and the extent to which they are used for specific activities for pupils in England compared with the international average.

Year 5

Mathematics

As shown in Figure 93 and Table 94 below, 86% of year 5 pupils in England were taught by teachers who reported that their pupils used digital devices at least monthly to support learning in mathematics in 2023, above the international average (76%). Larger percentages of pupils in England used devices to play mathematics games and practise problems than for other categories of use. The percentage for mathematics games use was above the international average while that for practising problems was the same. Apart from these 2 categories, smaller percentages of pupils in England used devices than the international averages. The extent to which pupils in England used devices for different purposes was mirrored in the international averages, although exact percentages were mostly different.

Figure 93: Percentages of year 5 pupils whose teachers reported that their pupils used digital devices at least monthly to support mathematics learning and for what purposes (England and comparator countries)



Source: IEA TIMSS International Report 2023

Table 94: Percentages of year 5 pupils whose teachers reported that their pupils used digital devices at least monthly to support mathematics learning and for what purposes (England and comparator countries)

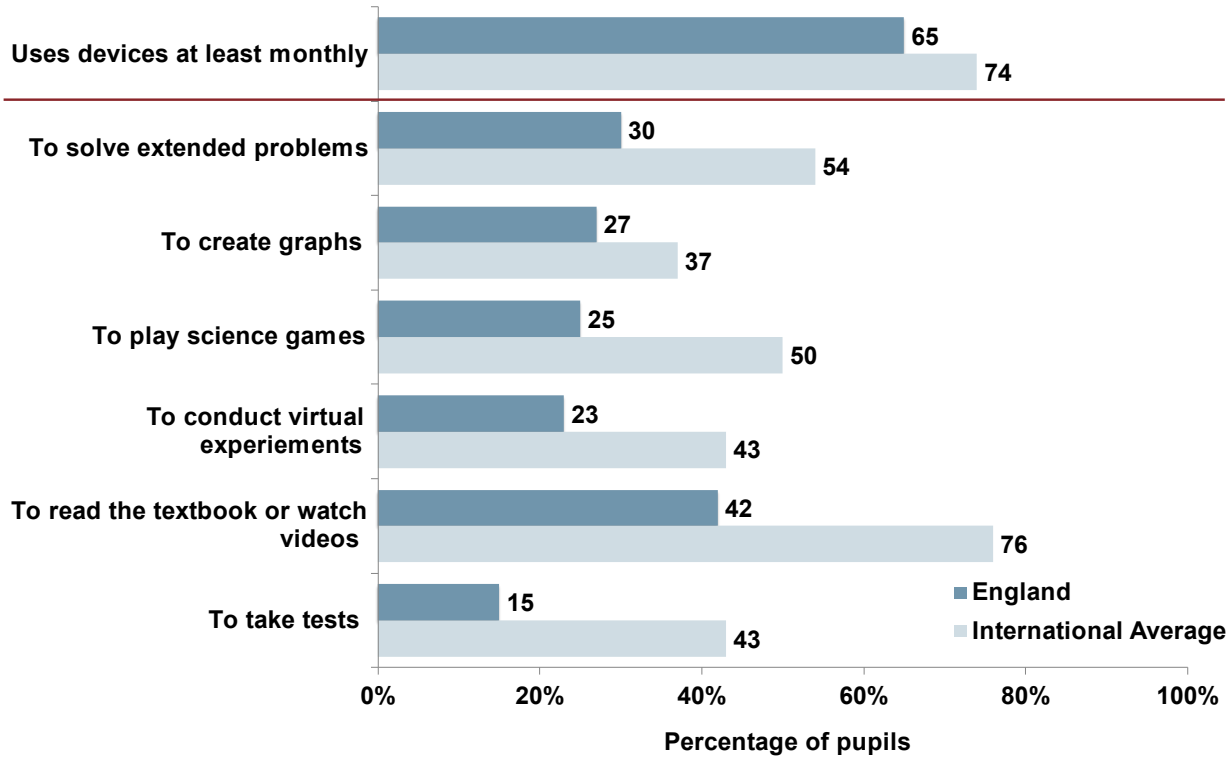
Access to digital devices	Percentage of pupils – England	Percentage of pupils – international
Uses devices at least monthly	86	76
To practise problems	70	70
To solve extended problems	47	58
To create graphs	31	40
To play mathematics games	93	71
To read the textbook or watch videos	56	68
To take tests	42	44

Source: IEA TIMSS International Report 2023

Science

As shown in Figure 94 and Table 95 below, 65% of year 5 pupils in England were taught by teachers who reported that their pupils used digital devices at least monthly to support learning in science in 2023, below the international average (74%). Pupils' frequency of device use in England was less overall in science than for mathematics. A larger percentage of pupils in England used devices to read their textbook or watch videos than for other categories of use. Smaller percentages of pupils in England used devices for each category compared with the international averages, most notably for taking tests. The extent to which pupils in England used devices for different purposes was partially mirrored in the international averages, although exact percentages were different.

Figure 94: Percentages of year 5 pupils whose teachers reported that their pupils used digital devices at least monthly to support science learning and for what purposes (England and comparator countries)



Source: IEA TIMSS International Report 2023

Table 95: Percentages of year 5 pupils whose teachers reported that their pupils used digital devices at least monthly to support science learning and for what purposes (England and comparator countries)

Access to digital devices	Percentage of pupils – England	Percentage of pupils – international
Uses devices at least monthly	65	74
To solve extended problems	30	54
To create graphs	27	37
To play science games	25	50
To conduct virtual experiments	23	43
To read the textbook or watch videos	42	76
To take tests	15	43

Source: IEA TIMSS International Report 2023

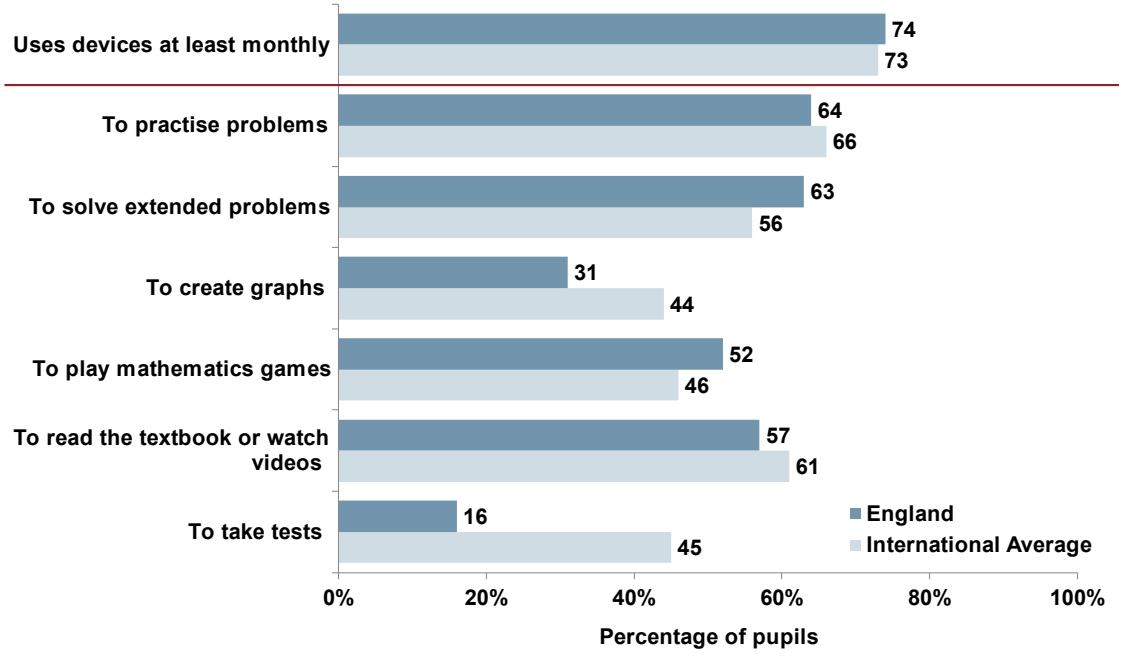
Year 9

Mathematics

As shown in Figure 95 and Table 96 below, 74% of year 9 pupils in England were taught by teachers who reported that their pupils used digital devices at least monthly to support learning in mathematics in 2023, similar to the international average (73%). In 2019, a similar question was asked of year 9 teachers at which time only 20% of their pupils made at least monthly use of devices in mathematics and a similar percentage in science; however, the question posed made specific reference to computers rather than any other devices[43].

In 2023, larger percentages of year 9 pupils in England used devices to either practise problems (64%) or solve extended problems (63%) than for other categories of use. The percentage for the former use was below the international average while that for the latter was above this. The extent to which pupils in England used devices for different purposes was partially mirrored in the international averages, although exact percentages were mostly different, except for taking tests where the percentage in England was notably different.

Figure 95: Percentages of year 9 pupils whose teachers reported that they used digital devices at least monthly to support mathematics learning and for what purposes (England and comparator countries)



Source: IEA TIMSS International Report 2023

[43] The 2019 question asked whether teachers organised activities on computers to support their learning in mathematics at least monthly, either at a whole class level or for specific groups.

Table 96: Percentages of year 9 pupils whose teachers reported that their pupils used digital devices at least monthly to support mathematics learning and for what purposes (England and comparator countries)

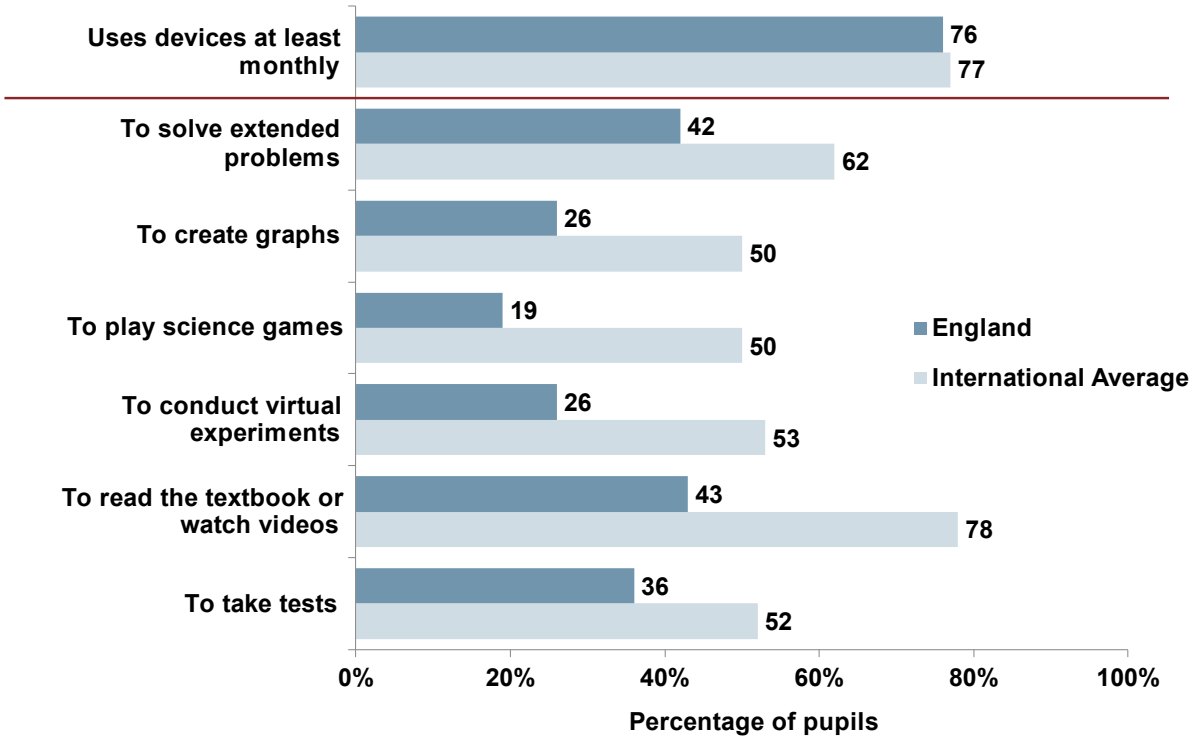
Access to digital devices	Percentage of pupils – England	Percentage of pupils – international
Uses devices at least monthly	74	73
To practise problems	64	66
To solve extended problems	63	56
To create graphs	31	44
To play mathematics games	52	46
To read the textbook or watch videos	57	61
To take tests	16	45

Source: IEA TIMSS International Report 2023

Science

As shown in Figure 96 and Table 97 below, 76% of year 9 pupils in England were taught by teachers who reported that their pupils used digital devices at least monthly to support learning in science in 2023, similar to the international average (77%). Pupils' frequency of device use in England was less overall than for mathematics. Larger percentages of pupils in England used devices to read their textbook or watch videos and solve extended problems than for other categories of use. Smaller percentages of pupils in England used devices for each category compared with the international averages, most notably for playing science games. The extent to which pupils in England used devices for different purposes was partially mirrored in the international averages, although exact percentages were different.

Figure 96: Percentages of year 9 pupils whose teachers reported that their pupils used digital devices at least monthly to support science learning and for what purposes (England and comparator countries)



Source: IEA TIMSS International Report 2023

Table 97: Percentages of year 9 pupils whose teachers reported that their pupils used digital devices at least monthly to support science learning and for what purposes (England and comparator countries)

Access to digital devices	Percentage of pupils – England	Percentage of pupils – international
Uses devices at least monthly	76	77
To solve extended problems	42	62
To create graphs	26	50
To play science games	19	50
To conduct virtual experiments	26	53
To read the textbook or watch videos	43	78
To take tests	36	52

Source: IEA TIMSS International Report 2023

10.10 To what extent do different barriers prevent year 5 and 9 teachers from incorporating digital devices to support learning?

Analysis in this section looks at the percentage of year 5 and 9 pupils whose teachers reported that they faced the following barriers in using digital devices to support pupils' learning[44].

1. Not knowing how to use digital devices to improve student learning
2. Not enough access to digital devices
3. Keeping students on task when the class is using digital devices
4. Lack of technical support from the school

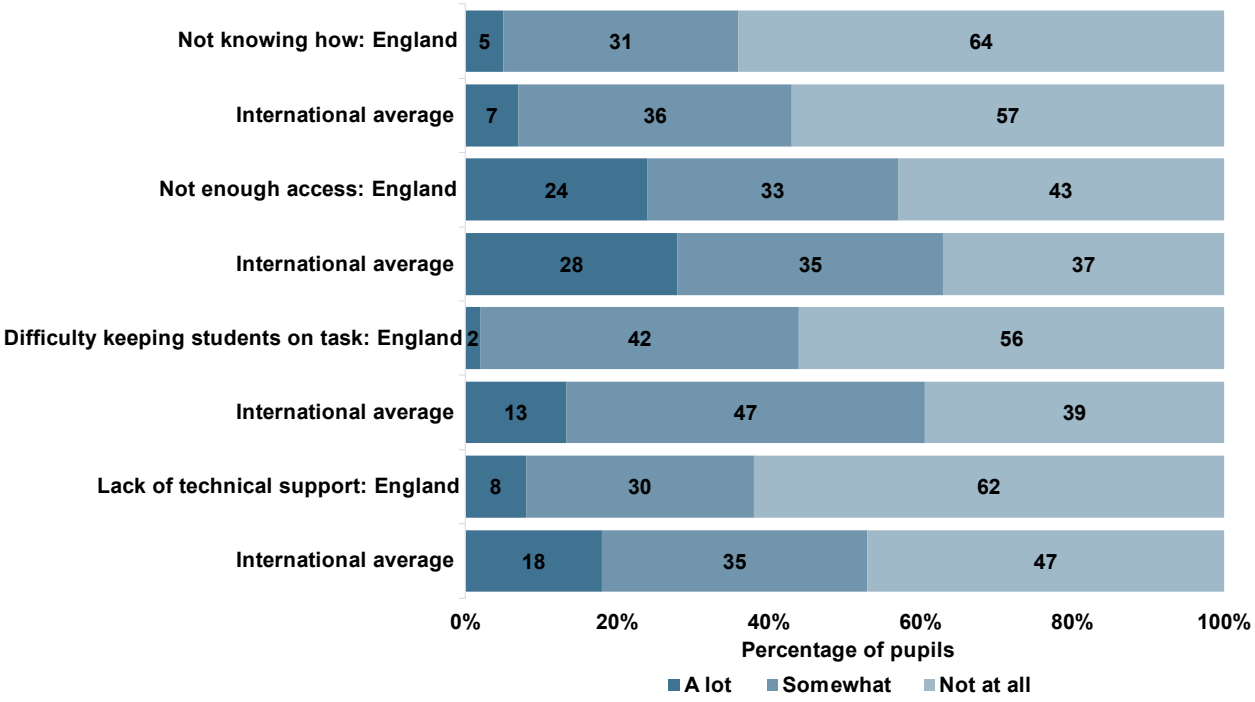
The analysis presents findings for pupils in England compared with the international average. This section focuses on mathematics, making reference to science only where there are notable differences between the 2 subjects. A full account of findings is reported in the *TIMSS 2023 International Report*.

Year 5

For year 5 pupils in England, the main barrier teachers faced that prevented them incorporating devices to support learning in mathematics was not enough access to them (24%). This being the main barrier was mirrored in the international averages. By contrast, the percentages in England for difficulty keeping pupils on track or lack of technical support were below the international averages. See Figure 97 and Table 98 below.

[44] Response options as to the extent of each barrier were: A lot; Somewhat; Not at all.

Figure 97: To what extent do different barriers prevent year 5 teachers from incorporating digital devices to support learning in mathematics?



Source: IEA TIMSS International Report 2023

Table 98: To what extent do different barriers prevent year 5 teachers from incorporating digital devices to support learning in mathematics?

