Department for Education

Achievement of 15-year-olds in England: PISA 2018 results

Research report

December 2019

Juliet Sizmur, Robert Ager, Jenny Bradshaw, Rachel Classick, Maria Galvis, Joanna Packer, David Thomas and Rebecca Wheater: National Foundation for Educational Research

Contents

List of figures

List of tables

Acknowledgements

Firstly we would like to thank all the pupils, teachers and headteachers who took part in PISA 2018. We are very grateful for their efforts and cooperation in helping to gather the valuable PISA data.

We are grateful for the support and guidance we have received at all stages of the study from all colleagues at the Department for Education, from the overall, general management of the study to the detailed and specific advice provided by the PISA team and other DfE colleagues.

Thanks are also due to a very wide array of NFER colleagues for their valued contributions of subject expertise, school liaison, implementation and delivery, project administration, statistical analyses communications and critical advice.

We would like to thank members of our expert advisory group: Jenny Bradshaw, Jannette Elwood, Debbie Heppelwhite, Joshua McGrane, Brett Pugh and Anna Vignoles.

PISA is a worldwide collaborative project with a number of international partners working together. We are grateful to all the members of the PISA International Consortium whose hard work and support contributed towards successful implementation of PISA 2018. We would also like to thank colleagues at OECD for their constant support and flexibility which were much appreciated.

Executive summary

Introduction

The Programme for International Student Assessment (PISA) is a study of educational achievement organised by the Organisation for Economic Co-operation and Development (OECD). PISA is conducted every 3 years, and assesses the abilities of pupils aged 15 in reading, mathematics and science. Pupils are assessed on their competence to address real-life challenges, and each round of PISA focuses on one of the three main areas – reading in 2018.

PISA enables governments to benchmark education policy and performance, to make evidence-based decisions and to learn from one another. It is also of great value to academic and research communities and to participating schools.

Nearly 80 countries participated in PISA 2018, including all members of the OECD and all 4 countries within the United Kingdom. In England, PISA 2018 was conducted from October 2018 to January 2019, with a sample of 5,174 15-year-old pupils in 170 schools.

Highlights

In PISA 2018, mean scores in England were significantly above the OECD averages in all 3 subjects. The mean scores in reading and science in England have not changed significantly over successive PISA cycles, but in mathematics, England's overall mean score showed a statistically significant increase compared with PISA 2015.

As with previous cycles of PISA, the highest-performing countries were east Asian, with Singapore, Macao (China) and the combined regions of Beijing, Shanghai, Jiangsu and Zhejiang in China (B-S-J-Z (China)) dominating the top positions in all 3 subject areas.

England's mean score for reading was similar to scores for Scotland and Northern Ireland, and all 3 had scores significantly higher than Wales. In both science and mathematics, the mean scores for England were significantly higher than the scores for Wales, Scotland and Northern Ireland, which were not significantly different from each other.

Achievement in reading

The mean reading score in England has remained consistent since 2006, and is above the OECD average, as it was in PISA 2015. The top performers in reading were south-east Asian countries (B-S-J-Z (China), Singapore, Macao (China) and Hong Kong (China)), with Estonia, Canada and Finland also scoring highly.

Although the mean reading score has not shown a statistically significant change since PISA 2006, England's performance in relation to other countries has changed. In PISA 2018 there were 9 countries where the mean reading score was statistically significantly higher than that in England, compared to 12 countries in PISA 2015. New Zealand, Japan, Norway, and Germany, which all outperformed England in PISA 2015, performed similarly to England in PISA 2018, and England outperformed 7 countries in 2018 that had had similar scores in 2015 (Slovenia, Belgium, France, Portugal, Netherlands, Switzerland and Russian Federation).

High-achieving pupils scored significantly higher in 2018 than in 2009, when reading was last the major domain. However, the scores among the lower achievers have remained stable over time. The attainment gap between England's high and low achieving pupils in 2018 was similar to the OECD average.

Pupils in England showed relative strengths in the reading skills of 'locating information' and 'evaluating and reflecting' but were less strong in 'understanding'.

In common with all other participating countries, girls in England outperformed boys in reading. However, the gender gap in England was significantly smaller than the average gap across the OECD.