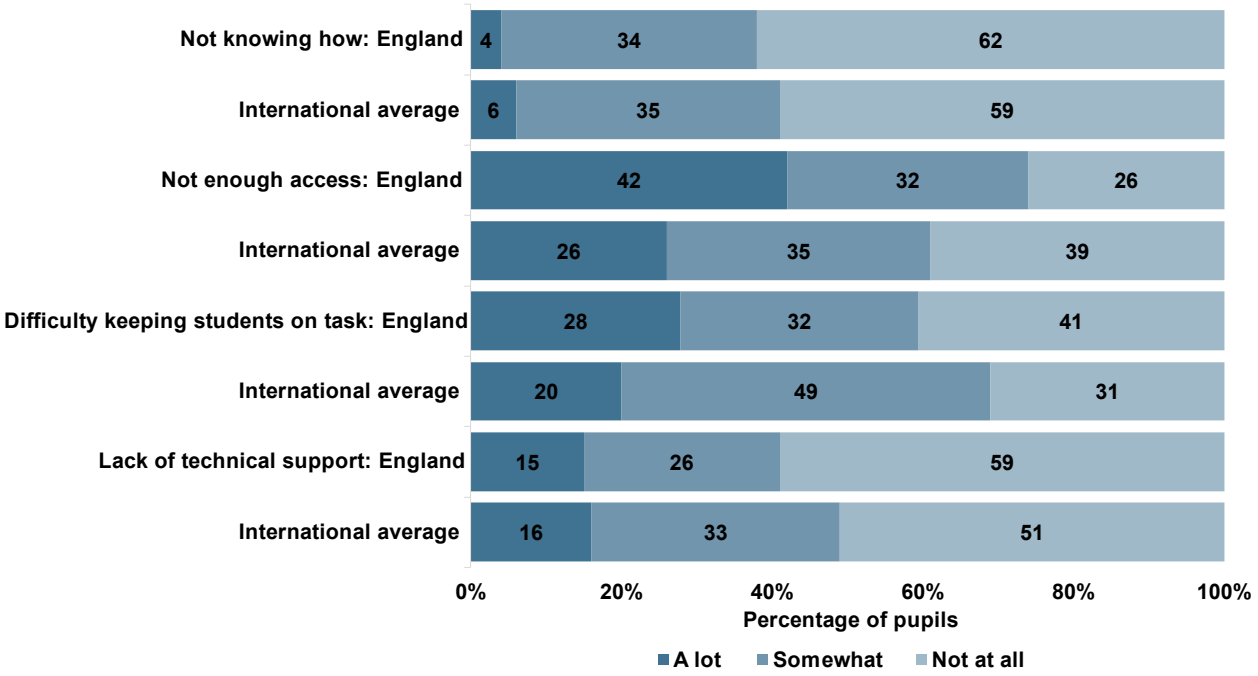
Barriers to incorporating digital devices	A lot	Somewhat	Not at all
Not knowing how to use devices – England	5	31	64
Not knowing how to use devices – international average	7	36	57
Not enough access to devices – England	24	33	43
Not enough access to devices – international average	28	35	37
Keeping students on task – England	2	42	56
Keeping students on task – international average	13	47	39
Lack of technical support – England	8	30	62
Lack of technical support – international average	18	35	47

Source: IEA TIMSS International Report 2023

Year 9

For year 9 pupils in England, the main barrier their teachers faced that prevented them incorporating devices to support learning in mathematics was not enough access to them. This being the main barrier was mirrored in the international averages, although the percentage was larger in England compared with the international average (42% compared with 26%). The percentages for pupils in England in the other categories of barrier followed a similar pattern to the international averages. See Figure 98 and Table 99 below.

Figure 98: To what extent do different barriers prevent year 9 teachers from incorporating digital devices to support learning in mathematics?



Source: IEA TIMSS International Report 2023

Table 99: To what extent do different barriers prevent year 9 teachers from incorporating digital devices to support learning in mathematics?

Barriers to incorporating digital devices	A lot	Somewhat	Not at all
Not knowing how to use devices – England	4	34	62
Not knowing how to use devices – international average	6	35	59
Not enough access to devices – England	42	32	26
Not enough access to devices – international average	26	35	39

Barriers to incorporating digital devices	A lot	Somewhat	Not at all
Keeping students on task – England	28	32	41
Keeping students on task – international average	20	49	31
Lack of technical support – England	15	26	59
Lack of technical support – international average	16	33	51

Source: IEA TIMSS International Report 2023

10.11 How highly did pupils report their digital self-efficacy and to what extent was this associated with their performance?

For the first time, in 2023, pupils responded to the following statements using a 4 point rating scale from ‘Agreed a lot’ to ‘Disagree a lot’. These were consistent across both year groups and subjects.

1. I can write and edit text on a computer, tablet or smartphone
2. I can create school presentations using a computer, tablet or smartphone
3. I can create tables, charts and graphs using a computer, tablet or smartphone
4. I can find information that I need online
5. I can tell if a website is trustworthy
6. I can easily do new things on computers, laptops, or smartphones
7. I can help my friends or family members with using their computers, laptops, or smartphones

Based on pupils’ responses, scores were calculated that assigned them into 1 of 3 categories. These related to the extent to which they had:

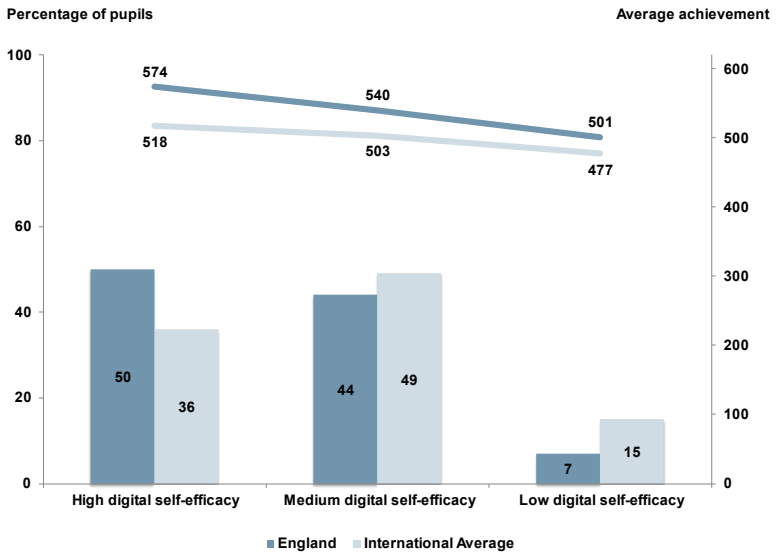
- high digital self-efficacy
- medium digital self-efficacy
- low digital self-efficacy

This section focuses on mathematics with reference to science where there are notable differences between the 2 subjects.

Year 5

As shown in Figure 99 and Table 100 below, half of year 5 pupils in England reported they had high digital self-efficacy in 2023, above the international average (36%). There was a significant positive association between higher levels of digital self-efficacy and pupils' performance. Pupils who reported high levels of digital self-efficacy had a significantly higher average score than their peers who reported medium digital self-efficacy. In turn, pupils who reported medium levels of digital self-efficacy had a significantly higher average score than their peers who reported low digital self-efficacy. These same significant associations were found for science.

Figure 99: The percentage of year 5 pupils who reported the extent of their digital self-efficacy and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 100: The percentage of year 5 pupils who reported the extent of their digital self-efficacy and their average score in mathematics (England and international average)

Extent of digital self-efficacy	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
High digital self-efficacy	574	518	50	36
Medium digital self-efficacy	540	503	44	49
Low digital self-efficacy	501	477	7	15

Source: IEA TIMSS International Report 2023

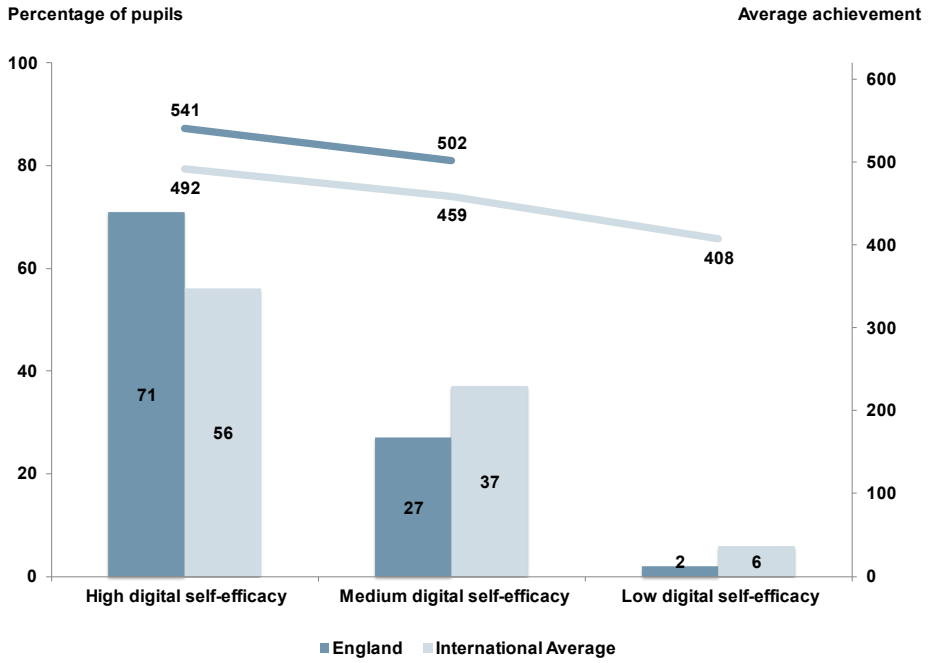
Note 1: Percentages may not sum to 100% due to rounding.

In both mathematics and science, a larger percentage of year 5 pupils in England reported they had high digital self-efficacy compared with their peers in 3 of the highest-performing comparator countries (Japan, the Republic of Korea and Singapore). The reverse was true for pupils in Chinese Taipei and Hong Kong. A larger percentage of year 5 pupils in England reported they had high digital self-efficacy compared with their peers in each of the English-speaking and European comparator countries, except Finland.

Year 9

As shown in Figure 100 and Table 101 below, 71% of year 9 pupils in England reported they had high digital self-efficacy in 2023, above the international average (56%). There was a significant positive association between higher levels of digital self-efficacy and pupils' performance. Pupils who reported high levels of digital self-efficacy had a significantly higher average score than their peers who reported medium digital self-efficacy[45]. The same significant association was found for science.

Figure 100: Percentages of year 9 pupils who reported the extent of their digital self-efficacy and their average score in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

[45] The number of year 9 pupils in England reporting low digital self-efficacy was too small to reliably estimate an average score.

Note 2: The number of pupils in England reporting low digital self-efficacy was too small for the IEA to report an average score.

Table 101: Percentages of year 9 pupils who reported the extent of their digital self-efficacy and their average score in mathematics (England and international average)

Extent of digital self-efficacy	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
High digital self-efficacy	541	492	71	56
Medium digital self-efficacy	502	459	27	37
Low digital self-efficacy	No data	408	2	6

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.
Note 2: The number of pupils in England reporting low digital self-efficacy was too small for the IEA to report an average score.

In both mathematics and science, a larger percentage of year 9 pupils in England reported they had high digital self-efficacy compared with their peers in 3 of the highest-performing comparator countries (Hong Kong, Japan and the Republic of Korea). The reverse was true for pupils in Chinese Taipei and Singapore. A larger percentage of pupils in England reported they had high digital self-efficacy compared with their peers in the United States, but not Australia and Ireland from the English-speaking countries[46]. A larger percentage of pupils in England reported they had high digital self-efficacy compared with their peers in each of the European comparator countries except Finland.

10.12 How frequently were pupils asked by their teacher to conduct science experiments and to what extent was this associated with their performance?

Year 5 and 9 pupils responded to the question ‘How often does your teacher ask you to conduct science experiments?’ using a 4 point rating scale from ‘At least once a week’ to ‘Never’.

Year 5

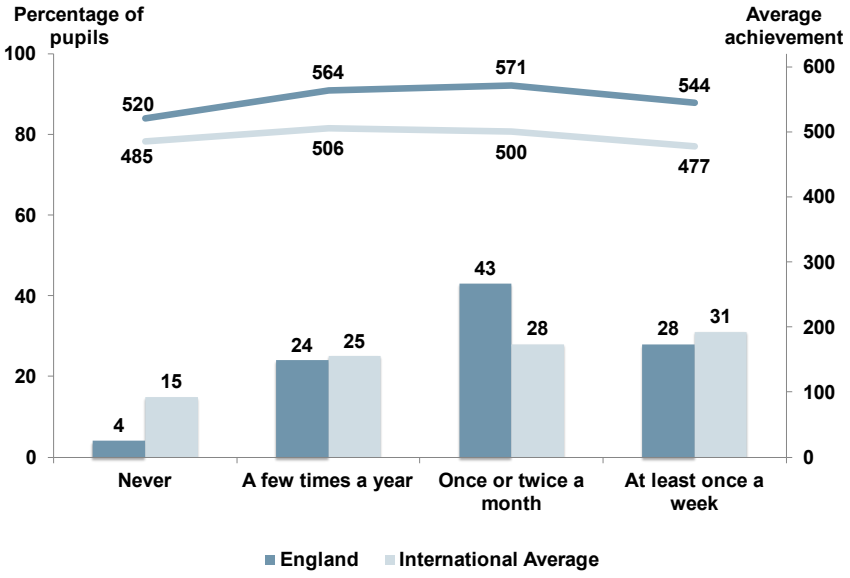
As shown in Figure 101 and Table 102 below, a smaller percentage of year 5 pupils in England were asked to conduct experiments at least once a week (28%) than the

[46] In addition to Canada not participating in the year 9 questionnaires, the IEA exhibits did not include the responses from New Zealand’s pupils to this questionnaire.

international average (31%) in 2023. However, the percentage for the once or twice a month category (43%) was above the international average (28%).

There were no clear patterns of association between greater frequency of requests to conduct experiments and higher pupil performance in England or across all countries. While pupils in England who were asked to conduct experiments at least once a week had a higher average score (544) than pupils who were never asked this (520), they performed significantly below their peers in the other 2 categories (564 and 571). Such higher performance for pupils in the middle 2 categories was also found across all countries as a whole.

Figure 101: Percentages of year 5 pupils who reported the frequency of teacher requests to conduct experiments and their average score in science (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 102: Percentages of year 5 pupils who reported the frequency of teacher requests to conduct experiments and their average score in science (England and international average)

Frequency of requests to conduct experiments	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Never	520	485	4	15
A few times a year	564	506	24	25
Once or twice a month	571	500	43	28

At least once a week	544	477	28	31

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

A smaller percentage of year 5 pupils in England (28%) were asked to conduct experiments at least once a week compared with their peers in each of the highest-performing countries, except Hong Kong (13%). However, a larger percentage of pupils in England were asked to conduct experiments at least once a week compared with their peers in each of the English-speaking countries and European comparator countries.

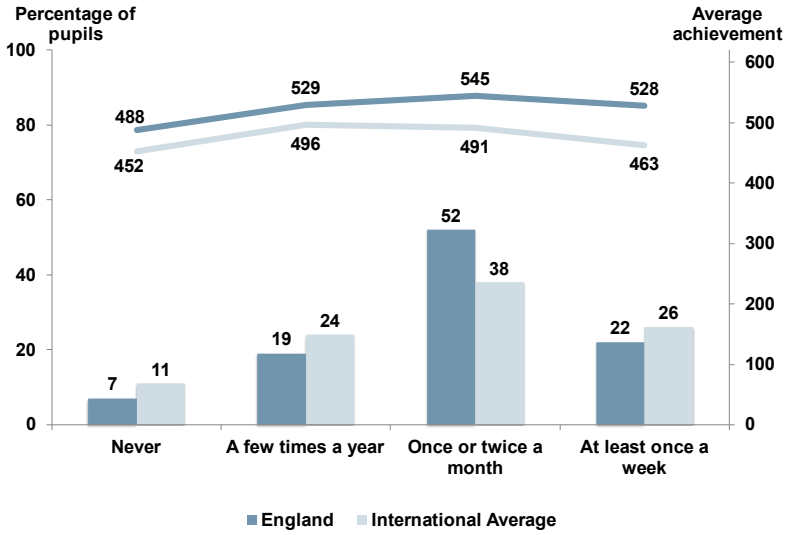
As in England, year 5 pupils in each of the comparator countries (except in Japan and the Republic of Korea) who were asked to conduct experiments at least once a week had a lower average score compared with their peers who were asked this one or twice a month.

Year 9

As shown in Figure 102 and Table 103 below, a smaller percentage of year 9 pupils in England were asked to conduct experiments at least once a week (22%) than the international average (26%) in 2023. However, the percentage for the once or twice a month category (52%) was above the international average (38%).

As in year 5, there were no clear patterns of association between greater frequency of requests to conduct experiments and pupil performance in England or across all countries. While pupils in England who were asked to conduct experiments at least once a week had a significantly higher average score (528) than pupils who were never asked this (488), they performed significantly below their peers who were asked to conduct experiments once or twice a month. As in year 5, such higher performance for pupils in the middle 2 categories was also found across all countries as a whole.

Figure 102: Percentages of year 9 pupils who reported the frequency of teacher requests to conduct experiments and their average score in science (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

Table 103: Percentages of year 9 pupils who reported the frequency of teacher requests to conduct experiments and their average score in science (England and international average)

Frequency of requests to conduct experiments	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Never	488	452	7	11
A few times a year	529	496	19	24
Once or twice a month	545	491	52	38
At least once a week	528	463	22	26

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding.

A larger percentage of year 9 pupils in England (22%) were asked to conduct experiments at least once a week compared with their peers in each of the highest-performing countries, except Hong Kong and Japan (48% and 34%). A smaller percentage of pupils in England were asked to conduct experiments at least once a week compared with their peers in Australia, but not the United States from the English-speaking countries, while the percentage in Ireland was the same (22%)[47]. Only pupils in Italy from the European comparator countries participated in this questionnaire and a smaller percentage of them were asked to conduct experiments at least once a week compared with their peers in England.

[47] In addition to Canada not participating in the year 9 questionnaires, the IEA exhibits did not include the responses from New Zealand's pupils to this questionnaire.

As in England, year 9 pupils in each of the comparator countries (except in Hong Kong and Japan) who were asked to conduct experiments at least once a week had a lower average score compared with their peers who were asked this one or twice a month.

10.13 To what extent do schools in England start GCSE provision for mathematics and science in year 9?

Headteachers reported whether or not pupils in their school started GCSE provision in mathematics and science in year 9.

For mathematics, 41% of year 9 pupils were in taught in schools where they started GCSE provision in year 9. The average score for these pupils was 555. The average score for pupils in schools where they did not start GCSE provision in Year 9 was significantly lower: 510.

For science, 59% of year 9 pupils were in taught in schools where they started GCSE provision in Year 9. The average score for these pupils was 541. The average score for pupils in schools where they did not start GCSE provision in Year 9 was not significantly different: 528.

Chapter 11. Home environment

This chapter summarises findings from pupil questionnaires on aspects of the home environment that support their learning. It also summarises findings from teacher and pupil questionnaires on factors that might limit teachers' ability to teach and pupils' ability to learn.

The response rates for the teachers' questionnaires in England were lower than in the majority of countries in TIMSS 2023. As a result, data on the extent to which year 5 pupils in England were considered not ready for instruction by their teachers was available for more than 70% but fewer than 85% of pupils in England, within the threshold the IEA sets for its international exhibits. In year 9, the percentage was lower: more than 50% but fewer than 70%. The response rates were taken into account in the analysis for this section and findings were included only if they were based on data for more than 50% of pupils. There were no reported caveats relating to the response rate percentages for pupil questionnaires, either for England or the comparator countries. The comparator countries referred to in this chapter are listed in section 1.5 of Volume 1 and, for convenience, in Appendix A of this volume.

Chapter sections focus on:

- the extent to which year 9 pupils had resources at home for learning[48]
- the extent to which year 5 and year 9 pupils:
    - were absent from school
    - were taught in classrooms where teaching was limited by pupils not ready for instruction
    - were ready for the school day

Where there are particularly interesting comparisons to be drawn between pupils in England and their peers in other comparator countries, these are discussed.

The chapter also describes whether or not these factors were associated with higher or lower performance in the TIMSS assessments, although it is important to note that an association (or correlation) between 2 variables (such as level of engagement and average achievement) is not the same as causation (i.e. that one thing causes the other).

[48] Based on the number of books at home; whether they had their own room and an internet connection in the home, just 1 of these, or neither; the highest level of either parent's education.

11.1 Main findings

- For year 9 pupils in England, there was a significant positive association between having more resources at home and higher average mathematics scores in 2023. Pupils with many resources had significantly higher average scores than those with some or few resources, while pupils with some resources had significantly higher average scores than those with few resources. The difference between the average scores for pupils with many and few resources was 116 scale points.
- The same associations were found in year 9 science, however the scale point difference between the average scores for pupils with many resources and few resources was larger (123).
- A significantly larger percentage of year 9 pupils in England (36%) had many resources compared with pupils in France (32%), Hong Kong (26%), Italy (33%) and the United States (31%); a significantly smaller percentage of pupils in England had many resources compared with pupils in Australia (42%), Finland (42%), Japan (43%) and the Republic of Korea (56%).
- A smaller percentage of year 5 pupils (65%) reported that they were never or almost never absent from school in 2023, compared with 2019 (68%). This 2023 percentage (65%) was above the international average (55%) but below their peers in each of the highest-performing countries. A larger percentage of pupils in England reported they were never or almost never absent from school compared with their peers in each of the English-speaking countries, and each of the European countries, except France.
- A smaller percentage of year 9 pupils (48%) reported that they were never or almost never absent from school in 2023, compared with 2019 (59%). This 2023 percentage (48%) was above the international average (46%) but below the averages for pupils in each of the highest-performing countries. The percentage of pupils who reported they were absent once every 2 weeks in 2023 (10%) was larger than in 2019 (5%)[49].
- There was some evidence of a significant positive association between lower absence rates and higher performance in both mathematics and science for year 5 pupils. Pupils who were absent once a week had significantly lower average mathematics scores than their peers in each of the other categories. Similarly, pupils who were absent once every two weeks had significantly lower average

[49] The categories were: never or almost never; once every 2 months; once a month; once every 2 weeks.

mathematics scores than their peers in the other categories where absence was less frequent.

- The difference between the average mathematics score between year 5 pupils in England who were never or almost never absent and those who were absent once a week was 108 scale points, larger than in 2019 (93).
- In science, this difference for year 5 pupils was 101 scale points in 2023, above that recorded in 2019 (83).
- There was some evidence of a significant positive association between lower absence rates and higher performance in both mathematics and science for year 9 pupils. Pupils who were absent once a week had significantly lower average scores than peers in the other categories. Similarly, pupils who were absent once every two weeks had significantly lower average scores than peers in the other categories where absence was less frequent.
- The difference between the average mathematics score between year 9 pupils who were never or almost never absent and those who were absent once a week was 80 scale points, similar to that recorded in 2019.
- In science, the difference in the average mathematics score of pupils who were never or almost never absent and those who were absent once a week was 84 scale points, smaller than in 2019 (92).
- Teachers reported that 18% of year 5 pupils were taught mathematics in classrooms where teaching was limited to a very little extent by pupils not ready for instruction, below the international average. However, a smaller percentage of pupils were reported to be taught in classrooms where teaching was limited a lot compared with the international average.
- Year 5 pupils taught mathematics in classrooms where teaching was limited to a very little extent had significantly higher average scores than their peers taught in classrooms where teaching was limited to some extent. Similar average scores and the same association was found in year 5 science.
- Teachers reported that 22% of year 9 pupils were taught mathematics in classrooms where teaching was limited to a very little extent by pupils not ready for instruction. This was above the international average. The percentage for science was 15%, below the international average.
- In both mathematics and science, year 9 pupils taught in classrooms where teaching was limited to a very little extent had significantly higher average scores in mathematics than peers taught in classrooms where teaching was limited to some extent. In turn, pupils taught in classrooms where teaching was limited to some extent had significantly higher average scores than peers taught in classrooms where teaching was limited a lot.

- In year 5 mathematics, 55% of pupils in England felt tired when they arrived at school almost every day or every day. The average score for pupils who felt tired every day when they arrived at school was significantly below the average scores for their peers in each of the other categories. The same association was found for year 5 science[50].
- In year 5 mathematics, 42% of pupils felt hungry when they arrived at school almost every day or every day. The average score for pupils who felt hungry every day was significantly below the average scores for their peers in each of the other categories. The average score for pupils in England who felt hungry almost every day was also significantly below the average scores for their peers who never or sometimes felt hungry. The same association was found for year 5 science.
- In year 9 mathematics, 3% of pupils reported that they never felt tired when they arrived at school; 68% of pupils felt tired almost every day or every day. The average score for pupils in England who felt tired every day was significantly below the average scores for their peers who felt tired sometimes or almost every day, but not those who reported never being tired.
- The same associations were found for year 9 science with one exception. The average scores for pupils who sometimes felt tired as well as those who felt tired almost every day were significantly above the average score for their peers who never felt tired.
- In year 9 mathematics 25% of pupils reported that they never felt hungry when they arrived at school; 30% felt hungry almost every day or every day. Pupils who felt hungry every day had a significantly lower average score than their peers in each of the other categories. Pupils who felt hungry almost every day had a significantly lower average score than their peers who sometimes or never felt this, while pupils who sometimes felt hungry had a significantly lower average score than their peers who never felt this.
- In science, the same associations were evident with one exception. While pupils who felt hungry almost every day had a significantly lower average score than their peers who never felt this, their average score was not significantly different from that of their peers who sometimes felt this.

[50] The categories were: I feel tired/hungry: every day; almost every day; sometimes; never

11.2 To what extent did year 9 pupils have resources at home for learning and how did this relate to performance?

In England, only year 9 pupils were asked about the resources they had at home for learning. Pupils reported on the availability of 3 home based resources using a series of statements centred on:

- the number of books at home
- whether they had their own room and an internet connection in the home, just 1 of these, or neither
- the highest level of either parent's education

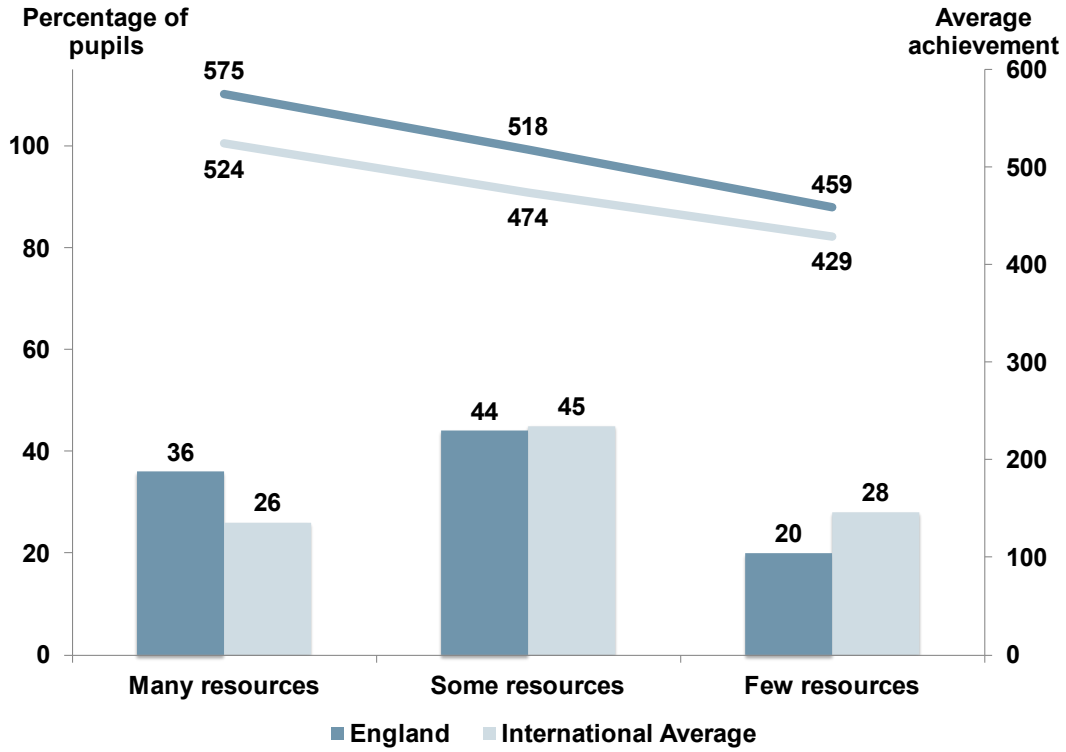
Based on their responses, pupils were assigned to 1 of 3 categories:

- pupils with many resources
- pupils with some resources
- pupils with few resources

For year 9 pupils in England, in 2023, as in 2019, there was a significant positive association between having more resources at home and higher average mathematics scores. Pupils with many resources had significantly higher average scores than those with some or few resources, while pupils with some resources had significantly higher average scores than those with few resources. The difference between the average scores in England for pupils with many (575) and few resources (459) was 116 scale points, above the international average of 95. See Figure 103 and Table 104 below.

The same associations were found in science, however the scale point difference between the average scores for pupils with many resources and few resources were larger, both for pupils in England (123) and the international average (100).

Figure 103: Percentages of year 9 pupils with different home resources for learning and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 104: Percentages of year 9 pupils with different home resources for learning and their average achievement in mathematics (England and international average)

Level of resources	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Pupils with many resources	575	524	36	26
Pupils with some resources	518	474	44	45
Pupils with few resources.	459	429	20	28

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

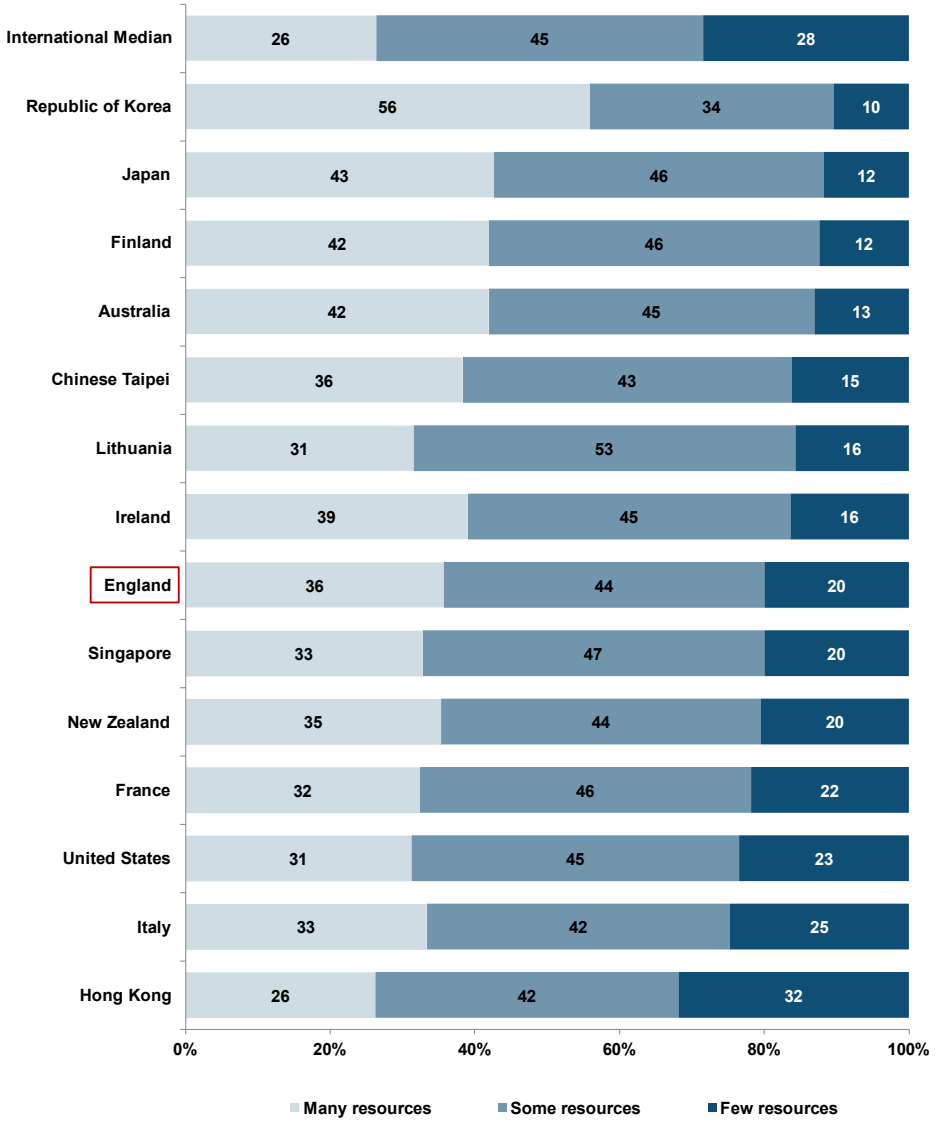
As shown in Figure 104 and Table 105 below, a larger percentage of pupils in England had many resources for home learning compared to the international average and pupils in 2 of the highest-performing countries: Singapore and Hong Kong. A larger percentage of pupils in England also had many resources for home learning compared to their peers in 2 of the English-speaking countries: New Zealand and the United States, with the reverse the case compared with pupils in Australia and Ireland. Similarly, a larger percentage of pupils in England had many resources for home learning compared to their

peers in 3 of the European countries: France, Italy and Lithuania with the reverse the case compared with pupils in Finland.