Achievement in science

The 2018 mean score for England in science remained significantly higher than the OECD average. The top performers in science were again from east Asian countries (B-S-J-Z (China), Singapore and Macao (China)), and Estonia and Finland were the highest scoring European countries. Ten countries had mean scores in science that were significantly higher than that of England.

The 2018 average science score in England was not significantly different from scores in any previous cycles of PISA (since 2006). Of the OECD members in the study, 12 (including Japan, Finland, Canada, Australia, Switzerland, Denmark, Norway, and Spain) had a significant drop in science performance from 2015 to 2018, compared to only 2 (Poland and Turkey) that had a significant increase.

In England, the gap between high and low achievers in science was significantly larger than the OECD average, with a larger proportion of pupils in England performing at the highest proficiency levels.

There was no statistically significant gap between performance of boys and girls in science in England, which was also the case in PISA 2015. This differs from the OECD average where there was a small but statistically significant gender gap in favour of girls.

Achievement in mathematics

England's mean score in mathematics was significantly higher than in PISA 2015, which is the first time performance has improved after a stable picture in all previous cycles of PISA. England's average score was also significantly higher than the OECD average. The number of countries significantly outperforming England decreased from 19 in 2015 to 12 in 2018, with England performing similarly to Denmark, Finland, Slovenia, Belgium, Germany, Republic of Ireland, and Norway, all of which had outperformed England in PISA 2015.

The 7 highest-performing countries in mathematics were all from east Asian countries (B-S-J-Z (China), Singapore, Macao (China), Hong Kong (China), Chinese Taipei, Japan and Korea), and the highest scoring European countries were Estonia and the Netherlands.

The size of the gap between scores of the highest and lowest achievers in England was similar to the OECD average. Lower achieving pupils made a greater improvement in mathematics than higher achievers, reducing the gap between them slightly since 2015, and the proportion of pupils in England working at the lower proficiency levels has decreased significantly.

Boys in England significantly outperformed girls in mathematics, as was also the case for the OECD average. The gap between boys and girls in England was similar to that in PISA 2015.

Variation in reading scores by pupil characteristics

In common with all other countries, pupils from the most advantaged backgrounds in England had higher reading achievement than those from less socio-economically advantaged homes. This gap in achievement was not significantly different in England from the OECD average.

The reading performance of pupils in England with an immigrant background was significantly lower than that of non-immigrant pupils, which is in line with the international trend. However, the difference is not statistically significantly different when gender and socio-economic factors are accounted for.

Pupils whose ethnicity was Mixed or White achieved, on average, higher mean reading scores than pupils from other ethnic groups, and significantly outperformed Asian and Black pupils. Pupils who spoke a language other than English at home also scored significantly less well in reading than pupils who spoke English at home. These analyses do not take account of other background characteristics, and in particular socio-economic status, which is likely to be an explanatory factor for differences in scores, as was the case for immigration background.

Pupils' attitudes and wellbeing

Pupils in England were more confident in their reading ability than the OECD average, with a higher percentage agreeing with the statements that they were good readers and could understand difficult texts. They did, however, have more negative attitudes towards reading, with a lower proportion agreeing that reading was a favourite hobby and that they liked talking about books. Pupils reported reading online materials far more frequently than printed materials, in both England and the OECD. The most popular reading activity was chatting online, a frequent activity for 92% and 88% of pupils in England and the OECD respectively.

Pupils in England were, on average, less satisfied with their lives than pupils across the OECD countries. They were also more likely to feel miserable and worried and less likely to agree that their life has a clear meaning.

In comparison with the OECD average, pupils in England had similar expectations of their highest level of qualification, but were more likely to expect to have a professional job in the future.

Schools

In England, there were larger differences in reading achievement between pupils attending the same schools than there were between pupils in different schools, compared with the OECD average. This is to be expected in a largely comprehensive education system, compared with selective systems that generally show a much larger difference in achievement between schools. It was also more common in England for headteachers to report that pupils were grouped by ability within schools, either by grouping them into different classes or by grouping within classes, than the OECD average. Grouping by ability is again more likely to be the case in a comprehensive system in which individual schools have pupils with a wide range of abilities.