However, the only significant differences with respect to comparator countries were that:

- a significantly larger percentage of pupils in England had many resources compared with pupils in France, Hong Kong, Italy and the United States
- a significantly smaller percentage of pupils in England had many resources compared with pupils in Australia, Finland, Japan and the Republic of Korea

Figure 104: Percentages of year 9 pupils with different home resources for learning (England and comparator countries)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 105: Percentages of year 9 pupils with different home resources for learning (England and comparator countries)

Country	Many resources	Some resources	Few resources
International median	26	45	28
Republic of Korea	56	34	10
Japan	43	46	12
Finland	42	46	12
Australia	42	45	13
Chinese Taipei	36	43	15
Lithuania	31	53	16
Ireland	39	45	16
England	36	44	20
Singapore	33	47	20
New Zealand	35	44	20
France	32	46	22
United States	31	45	23
Italy	33	42	25
Hong Kong	26	42	32

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

11.3 How often were pupils absent from school?

Year 5 and 9 pupils reported the extent to which they were absent from school in both subjects by selecting 1 of the following statements:

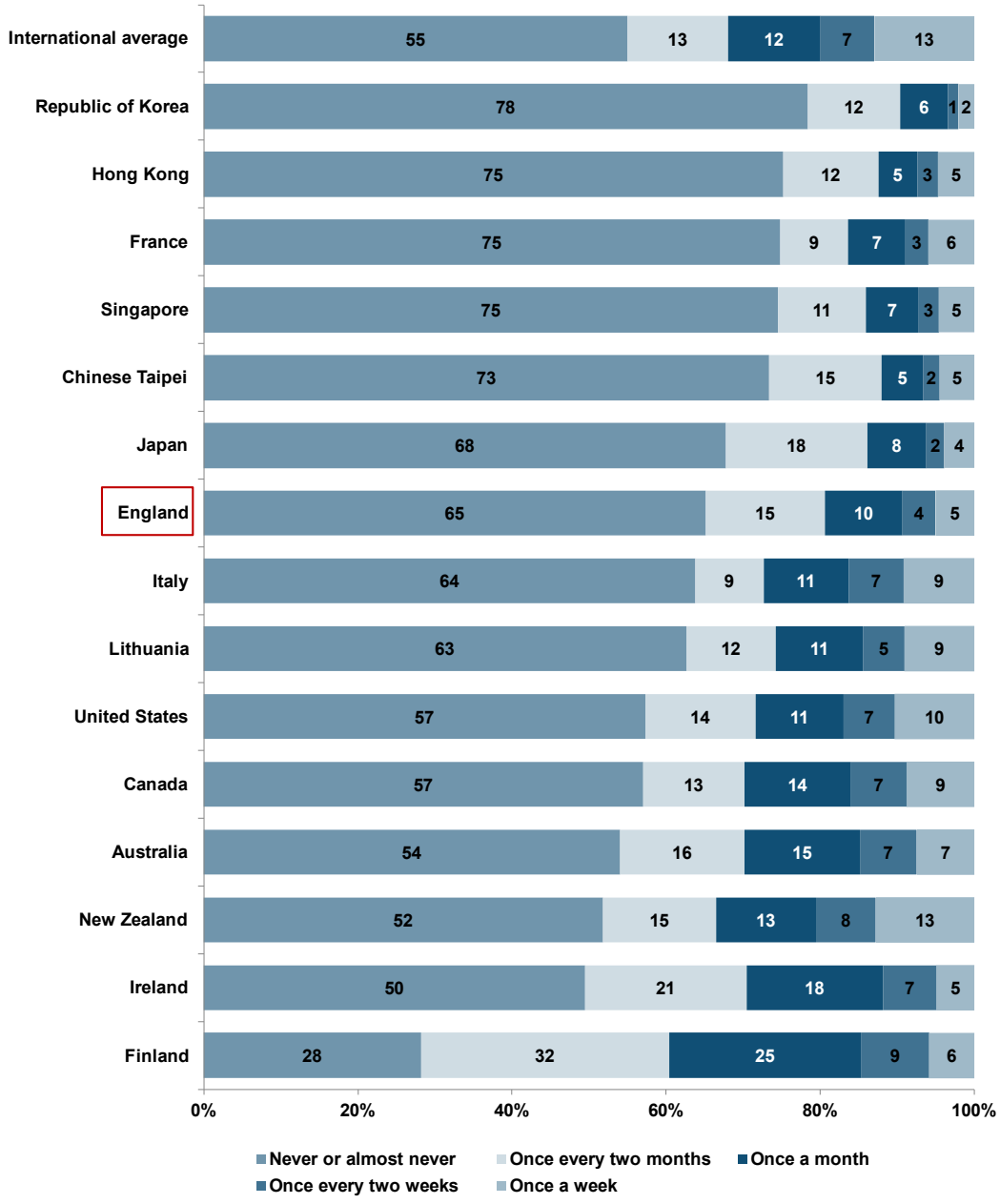
- never or almost never
- once every 2 months
- once a month
- once every 2 weeks
- once a week

As shown in Figure 105 and Table 106 below, a large percentage of year 5 pupils in England (65%) reported that they were never or almost never absent from school in 2023. This was above the international average (55%) but below their peers in each of

the highest-performing countries. Although the percentage of pupils in England who reported that they were never or almost never absent from school in 2023 (65%) was below that recorded in 2019 (68%), this difference of 3 percentage points was smaller than the 6 point difference between the corresponding international percentages (61% in 2019 and 55% in 2023). A larger percentage of pupils in England reported they were never or almost never absent from school compared with their peers in each of the English-speaking countries, and each of the European countries, except France.

Year 5

Figure 105: Percentages of year 5 pupils reporting levels of school absence (England and comparator countries)



Source: IEA TIMSS International Report 2023

Table 106: Percentages of year 5 pupils reporting levels of school absence (England and comparator countries)

Country	Never or almost never	Once every 2 months	Once a month	Once every 2 weeks	Once a week
International average	55	13	12	7	13
Republic of Korea	78	12	6	1	2
Hong Kong	75	12	5	3	5
France	75	9	7	3	6
Singapore	75	11	7	3	5
Chinese Taipei	73	15	5	2	5
Japan	68	18	8	2	4
England	65	15	10	4	5
Italy	64	9	11	7	9
Lithuania	63	12	11	5	9
United States	57	14	11	7	10
Canada	57	13	14	7	9
Australia	54	16	15	7	7
New Zealand	52	15	13	8	13
Ireland	50	21	18	7	5
Finland	28	32	25	9	6

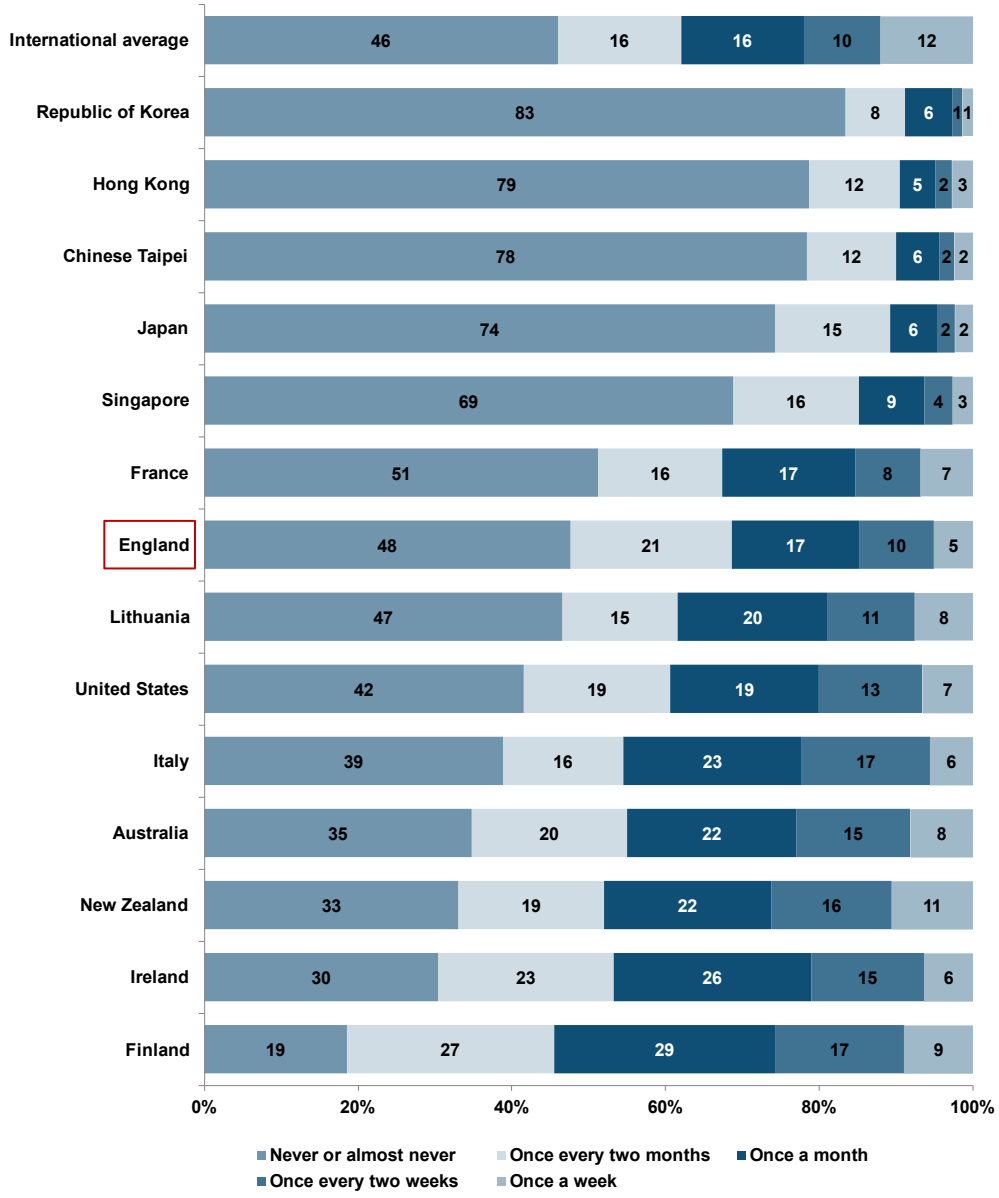
Source: IEA TIMSS International Report 2023

Year 9

As shown in Figure 106 and Table 107 below, the percentage of year 9 pupils in England who reported that they were never or almost never absent from school in 2023 was 48%. This was just above the international average (46%) but below the averages for pupils in each of the highest-performing countries. The percentage of pupils in England who reported that they were never or almost never absent from school in 2023 (48%) was smaller than in 2019 (59%). This difference of 11 percentage points was larger than the corresponding 9 point difference between the international percentages (55% in 2019 and 46% in 2023). The percentage of pupils in England who reported they were absent once every 2 weeks in 2023 (10%) was larger than in 2019 (5%).

However, a larger percentage of pupils in England reported they were never or almost never absent from school compared to pupils in each of the 3 other English-speaking countries and each of the European comparator countries, except France.

Figure 106: Percentages of year 9 pupils reporting levels of school absence (England and comparator countries)



Source: IEA TIMSS International Report 2023

Table 107: Percentages of year 9 pupils reporting levels of school absence (England and comparator countries)

Country	Never or almost never	Once every 2 months	Once a month	Once every 2 weeks	Once a week
International average	46	16	16	10	12
Republic of Korea	83	8	6	1	1
Hong Kong	79	12	5	2	3
Chinese Taipei	78	12	6	2	2
Japan	74	15	6	2	2
Singapore	69	16	9	4	3
France	51	16	17	8	7
England	48	21	17	10	5
Lithuania	47	15	20	11	8
United States	42	19	19	13	7
Italy	39	16	23	17	6
Australia	35	20	22	15	8
New Zealand	33	19	22	16	11
Ireland	30	23	26	15	6
Finland	19	27	29	17	9

Source: IEA TIMSS International Report 2023

11.3.1 Was there an association between absence and achievement?

Year 5

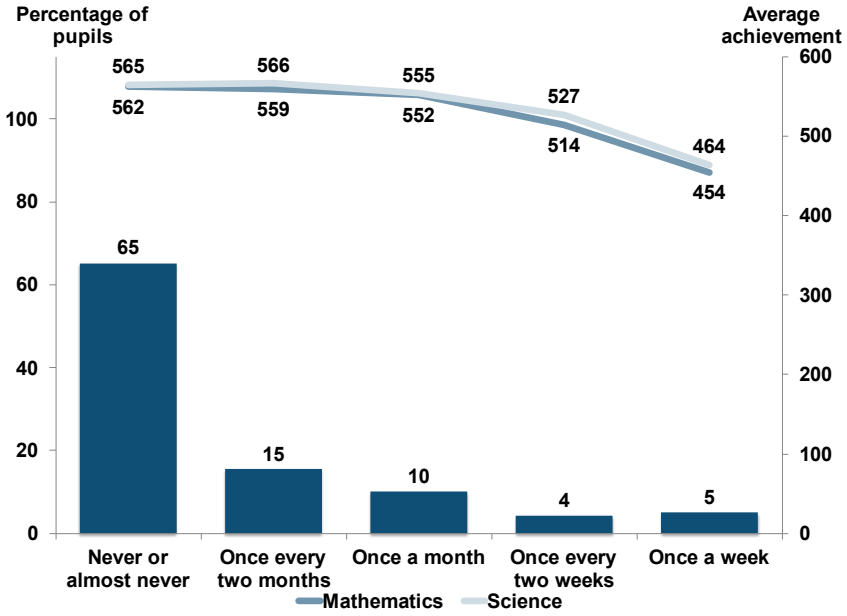
In 2023, there was some evidence of a significant positive association between lower absence rates and higher performance in both mathematics and science for year 5 pupils in England (see Figure 107 and Table 108 below). Pupils who were absent once a week had significantly lower average mathematics scores than their peers in each of the other categories. Similarly, pupils who were absent once every two weeks had significantly lower average mathematics scores than their peers in the other categories where absence was less frequent. None of the other average score differences were significant.

In England, the difference between the average mathematics score between pupils who were never or almost never absent and those who were absent once a week was 108

scale points (562 compared with 454). This difference was larger than in 2019 (93 scale points: 565 compared with 472). In both 2019 and 2023, these differences for England's pupils were larger than those between the international averages (64 and 65 points respectively).

In science, this difference for England's year 5 pupils was 101 scale points in 2023, above that recorded in 2019 (83 points: 544 compared to 461). In both 2023 and 2019, these differences (101 and 83) were larger than those between the international averages (66 points in both cycles).

Figure 107: The percentage of year 5 pupils reporting school absence and their average achievement in mathematics and science (England)



Source: IEA TIMSS International Report 2023

Table 108: The percentage of year 5 pupils reporting school absence and their average achievement in mathematics and science (England)

Frequency of absence	Average mathematics score	Average science score
Never or almost never	562	565
Once every 2 months	559	566
Once a month	552	555
Once every 2 weeks	514	527
Once a week	454	464

Source: IEA TIMSS International Report 2023

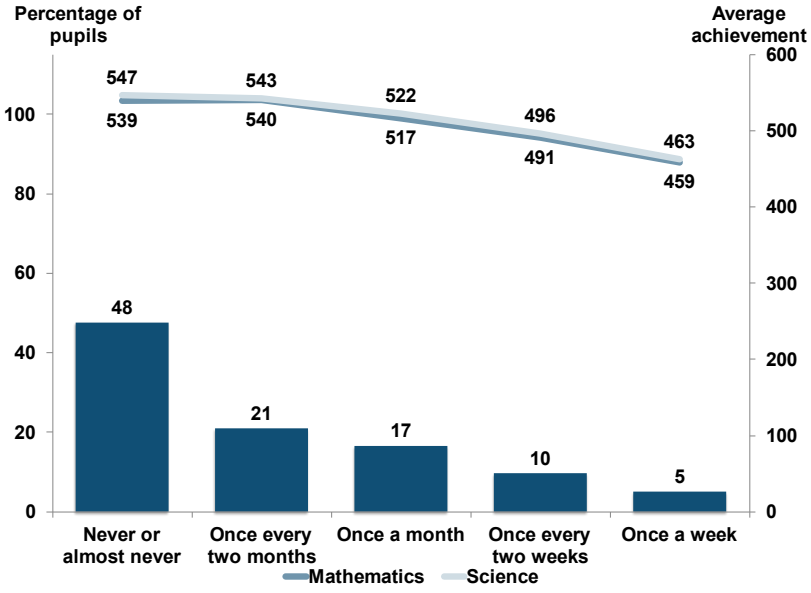
Year 9

In 2023, there was some evidence of a significant positive association between lower absence rates and higher performance in both mathematics and science for year 9 pupils in England (see Figure 108 and Table 109 below). Pupils who were absent once a week had significantly lower average mathematics scores than their peers in each of the other categories. Similarly, pupils who were absent once every two weeks had significantly lower average mathematics scores than their peers in the other categories where absence was less frequent. In contrast to year 5, pupils in year 9 who were absent once a month also had significantly lower average mathematics scores than their peers in the other categories where absence was less frequent. None of the other average score differences were significant.

In England, the difference between the average mathematics score between pupils who were never or almost never absent and those who were absent once a week was 80 scale points (539 compared with 459). This difference was similar to that recorded in 2019 (82 scale points: 529 compared with 447). In 2023, the difference for England's pupils was similar to those between the international averages (80 and 82 respectively); in 2019 this difference had been larger (82 and 90 respectively).

In science, the difference between the average mathematics score between pupils who were never or almost never absent and those who were absent once a week was 84 scale points (547 compared with 463) in 2023, smaller than that recorded in 2019 (92 points: 531 compared to 439). In both 2023 and 2019, these differences (84 and 92) were similar to those between international averages (82 and 91).

Figure 108: The percentage of year 9 pupils reporting school absence and their average achievement in mathematics and science (England)



Source: IEA TIMSS International Report 2023

Table 109: The percentage of year 9 pupils reporting school absence and their average achievement in mathematics and science (England)

Frequency of absence	Average mathematics score	Average science score
Never or almost never	539	547
Once every 2 months	540	543
Once a month	517	522
Once every 2 weeks	491	496
Once a week	459	463

Source: IEA TIMSS International Report 2023

11.4 To what extent is classroom teaching limited by pupils not ready for instruction?

Teachers were asked ‘to what extent do the following limit how you teach this class?’

1. Students lacking prerequisite knowledge or skills
2. Students suffering from lack of basic nutrition
3. Students suffering from not enough sleep
4. Students absent from class
5. Disruptive students
6. Uninterested students
7. Distracted students
8. Students with mental, emotional or psychological impairment
9. Students with difficulties understanding the language of instruction

Based on teachers’ responses, pupils they taught were assigned to 1 of 3 IEA-defined categories:

- very little
- some
- a lot

This section focuses on mathematics, making reference to science only where there are notable differences between the 2 subjects. The responses to these questions were not included in the IEA exhibits in 2019 nor included in the national report for England in 2019.

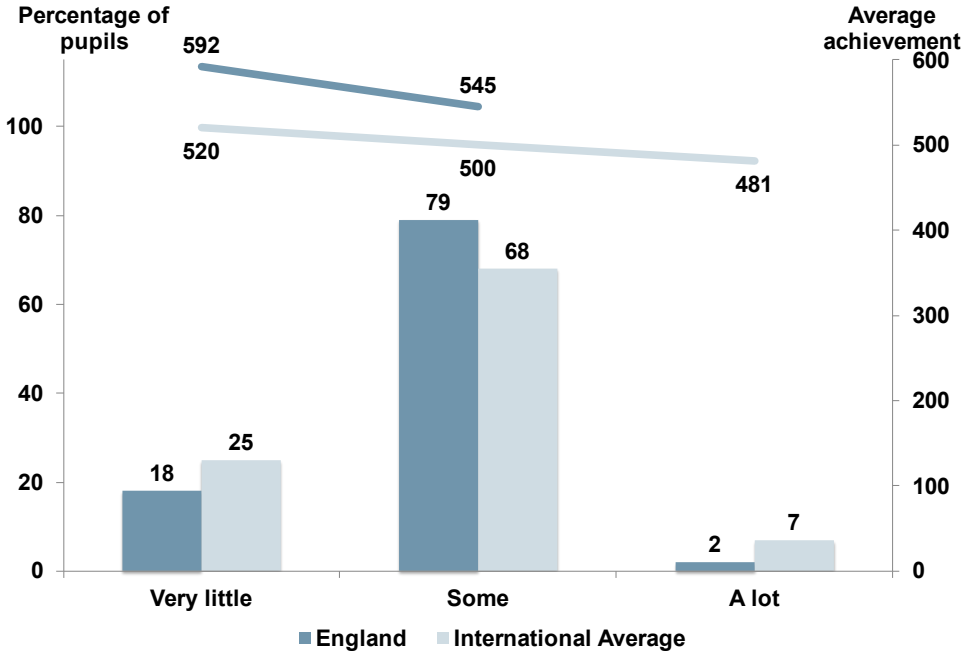
Year 5

As shown in Figure 109 and Table 110 below, 18% of year 5 pupils in England in 2023 were reported by teachers to be taught in classrooms where, to a very little extent, teaching was limited by pupils not ready for instruction. This percentage was below the international average (25%). However, a smaller percentage of pupils in England were reported to be taught in classrooms where teaching was limited a lot (2%) compared with the international average (7%).

There was a significant positive association between the extent to which teachers reported such limitations and pupils' performance. Pupils taught in classrooms where teaching was limited to a very little extent had significantly higher average scores than their peers taught in classrooms where teaching was limited to some extent. Similar average scores and the same association were also found in year 5 science.

The international averages also show the same successive reduction in year 5 pupils' average scores between the categories in both mathematics and science.

Figure 109: Percentage of year 5 pupils taught by teachers in classrooms where teaching is limited by pupils not ready for instruction and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding
Note 2: Where the percentage of pupils is too small to calculate an average score, no data is presented.

Table 110: Percentage of year 5 pupils taught by teachers in classrooms where teaching is limited by pupils not ready for instruction and their average achievement in mathematics (England and international average)

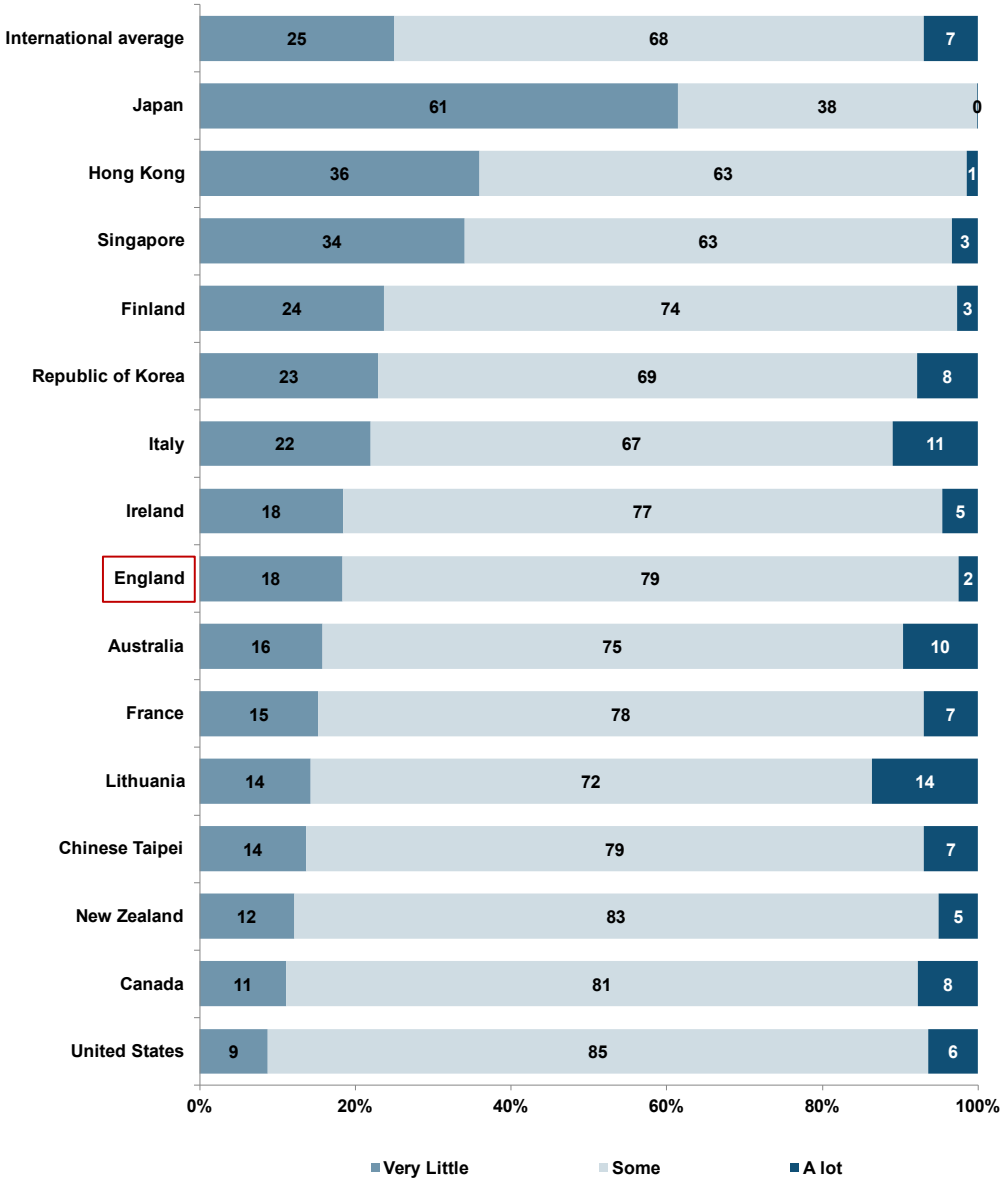
Extent of limitation	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very little	592	520	18	25
Some	545	500	79	68
A lot	No data	481	2	7

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding
Note 2: Where the percentage of pupils is too small to calculate an average score, no data is presented.

As shown in Figure 110 and Table 111 below, a smaller percentage of year 5 pupils in England were reported to be taught in classrooms where teaching was limited to a very little extent compared with pupils in each of the highest-performing countries, except in Chinese Taipei. A larger percentage of pupils in England were reported to be taught in classrooms where teaching was limited to a very little extent compared with pupils in each of the English-speaking countries (except Ireland) and half of the European comparator countries: France and Lithuania. Only in Hong Kong and Japan did a smaller percentage of pupils report they were taught in classrooms where teaching was limited a lot compared with pupils in England. Similar findings were found in science.

Figure 110: Percentage of year 5 pupils taught by teachers in classrooms where teaching is limited by pupils not ready for instruction (England and comparator countries)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 111: Percentage of year 5 pupils taught by teachers in classrooms where teaching is limited by pupils not ready for instruction and their average achievement in mathematics (England and comparator countries)

Country	Very little	Some	A lot
International average	25	68	7
Japan	61	38	0

Country	Very little	Some	A lot
Hong Kong	36	63	1
Singapore	34	63	3
Finland	24	74	3
Republic of Korea	23	69	8
Italy	22	67	11
Ireland	18	77	5
England	18	79	2
Australia	16	75	10
France	15	78	7
Lithuania	14	72	14
Chinese Taipei	14	79	7
New Zealand	12	83	5
Canada	11	81	8
United States	9	85	6

Source: IEA TIMSS International Report 2023

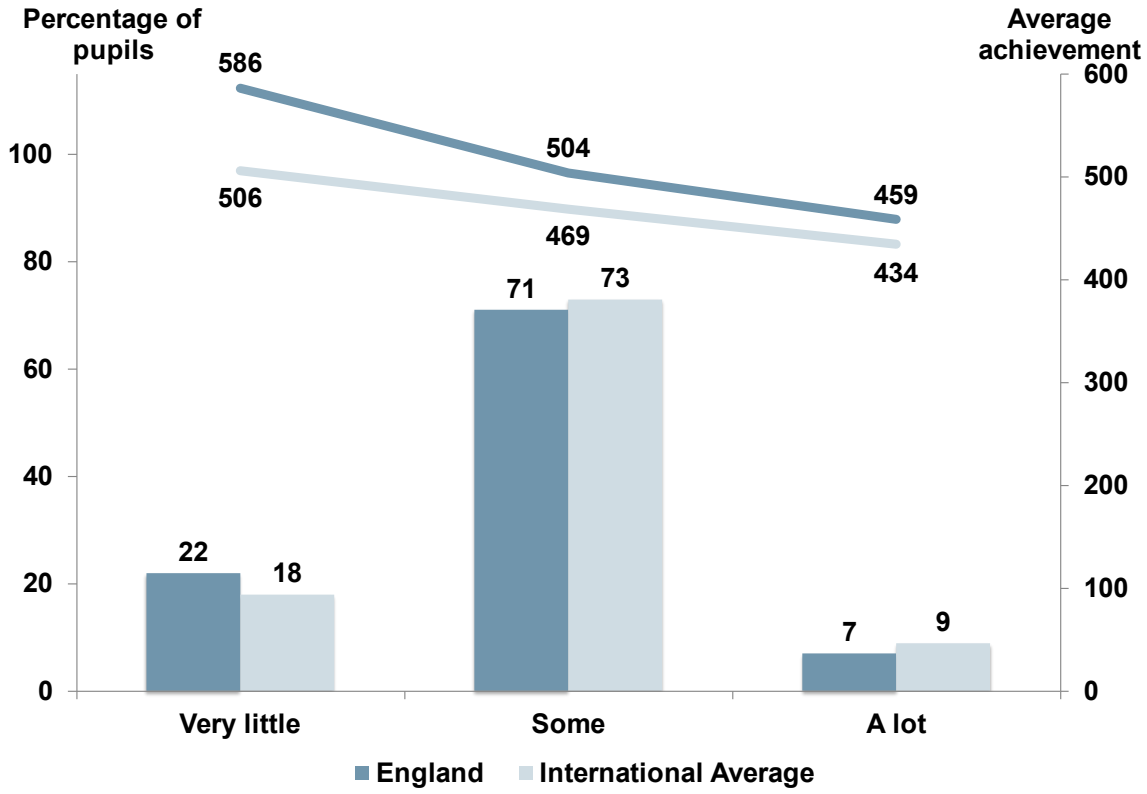
Note 1: Percentages may not sum to 100% due to rounding

Year 9

As shown in Figure 111 and Table 112 below, 22% of year 9 pupils in England in 2023 were reported by teachers to be taught mathematics in classrooms where, to a very little extent, teaching was limited by pupils not ready for instruction. This percentage was above the international average (18%). A smaller percentage of pupils in England were reported to be taught in classrooms where teaching was limited a lot (7%) compared with the international average (9%).

There was a significant positive association between the extent to which teachers reported such limitations and pupils' performance. Pupils taught in classrooms where teaching was limited to a very little extent had significantly higher average scores than their peers taught in classrooms where teaching was limited to some extent. In turn, pupils taught in classrooms where teaching was limited to some extent had significantly higher average scores than their peers taught in classrooms where teaching was limited a lot. The international averages also show the same successive reduction in year 9 pupils' average scores between the categories in mathematics.

Figure 111: Percentage of year 9 pupils taught by teachers in classrooms where teaching is limited by pupils not ready for instruction and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 112: Percentage of year 9 pupils taught by teachers in classrooms where teaching is limited by pupils not ready for instruction and their average achievement in mathematics (England and international average)

Extent of limitation	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very little	586	506	22	18
Some	504	469	71	73
A lot	459	434	7	9

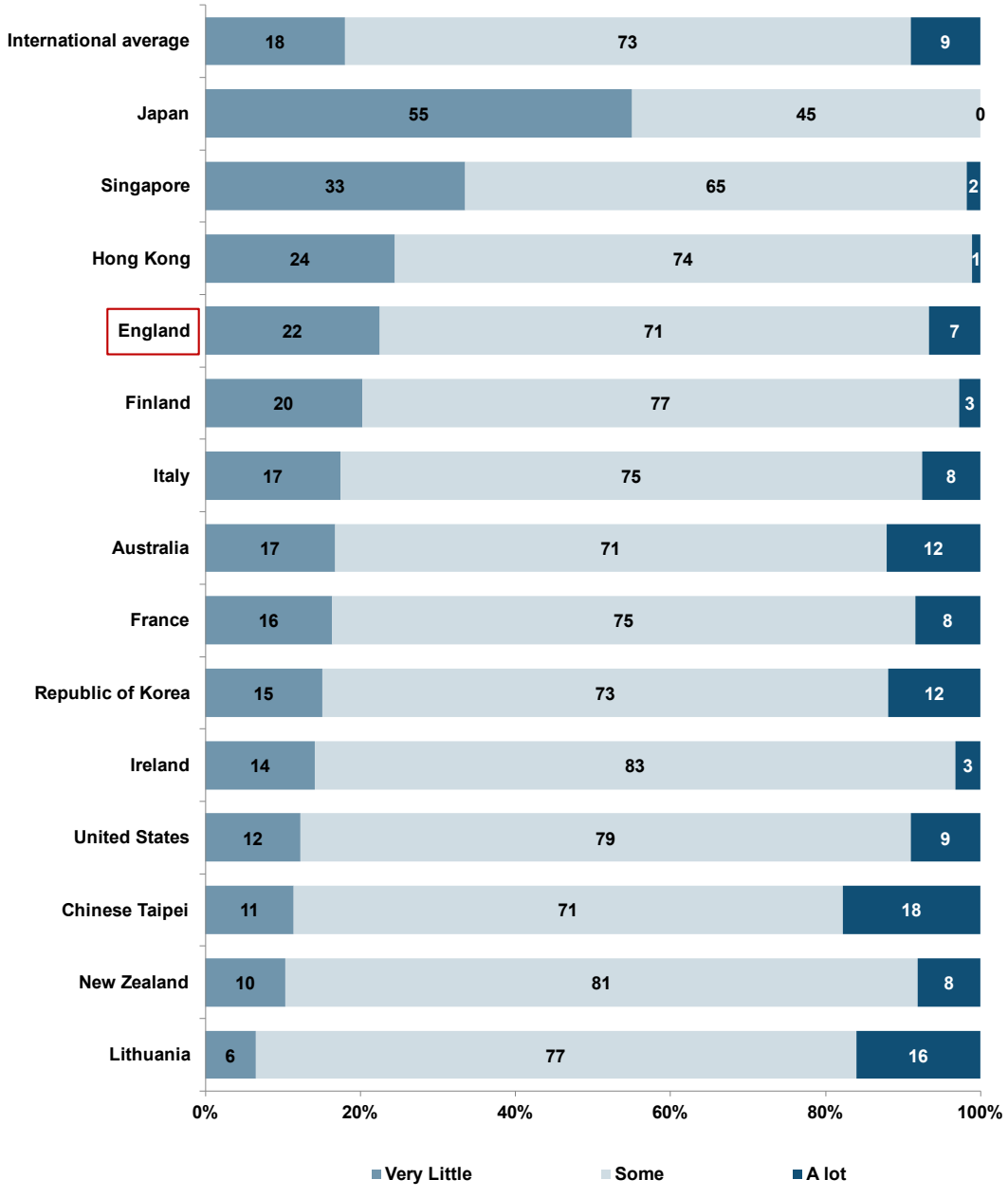
Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

As shown in Figure 112 and Table 113 below, a smaller percentage of year 9 pupils in England were reported to be taught mathematics in classrooms where teaching was limited to a very little extent compared with pupils in 3 of the highest-performing countries. The exceptions were pupils in Chinese Taipei and the Republic of Korea. A

larger percentage of pupils in England were reported to be taught in classrooms where teaching was limited to a very little extent compared with pupils in each of the English-speaking and European comparator countries.

Figure 112: Percentage of year 9 pupils taught mathematics by teachers in classrooms where teaching is limited by pupils not ready for instruction (England and comparator countries)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 113: Percentage of year 9 pupils taught mathematics by teachers in classrooms where teaching is limited by pupils not ready for instruction (England and comparator countries)

Country	Very little	Some	A lot
International average	18	73	9
Japan	55	45	0
Singapore	33	65	2
Hong Kong	24	74	1
England	22	71	7
Finland	20	77	3
Italy	17	75	8
Australia	17	71	12
France	16	75	8
Republic of Korea	15	73	12
Ireland	14	83	3
United States	12	79	9
Chinese Taipei	11	71	18
New Zealand	10	81	8
Lithuania	6	77	16

Source: IEA TIMSS International Report 2023

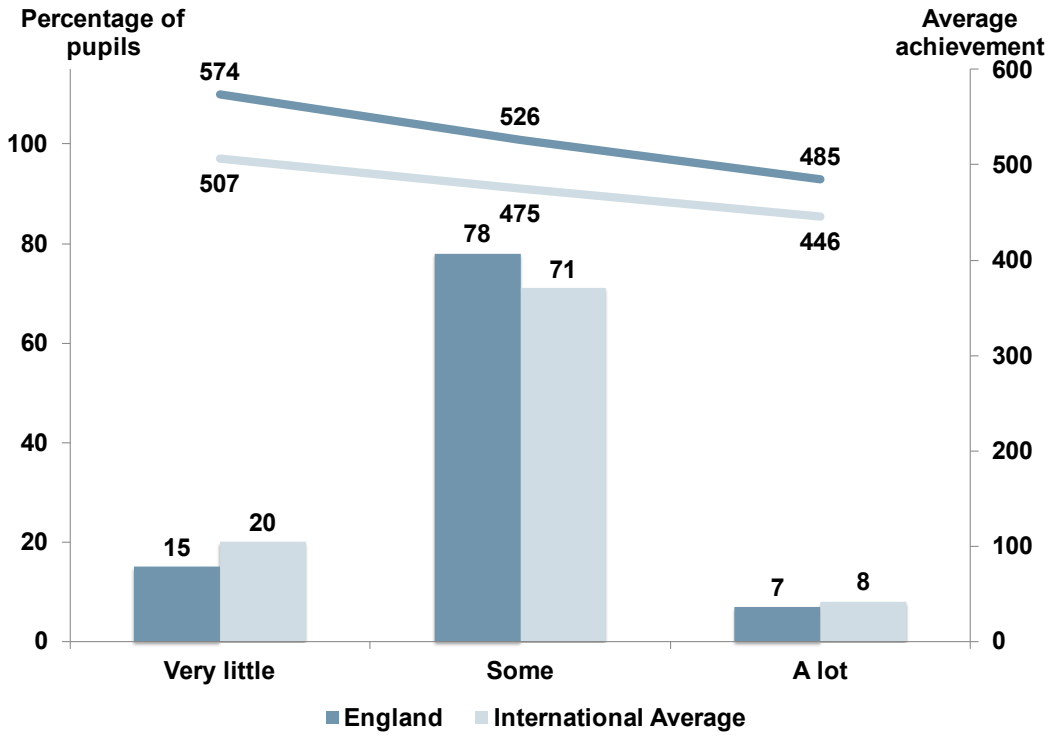
Note 1: Percentages may not sum to 100% due to rounding

As shown in Figure 113 and Table 114 below, 15% of year 9 pupils in England in 2023 were reported by teachers to be taught science in classrooms where, to a very little extent, teaching was limited by pupils not ready for instruction. This percentage was below the international average (20%). A similar percentage of pupils in England were reported to be taught in classrooms where teaching was limited a lot (7%) compared with the international average (8%).

As with mathematics, there was a significant positive association between the extent to which teachers reported such limitations and pupils' performance in science. Pupils taught in classrooms where teaching was limited to a very little extent had significantly higher average scores than their peers taught in classrooms where teaching was limited to some extent. In turn, pupils taught in classrooms where teaching was limited to some extent had significantly higher average scores than their peers taught in classrooms

where teaching was limited a lot. The international averages also show the same successive reduction in year 9 pupils' average scores between the categories in science.

Figure 113: Percentage of year 9 pupils taught by teachers in classrooms where teaching is limited by pupils not ready for instruction and their average achievement in science (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 114: Percentage of year 9 pupils taught by teachers in classrooms where teaching is limited by pupils not ready for instruction and their average achievement in science (England and international average)

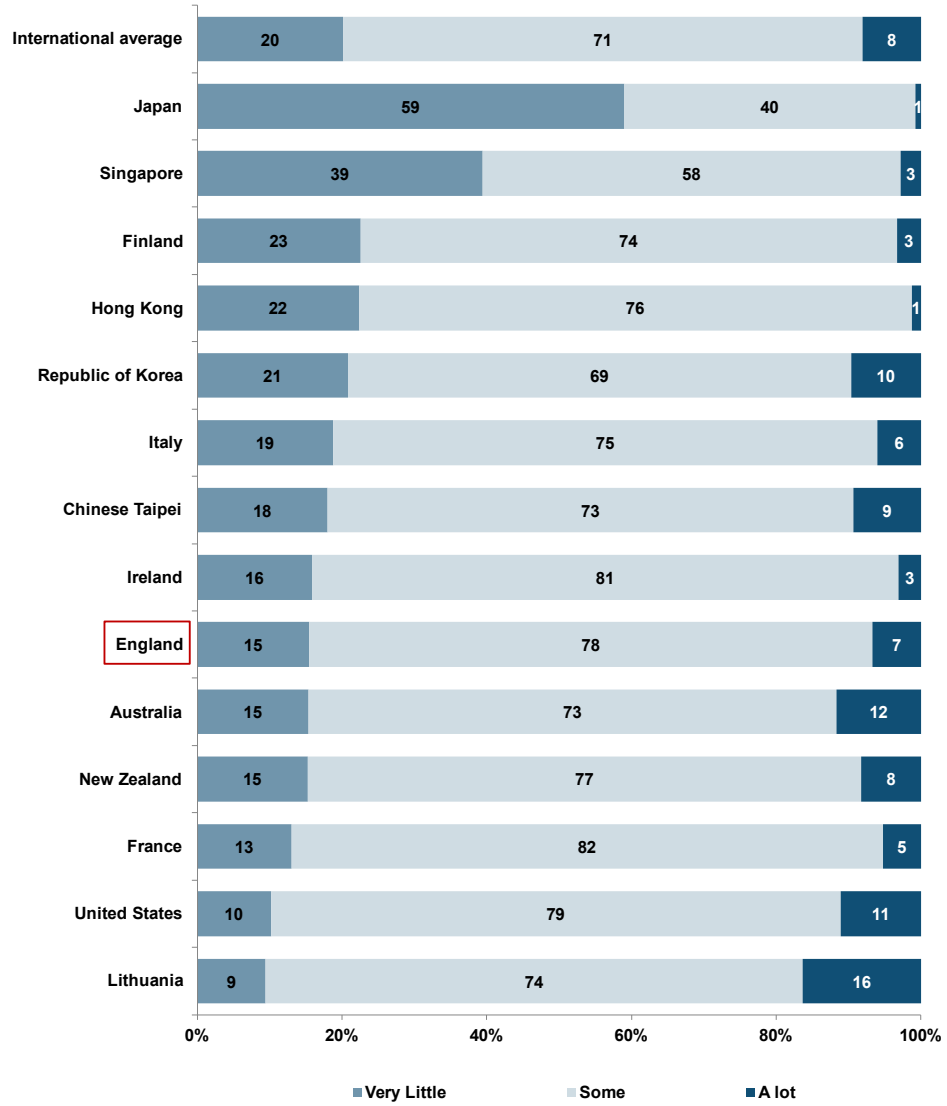
Extent of limitation	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Very little	574	507	15	20
Some	526	475	78	71
A lot	485	446	7	8

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

As shown in Figure 114 and Table 115 below, a smaller percentage of year 9 pupils in England were reported to be taught science in classrooms where teaching was limited to a very little extent compared with pupils in each of the highest-performing countries. A larger percentage of pupils in England were reported to be taught in classrooms where teaching was limited to a very little extent compared with pupils in the United States from the English-speaking countries. The reverse was true compared with pupils in Ireland while in Australia and New Zealand the percentages were the same. This was also the case compared with half of the European comparator countries. A larger percentage of pupils in England were reported to be taught in classrooms where teaching was limited to a very little extent compared with pupils in France and Lithuania while the reverse was true compared with pupils in Finland and Italy.

Figure 114: Percentage of year 9 pupils taught science by teachers in classrooms where teaching is limited by pupils not ready for instruction (England and comparator countries)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 115: Percentage of year 9 pupils taught science by teachers in classrooms where teaching is limited by pupils not ready for instruction (England and comparator countries)

Country	Very little	Some	A lot
International average	20	71	8
Japan	59	40	1
Singapore	39	58	3
Finland	23	74	3
Hong Kong	22	76	1
Republic of Korea	21	69	10
Italy	19	75	6
Chinese Taipei	18	73	9
Ireland	16	81	3
England	15	78	7
Australia	15	73	12
New Zealand	15	77	8
France	13	82	5
United States	10	79	11
Lithuania	9	74	16

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

11.5 To what extent did pupils report that they felt tired and/or hungry when they arrived at school?

In 2023, year 5 and 9 pupils were asked to respond to two statements:

1. I feel tired
2. I feel hungry

The response options were:

- every day
- almost every day
- sometimes
- never

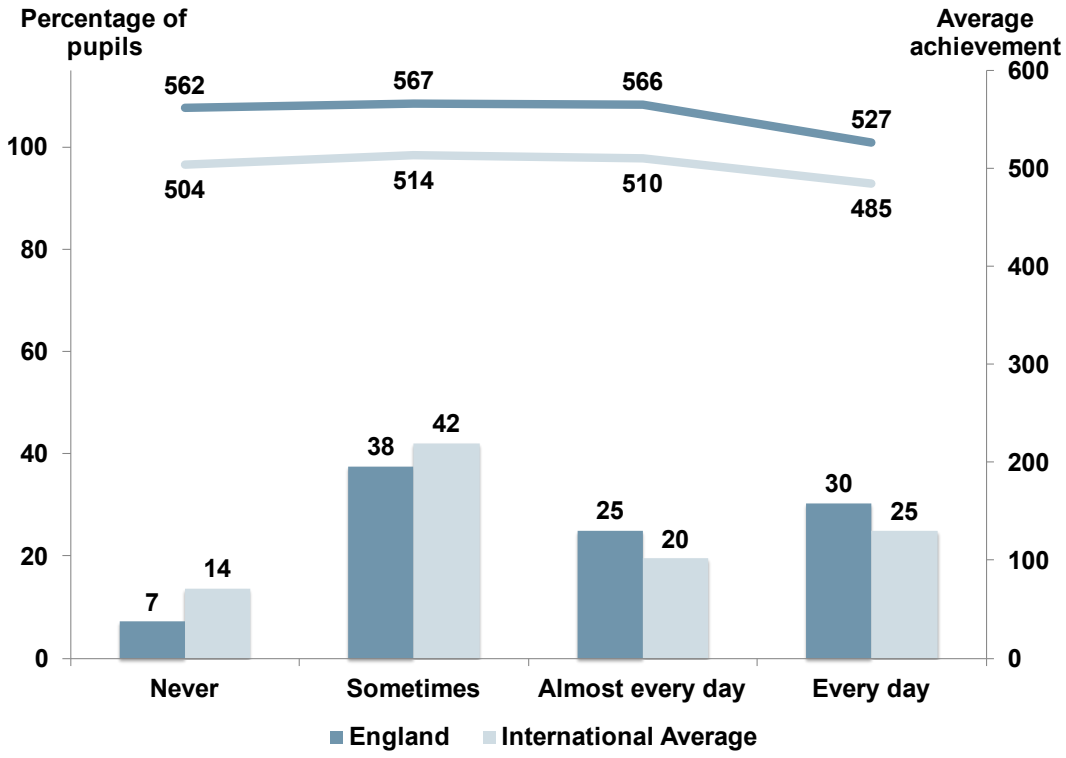
This section focuses on mathematics, making reference to science only where there are notable differences between the 2 subjects. The responses to these questions were not included in the IEA exhibits in 2019 nor included in the national report for England in 2019.

Year 5

As shown in Figure 115 and Table 116 below, a smaller percentage of year 5 pupils in England (in mathematics) reported that they never felt tired when they arrived at school compared with the international average (7% and 14% respectively). Fifty-five per cent of pupils in England felt tired when they arrived at school almost every day or every day, above the international average (45%). The average score for pupils in England who felt tired every day when they arrived at school was significantly below the average scores for their peers in each of the other 3 categories. There were no other significant differences between the performance of pupils in the different categories. The same association was found for year 5 science.

The international averages also show that pupils who felt tired when they arrived at school every day had a lower average score than their peers in the other categories.

Figure 115: Percentages of year 5 pupils who reported how often they felt tired when they arrived at school and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 116: Percentages of year 5 pupils who reported how often they felt tired when they arrived at school and their average achievement in mathematics (England and international average)

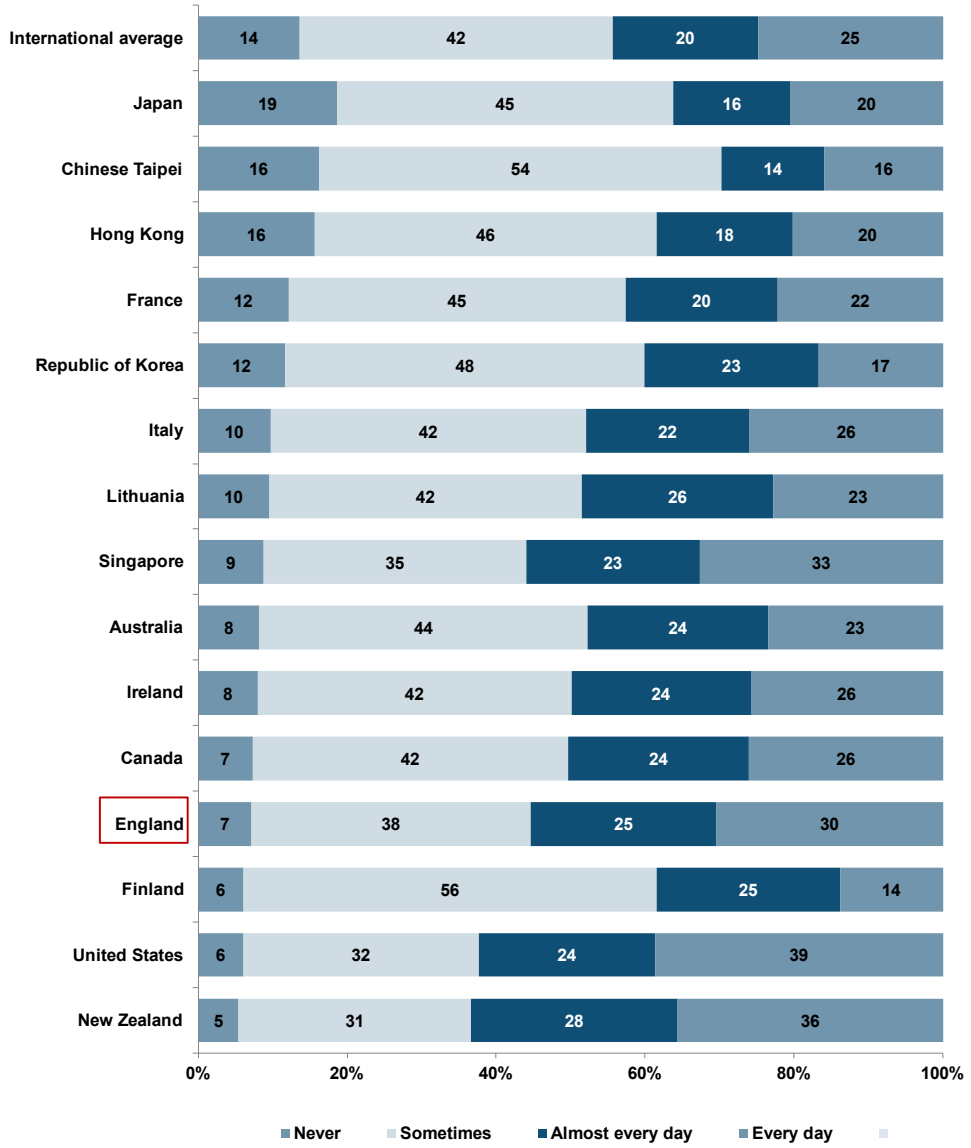
Extent of feeling tired	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Never	562	504	7	14
Sometimes	567	514	38	42
Almost every day	566	510	25	20
Every day	527	485	30	25

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

As shown in Figure 116 and Table 117 below, a smaller percentage of year 5 pupils in England reported that they never felt tired when they arrived at school compared with pupils in each of the highest-performing countries. However, while the percentage of pupils in England who felt tired when they arrived at school almost every day or every day (55%) was larger than for their peers in most of these countries, it was similar to that recorded in Singapore (56%). A smaller percentage of year 5 pupils in England reported that they never felt tired when they arrived at school compared with pupils in most of the English-speaking and European comparator countries. The percentage of pupils in England who felt tired when they arrived at school almost every day or every day (55%) was larger than for their peers in each of these countries, except New Zealand and the United States.

Figure 116: Percentages of year 5 pupils who reported how often they felt tired when they arrived at school (England and comparator countries)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 117: Percentages of year 5 pupils who reported how often they felt tired when they arrived at school (England and comparator countries)

Country	Never	Sometimes	Almost every day	Every day
International average	14	42	20	25
Japan	19	45	16	20
Chinese Taipei	16	54	14	16
Hong Kong	16	46	18	20

Country	Never	Sometimes	Almost every day	Every day
France	12	45	20	22
Republic of Korea	12	48	23	17
Italy	10	42	22	26
Lithuania	10	42	26	23
Singapore	9	35	23	33
Australia	8	44	24	23
Ireland	8	42	24	26
Canada	7	42	24	26
England	7	38	25	30
Finland	6	56	25	14
United States	6	32	24	39
New Zealand	5	31	28	36

Source: IEA TIMSS International Report 2023

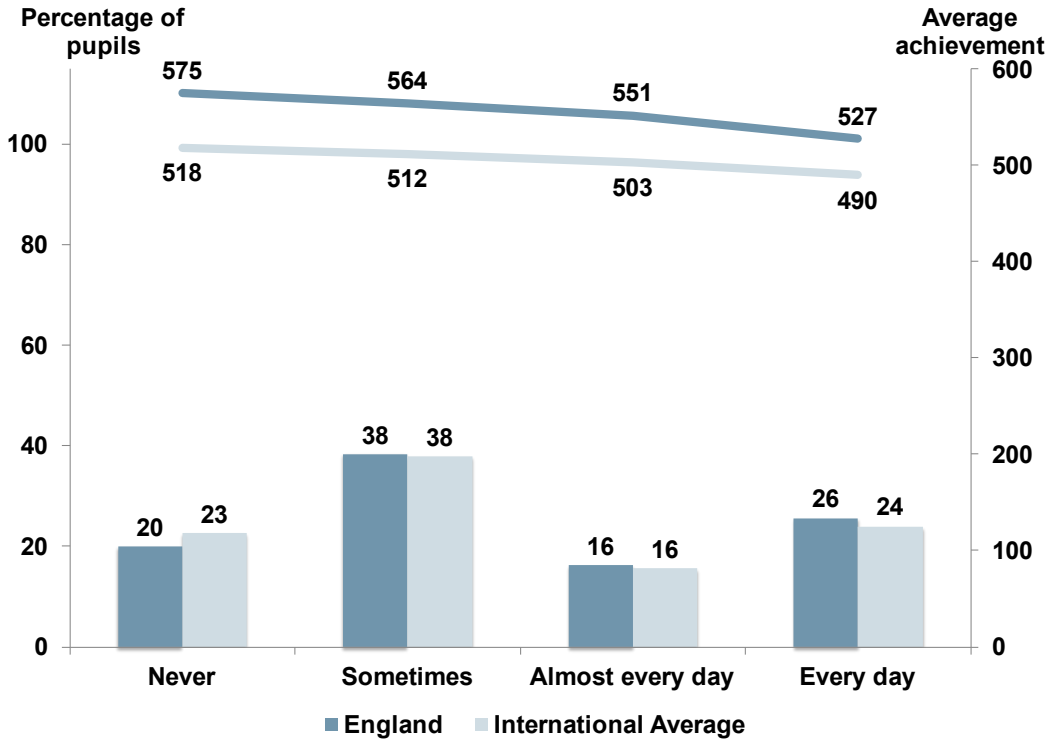
Note 1: Percentages may not sum to 100% due to rounding

As shown in Figure 117 and Table 118 below, a smaller percentage of year 5 pupils in mathematics reported that they never felt hungry when they arrived at school compared with the international average (20% and 23% respectively). Forty-two per cent of pupils in England felt hungry when they arrived at school almost every day or every day, above the international average (40%).

The average score for pupils in England who felt hungry every day when they arrived at school was significantly below the average scores for their peers in each of the other 3 categories. The average score for pupils in England who felt hungry almost every day was also significantly below the average scores for their peers who never or sometimes felt hungry. However, the difference between the average scores for pupils who never felt hungry when they arrived at school and those that sometimes did was not significant. The same association was found for year 5 science.

The international averages also show the same successive reduction in year 5 pupils' average scores between the categories in both mathematics and science.

Figure 117: Percentages of year 5 pupils who reported how often they felt hungry when they arrived at school and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 118: Percentages of year 5 pupils who reported how often they felt hungry when they arrived at school and their average achievement in mathematics (England and international average)

Extent of feeling hungry	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Never	575	518	20	23
Sometimes	564	512	38	38
Almost every day	551	503	16	16
Every day	527	490	26	24

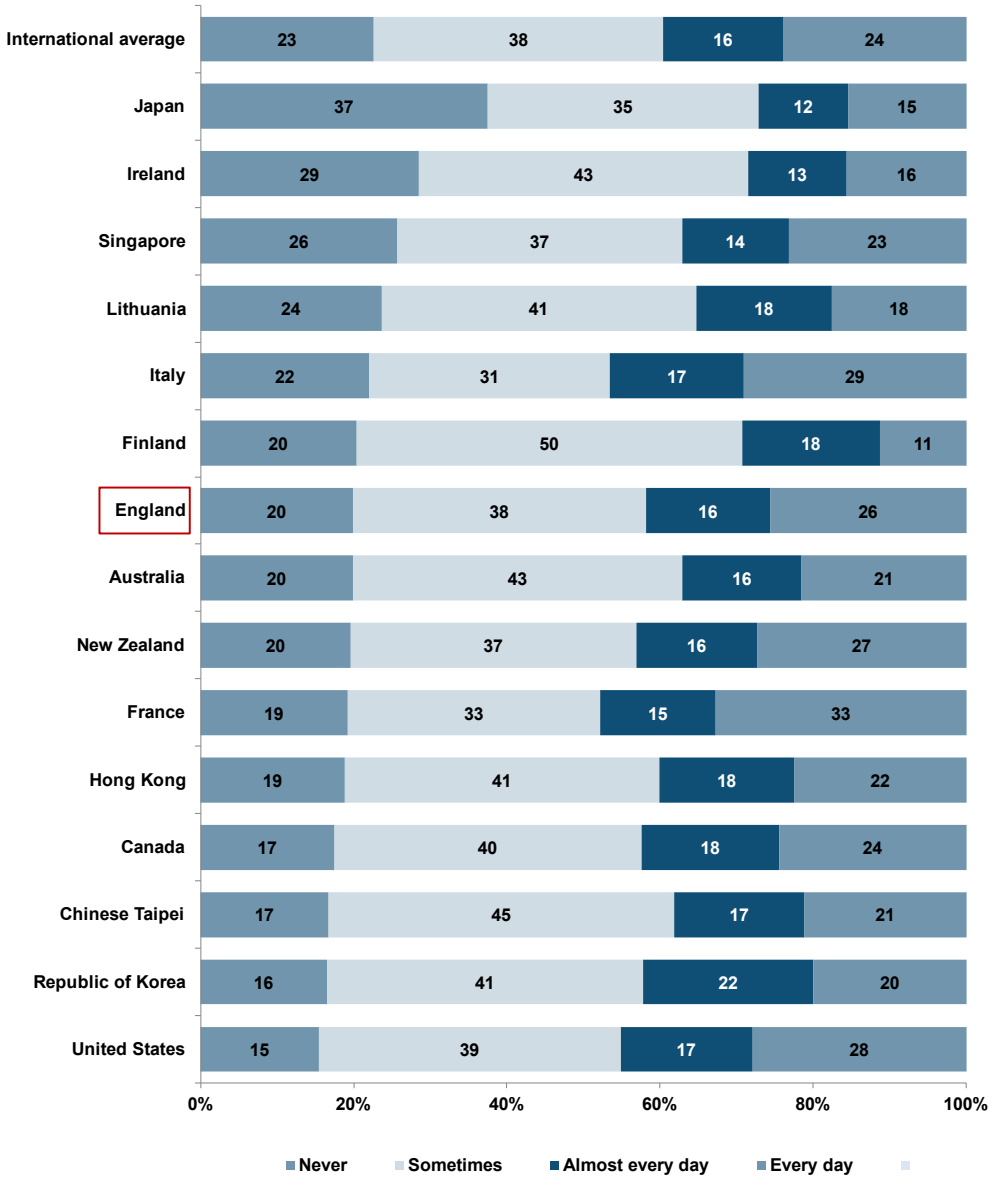
Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

As shown in Figure 118 and Table 119 below, a larger percentage of year 5 pupils in England reported that they never felt hungry when they arrived at school compared with pupils in most of the highest-performing countries. The reverse was true compared with

pupils in Japan and Singapore. A larger percentage of pupils in England reported that they never felt hungry compared with pupils in Canada and the United States from the English-speaking countries. In Ireland, the percentage of pupils was larger, while in Australia and New Zealand it was the same. A smaller percentage of pupils in England reported that they never felt hungry compared with pupils in Italy and Lithuania, while the percentage was larger compared with pupils in France and the same as for pupils in Finland.

Figure 118: Percentages of year 5 pupils who reported how often they felt hungry when they arrived at school (England and comparator countries)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 119: Percentages of year 5 pupils who reported how often they felt hungry when they arrived at school (England and comparator countries)

	Never	Sometimes	Almost every day	Every day
International average	23	38	16	24
Japan	37	35	12	15
Ireland	29	43	13	16
Singapore	26	37	14	23
Lithuania	24	41	18	18
Italy	22	31	17	29
Finland	20	50	18	11
England	20	38	16	26
Australia	20	43	16	21
New Zealand	20	37	16	27
France	19	33	15	33
Hong Kong	19	41	18	22
Canada	17	40	18	24
Chinese Taipei	17	45	17	21
Republic of Korea	16	41	22	20
United States	15	39	17	28

Source: IEA TIMSS International Report 2023

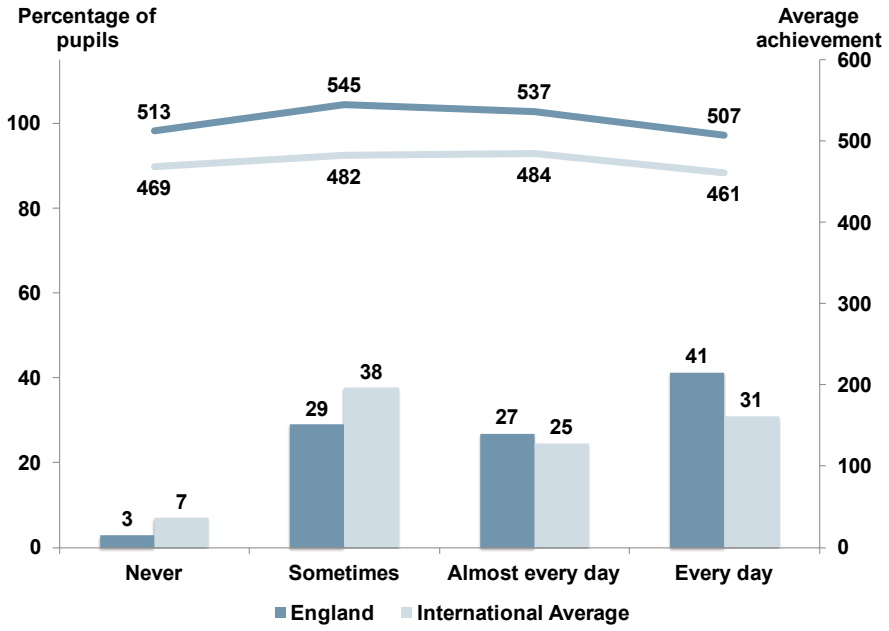
Note 1: Percentages may not sum to 100% due to rounding

Year 9

As shown in Figure 119 and Table 120 below, a smaller percentage of year 9 pupils in mathematics reported that they never felt tired when they arrived at school compared with the international average (3% and 7% respectively). Sixty-eight per cent of pupils in England felt tired when they arrived at school almost every day or every day, above the international average (56%). The average score for pupils in England who felt tired every day when they arrived at school was significantly below the average scores for their peers who felt tired sometimes or almost every day, but not those who reported never being tired. The average score for pupils in England who sometimes felt tired when they arrived at school was significantly above the average score for their peers who never felt tired. There were no other significant differences between the performance of pupils in the different categories.

The same associations were found for year 9 science with one exception. The average scores for pupils in England who sometimes felt tired when they arrived at school as well as those who felt tired almost every day were significantly above the average score for their peers who never felt tired. The international averages also show that pupils who felt tired when they arrived at school every day had a lower average score than their peers in the other categories.

Figure 119: Percentages of year 9 pupils who reported how often they felt tired when they arrived at school and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 120: Percentages of year 9 pupils who reported how often they felt tired when they arrived at school and their average achievement in mathematics (England and international average)

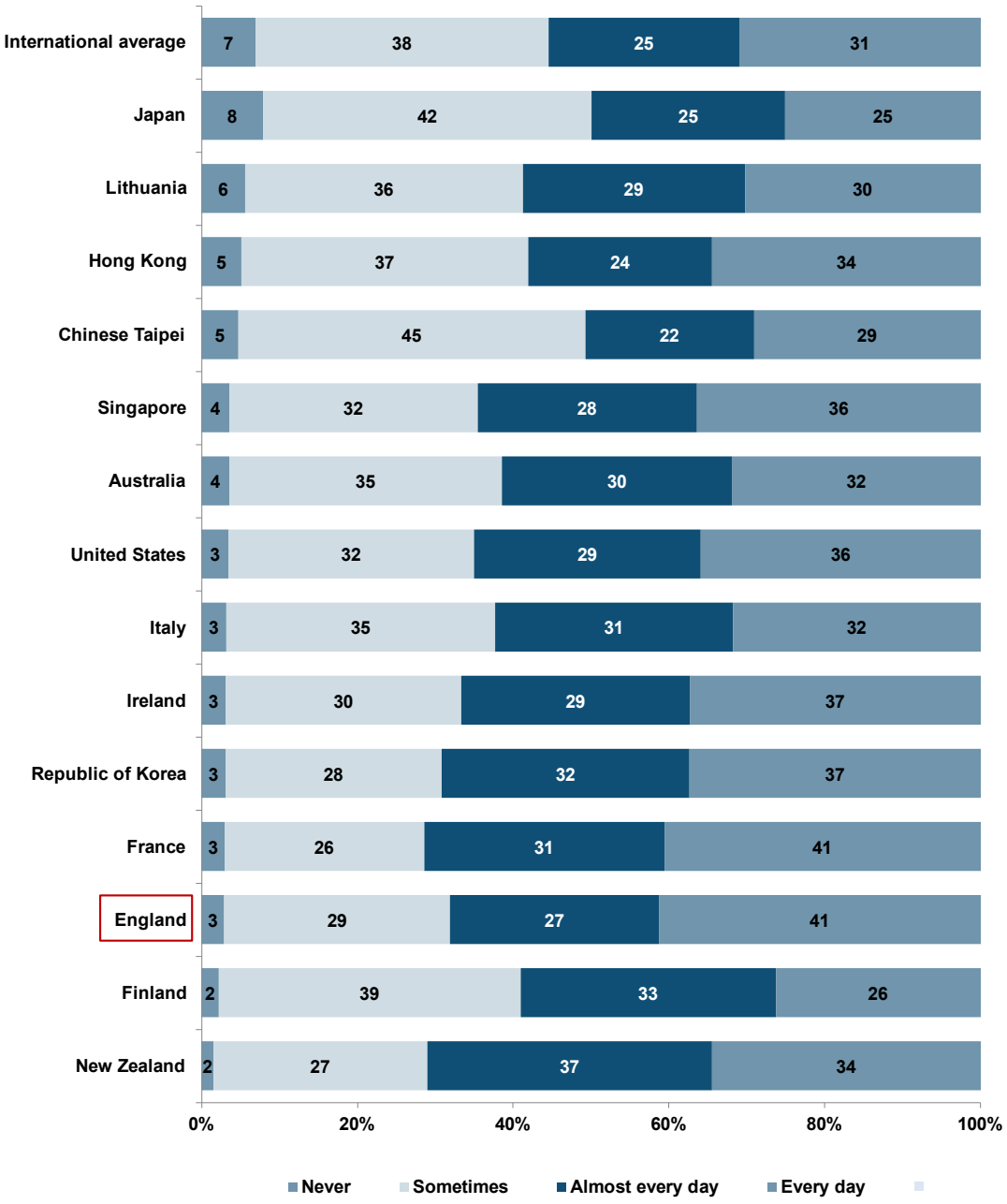
Extent of feeling tired	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Never	513	469	3	7
Sometimes	545	482	29	38
Almost every day	537	484	27	25
Every day	507	461	41	31

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

As shown in Figure 120 and Table 121 below, the percentage of year 9 pupils in England who reported that they never felt tired when they arrived at school was smaller than each of the highest-performing countries, except the Republic of Korea where it was the same. However, the percentage range for all comparator countries is narrow overall (2% to 8%). The percentage of pupils in England who felt tired when they arrived at school almost every day or every day (68%) was larger than for their peers in each of these countries, except in France, New Zealand and the Republic of Korea.

Figure 120: Percentages of year 9 pupils who reported how often they felt tired when they arrived at school (England and comparator countries)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 121: Percentages of year 9 pupils who reported how often they felt tired when they arrived at school (England and comparator countries)

	Never	Sometimes	Almost every day	Every day
International average	7	38	25	31
Japan	8	42	25	25
Lithuania	6	36	29	30
Hong Kong	5	37	24	34
Chinese Taipei	5	45	22	29
Singapore	4	32	28	36
Australia	4	35	30	32
United States	3	32	29	36
Italy	3	35	31	32
Ireland	3	30	29	37
Republic of Korea	3	28	32	37
France	3	26	31	41
England	3	29	27	41
Finland	2	39	33	26
New Zealand	2	27	37	34

Source: IEA TIMSS International Report 2023

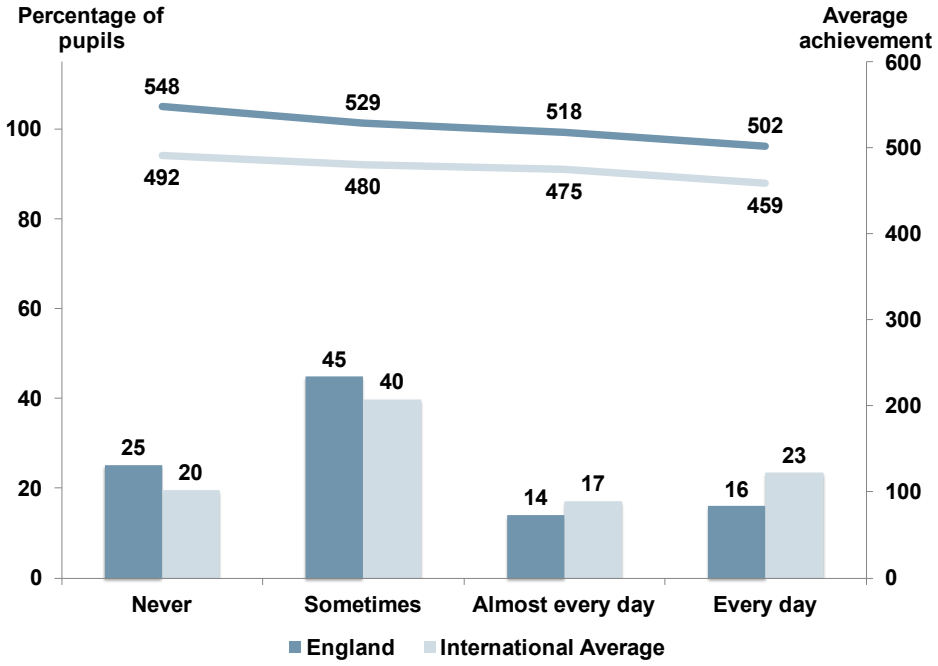
Note 1: Percentages may not sum to 100% due to rounding

As shown in Figure 121 and Table 122 below, a larger percentage of year 9 pupils in mathematics reported that they never felt hungry when they arrived at school compared with the international average (25% and 20% respectively). Thirty per cent of pupils in England felt hungry when they arrived at school almost every day or every day, below the international average (40%). There was a significant, negative association between pupils arriving at school feeling hungry and their average score. Pupils who felt hungry every day when they arrived at school had a significantly lower average score than their peers in each of the other categories. Pupils who felt hungry almost every day had a significantly lower average score than their peers who sometimes or never felt this, while pupils who sometimes felt hungry had a significantly lower average score than their peers who never felt this.

In science, the same associations are evident with one exception. While pupils who felt hungry almost every day had a significantly lower average score than their peers who never felt this, their average score (528) was not significantly different from that of their

peers who sometimes felt this (535). The international averages also show the same successive reduction in year 9 pupils' average scores between the categories in both mathematics and science.

Figure 121: Percentages of year 9 pupils who reported how often they felt hungry when they arrived at school and their average achievement in mathematics (England and international average)



Source: IEA TIMSS International Report 2023

Table 122: Percentages of year 9 pupils who reported how often they felt hungry when they arrived at school and their average achievement in mathematics (England and international average)

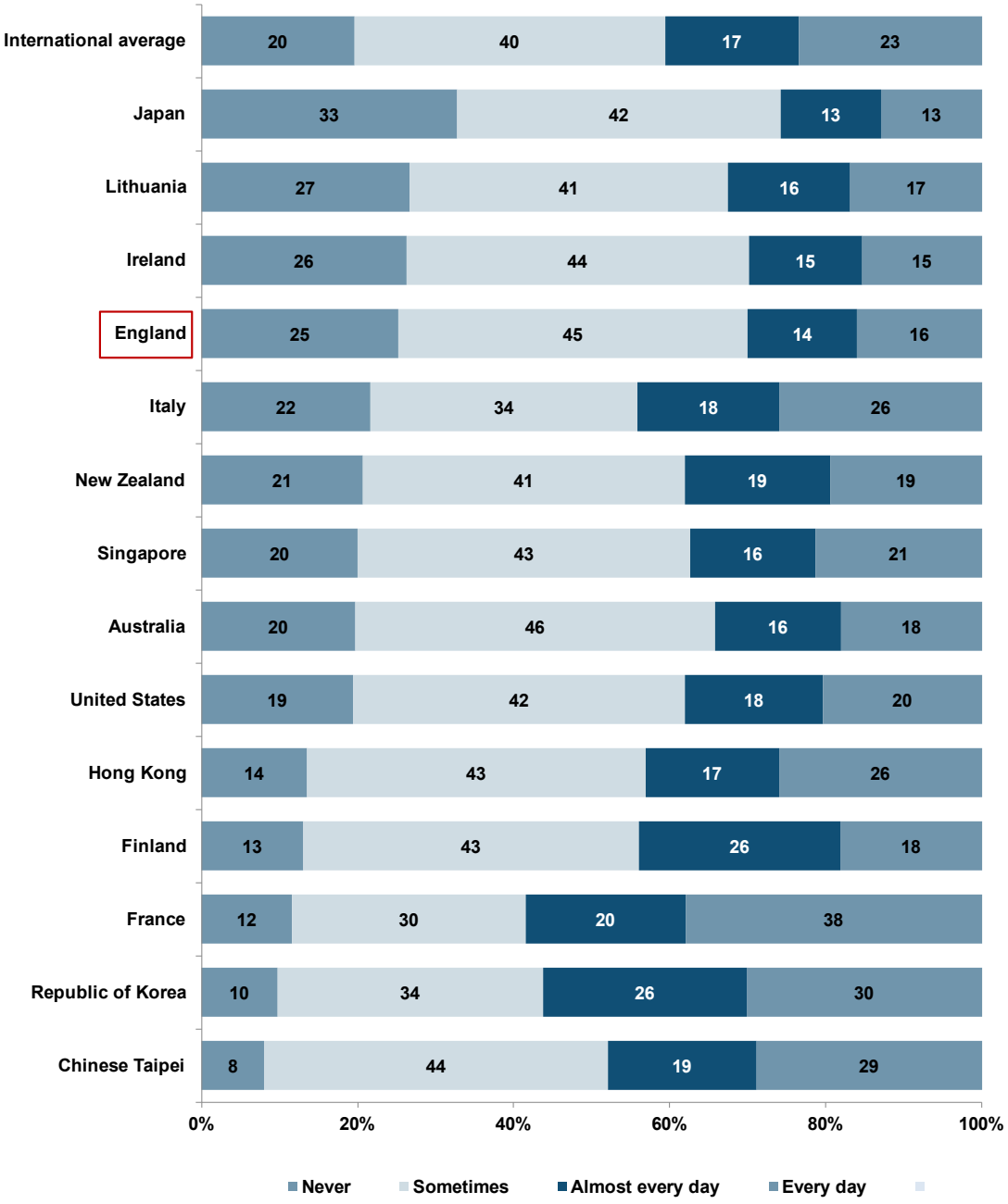
Extent of feeling hungry	Average score – England	Average score – international	Percentage of pupils – England	Percentage of pupils – international
Never	548	492	25	20
Sometimes	529	480	45	40
Almost every day	518	475	14	17
Every day	502	459	16	23

Source: IEA TIMSS International Report 2023

As shown in Figure 122 and Table 123 below, the percentage of year 9 pupils in England who reported that they never felt hungry when they arrived at school was larger than for their peers in each of the highest-performing countries, except Japan. It was also larger

compared with pupils in each of the English-speaking countries (except in Ireland) and each of the European countries (except in Lithuania). Only in Japan did a smaller percentage of pupils report they felt hungry when they arrived at school almost every day or every day compared with pupils in England.

Figure 122: Percentages of year 9 pupils who reported how often they felt hungry when they arrived at school (England and comparator countries)



Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Table 123: Percentages of year 9 pupils who reported how often they felt hungry when they arrived at school (England and comparator countries)

	Never	Sometimes	Almost every day	Every day
International average	20	40	17	23
Japan	33	42	13	13
Lithuania	27	41	16	17
Ireland	26	44	15	15
England	25	45	14	16
Italy	22	34	18	26
New Zealand	21	41	19	19
Singapore	20	43	16	21
Australia	20	46	16	18
United States	19	42	18	20
Hong Kong	14	43	17	26
Finland	13	43	26	18
France	12	30	20	38
Republic of Korea	10	34	26	30
Chinese Taipei	8	44	19	29

Source: IEA TIMSS International Report 2023

Note 1: Percentages may not sum to 100% due to rounding

Conclusion

Volume 1 of the *TIMSS 2023 Report for England* analyses core and comparative year 5 and year 9 sample pupils' performance in mathematics and science. Volume 2 of the report presents analysis of performance by pupil characteristics, including gender, having English as an additional language and socio-economic status (SES). It also includes analysis of pupils' reported experiences and attitudes in the context of home, school and classroom environments, and a brief discussion of pupil environmental awareness. Such wider contexts are important for understanding pupils' experiences in school and understanding of pupils' persistence in using and participating in mathematics and science as they mature. Volume 2 also includes analysis of responses to questionnaires from headteachers and teachers in the schools that participated in the TIMSS Assessments. The results highlight experiences relating to school environment, classroom management and their perception of pupils' performance. As with pupils, the wider contexts of headteachers and teachers are integral to better understanding schools, as well as teaching and learning in mathematics and science.

This conclusion concentrates on key issues and themes that have emerged from the TIMSS assessment cycle in 2023 and highlights areas where further research might establish additional analytical insights.

In 2023, pupils in England performed, on average, significantly above the TIMSS centrepoint (500) in mathematics and science in both years 5 and 9. They also performed significantly above the 2023 international mean in both subjects and both year groups.

The 2023 data revealed some important outcomes relating to gender; this contrasted with 2019, when there were no significant differences between the performances of boys and girls in either subject or either year group.

In mathematics in 2023, at both year 5 and year 9, boys significantly outperformed girls. At year 5, this was also the case in each of the highest-performing countries and for most of the English-speaking and European comparator countries. At year 9, boys outperformed girls in other English-speaking and most European comparator countries. Most noteworthy for pupils in year 9 in England was the difference in average scores between boys and girls. A difference of 26 points was the largest for any of the participating countries in 2023.

In year 5 science there was no significant difference in performance between boys and girls, but at year 9 a gap emerged with boys again significantly outperforming girls. This pattern was also seen in other English-speaking countries but, as with year 9 mathematics, not in the highest-performing countries. The 14 point scale score difference between year 9 boys' and girls' average science scores in England was, like

mathematics, the largest (jointly held) for any of the countries participating in 2023[51]. When interrogating the data in relation to the international benchmarks, gender differences echoed the earlier findings in relation to overall performance. In mathematics, a significantly higher percentage of boys reached most benchmarks in both year 5 and year 9 mathematics than girls. In year 9 science, significantly larger percentages of boys compared to girls reached the advanced or high benchmarks.

These findings signal an urgent need to assess why a gender gap of this kind has re-emerged over time in England, especially given the large-scale initiatives in place to address this in mathematics and science

Mathematics performance by pupils for whom English was not their first language did not differ significantly from that by pupils who had English as their first language in either year 5 or year 9. However, in both year 5 and year 9 science, pupils whose first language was English significantly outperformed pupils for whom it was not, at most benchmarks.

Pupils who were eligible for free school meals (FSM) at any time in the last 6 years performed significantly lower than their non-eligible peers across both year groups and both subjects. TIMSS' proxy for socio-economic status, books at home, reveals a wider gap in performance for both year groups in both subjects compared with 2019. This highlights a persistent pattern where relative poverty negatively impacts pupil performance and, as the data demonstrates, this disparity is increasing. The data could be interrogated further alongside the wider research on child poverty[52] and its effects on educational attainment. Socio-economic disadvantage was again associated with a significantly lower percentage of pupils eligible for FSM reaching each benchmark, for both year groups and both subjects, compared with their peers.

The 2023 findings suggest a positive and significant association between confidence in learning about a subject and achievement. The more confident pupils were and the more they liked the subject, the better they performed in it. Pupils' responses revealed generally positive views about instructional clarity and teaching. These were both also associated with better performance.

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[51] The scale score differences between girls' and boys' average scores in 7 primarily Middle East and North African countries was higher than 14 scale points, with girls outperforming boys.

[52] Adjei, N. K., Schlüter, D. K., Straatmann, V. S., Melis, G., Fleming, K. M., McGovern, R., Howard, L. M., Kaner, E., Wolfe, I., & Taylor-Robinson, D. C. (2022). Impact of poverty and family adversity on adolescent health: a multi-trajectory analysis using the UK Millennium Cohort Study. *The Lancet Regional Health. Europe*, *13*. Available at: https://doi.org/10.1016/j.lanepe.2021.100279
House of Commons Committee of Public Accounts (2023) Education recovery in schools in England. Available at: https://committees.parliament.uk/publications/40220/documents/196416/default/;
Education Policy Institute (2024) *Annual Report 2023: Executive Summary*. Available at: https://epi.org.uk/annual-report-2023-executive-summary/

Gender differences were clear in responses to questions asked about confidence in mathematics and science, as well as liking the subjects. Girls were significantly less confident and liked the subject less in both year groups and for both subjects, but in contrast to the 2019 cycle where their lack of confidence was not accompanied by significantly different performance, in 2023 girls were also outperformed by their male peers. Overall, boys demonstrated more interest in further study of both subjects beyond secondary school and in careers that might include some aspects of mathematics or science. In mathematics, this was true in both year groups, although in science it was apparent only in year 9. This suggests a need to review how future study and employment related to mathematics and science are communicated, particularly to girls, to ensure the related sectors are attractive.

England's schools compared favourably with international comparators in terms of emphasis on academic performance, resources, discipline and safety – continuing the trends from 2019. Most of England's headteachers again reported that their schools focused on academic success and this was reflected in strong average pupil performance. Overall responses suggest that participating schools maintained discipline well and almost none reported moderate to severe discipline problems. However, compared to the international average, larger percentages of pupils in both year 5 and year 9 reported disorderly behaviour in some or most of their lessons. As in 2019, when pupils reported that they were frequently bullied, or that their classes were frequently disrupted, their performance was on average negatively impacted. Pupils' sense of belonging at school revealed a positive association between belonging and performance, so it seems that schools that were able to foster an inclusive culture within the school environment were adding value to their pupils' school experience. However, bearing the above issues in mind, together with the research relating to classroom disruption and learning[53], particularly since the pandemic, the challenges warrant further exploration.

The evaluation of teaching experience reveals a workforce that is experienced and clear about professional development needs. Pupils whose teachers of mathematics reported having professional expertise and confidence had significantly higher performance. An important issue resulting from this part of the TIMSS study was how satisfied teachers were with their employment. In both subjects and year groups, fewer than half of respondents were highly satisfied with their job. Further, the results show an increase in dissatisfaction about their job for mathematics teachers of both year 5 and year 9 pupils. The challenges that teachers raise included the need for more time to assist pupils,

[53] Rushton, E. A. C., Murtagh, L., Ball-Smith, C., Black, B., Dunlop, L., Gibbons, S., … Scott, C. (2022). Reflecting on 'classroom readiness' in initial teacher education in a time of global pandemic from the perspectives of eight university providers from across England, UK. Journal of Education for Teaching, 49(4), 551–568. https://doi.org/10.1080/02607476.2022.2150840; Vincent, C. (2022). Belonging in England today: Schools, race, class and policy. Journal of Sociology, 58(3), 324-341. https://doi.org/10.1177/14407833211050695

insufficient preparation time and too much administration. Such findings are reflected in national teacher satisfaction surveys[54].

Given that this cycle of TIMSS was administered wholly online, using tablets provided by Pearson, the survey relating to technology is valuable in terms of understanding availability of digital resources in schools. Teachers saw a lack of access as the most significant barrier to using digital resources to support teaching in both subjects. This was confirmed by the finding that access to digital devices (computers, tablets or smartphones) for pupils in England in year 5 mathematics and for both years in science was below the international average. However, it was perhaps unsurprising that pupils generally reported a high degree of digital self-efficacy, and this confidence was significantly associated with higher performance.

Pupils' home environment was an important factor relating to their performance in the TIMSS tests at year 9, with more resources being strongly associated with higher than average scores in both mathematics and science. Most pupils in year 5 and year 9 in England attended school regularly, however the data revealed that pupils who reported being absent at least once every two weeks has doubled since 2019. Absenteeism is currently a cause for concern in England[55] and the data reported here reveal a persistent negative association between missing school regularly and overall performance. Teachers reported that most pupils were ready to learn and be engaged; teachers expressing such views tended to be associated with pupils who had higher scores. However, some pupils may be unable to engage due to their reported tiredness and/or hunger experienced during the school day. The percentages of pupils at both year 5 and year 9 who felt hungry and/or tired is a further concern that may have links to the earlier challenges relating to socio-economic status and its potential negative impacts on learning and performance.

Overall, it is important to remember that the 2023 TIMSS results saw a stable or improving average performance in both subjects in both year 5 and year 9. Given the challenges of the past five years, the teachers and pupils are to be commended for their results in the assessments. However, as Volume 2 demonstrates, within the details of the data are findings that indicate the need for more granular research to be conducted into gender-differential performance, attitudes and aspirations, particularly in mathematics. Disadvantage due to SES was a recurring theme in the data from this TIMSS cycle in

[54] Department for Education (2024) *Working lives of teachers and leaders: wave 2 summary report*. Available at: https://scholar.google.co.uk/scholar?hl=en&as_sdt=0%2C5&q=working-lives-of-teachers-and-leaders-wave-2%2Fworking-lives-of-teachers-and-leaders-wave-2-summary-report&btnG=

[55] Education Policy Institute. (2024) Examining post-pandemic absences in England [blog]. London: EPI. Available at: https://epi.org.uk/publications-and-research/examining-post-pandemic-absences-in-england-3/#:~:text=Between%20autumn%202022/23%20and,the%20difference%20continues%20to%20increase

England and requires continued attention if we are to move closer to equity of opportunity for all young people in education.

Appendix A: International comparisons

Throughout the report, comparisons are made with other countries that took part in the study. The report analyses England's performance in relation to all participating countries in some places, but readers are generally referred to the IEA's *TIMSS International Report 2023*[56] for such comparisons.

Analysis in this report focuses on England's performance compared with a sub-set of participating countries; these were selected to provide relevant and interesting comparisons.

The comparator countries referenced in this report fit into one of the following categories:

- **highest-performing countries** that over time have consistently performed significantly better than England in TIMSS (5 countries: Chinese Taipei, Hong Kong, Japan, Republic of Korea, Singapore)
- other **English-speaking countries**, since these can be seen as having similar contexts to England and provide helpful benchmarks for TIMSS (5 countries: Australia, Canada, Ireland, New Zealand, United States)
- a selection of **European countries**, chosen to provide a balanced view of performance across Europe in relation to TIMSS (4 countries: Finland, France, Italy, Lithuania)

We note that interpretation of headline performance data is rarely straightforward. For example, in 2023 Turkey's grade 4 pupils performed particularly well in both mathematics and science. In Appendix B of Volume 1[57], we explain why we have not in fact included Turkey as a key comparator, and we draw attention there also to some characteristics of comparator data we have used, that mean comparisons need to be particularly careful. Whenever comparisons are made with other countries it is important to consider the potential effect of cultural differences. This is particularly important in chapters 7–11, which draw on responses from the attitudinal questionnaires that accompanied the main TIMSS assessments[58].

[56] See: von Davier, M.K., Reynolds, A.M., Fishbein, K.A., Khorramdel, B., Aldrich, L., Bookbinder, C.E.A., Ummugal, A., & Liqun , B.Y. (2024) TIMSS 2023 International Results in Mathematics and Science

[57] See TIMSS 2023 National Report for England: Volume 1. Available at: https://assets.publishing.service.gov.uk/media/6749d3f22ac8a6da30723aa2/TIMSS_2023_national_report_for_England.pdf

[58] The TIMSS process involves a rigorous translation and cultural adaptation phase during which the wording of questions is tested for differential item functioning (DIF) according to culture and language. DIF refers to group differences in performances on a test question (item) amongst test-takers who are comparable in terms of their overall proficiency.

Although the benchmarking systems follow the same guidelines that apply to countries participating in TIMSS, in this report international comparisons are made between England and other participating countries, rather than with these systems.

Appendix B: List of figures

Appendix C: List of tables

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