Headteachers in England reported fewer discipline problems or problems with either teacher or pupil behaviour than the OECD average. Pupils reported a similar incidence of bullying to the OECD average but showed a higher rate of disapproval of bullying behaviour.

Headteachers in England reported a greater availability of ICT resources than on average in the OECD and were less likely than the OECD average to report that teaching was hindered by inadequate or poorly qualified teachers or support staff.

PISA across the UK

There were no significant differences between mean scores for reading in England, Northern Ireland and Scotland, and all 3 were significantly above the OECD average.

The mean reading score in Wales was significantly lower than that of the other countries of the UK but not significantly different from the OECD average. In science and mathematics, the mean scores in England were significantly higher than the other countries of the UK and also higher than the OECD average. There were no statistically significant differences between Scotland, Wales and Northern Ireland, which again did not differ significantly from the OECD average.

In common with England, there was no significant change in the mean reading score in Northern Ireland and Wales since 2006. However, there was a significant improvement in the mean score for reading in Scotland compared with PISA 2015, following a similar sized fall between 2012 and 2015. In science, the mean score in England has remained stable while Scotland, Wales and Northern Ireland have shown a decline over successive cycles of PISA, each with mean scores in PISA 2018 that were significantly lower than those in PISA 2006. In mathematics, both England and Wales have shown improvements, with England's average score increasing between 2015 and 2018, and Wales's performance increasing compared to 2012, following a similar decrease between 2006 and 2012, while Scotland has declined significantly since PISA 2006 and Northern Ireland has remained broadly stable.

In all countries of the UK, girls significantly outperformed boys in reading, as was the case across the OECD countries. In science, girls significantly outperformed boys in Northern Ireland but there were no significant gender differences in England, Wales or Scotland. In mathematics, boys significantly outperformed girls in England and Scotland but there were no significant differences in Wales or Northern Ireland.

The gap in reading attainment between the most and least disadvantaged pupils was significantly smaller than the OECD average in Northern Ireland, Scotland and Wales, but the difference between England and the OECD average was not statistically significant.

Pupils in all countries of the UK had more negative attitudes towards reading than the OECD average, but pupils in England reported that they read more than those in the rest of the UK. Pupils in all UK countries were less satisfied with their lives than the OECD average, and had lower expectations of their highest level of qualification than pupils across the OECD.

Headteachers in Scotland reported more problems with pupil truancy and teacher absenteeism than those in the rest of the UK, while those in Wales reported greater shortages or inadequacies of educational materials (for example textbooks, IT equipment etc.). Principals in Northern Ireland reported more inadequacies with the physical infrastructure of their schools than headteachers in England, Wales and Scotland.

1 Introduction

This report presents the reading, mathematics and science results of the international comparison study PISA 2018 for 15-year-olds in England. The results for the United Kingdom as a whole are reported in the OECD's international reports.

Comparisons are made with other countries of the UK and some selected countries identified as of particular interest, for example, because of high achievement.

Chapter 1 gives background on the PISA study and its implementation in the UK. It also outlines the structure of the rest of the report.

1.1 What is PISA?

1.1.1 Background to PISA

The Programme for International Student Assessment (PISA) is a study of educational achievement organised by the Organisation for Economic Co-operation and Development (OECD). In England, Wales, Northern Ireland and Scotland, PISA 2018 was carried out on behalf of the respective governments by the National Foundation for Educational Research (NFER), which acted as the National Centre for PISA.

PISA assesses the knowledge and skills of pupils aged 15. Pupils are assessed on their competence to address real-life challenges involving reading, mathematics and science. PISA is carried out on a 3-year cycle. The first PISA study was in 2000 (supplemented in 2002) and was undertaken in 43 countries (32 in 2000 and another 11 in 2002). Since then, the number of participating countries has increased with 79 countries participating in PISA 2018. Each round of PISA focuses on one of the three areas in which knowledge and skills are assessed: mathematics, science and reading. The major domain for PISA 2018 was reading, with science and mathematics as minor subject domains.

The data collected through PISA enables governments to benchmark education policy and performance, to make evidence-based decisions and to learn from policies and practices in other countries. It is also of great value to academic and research communities and to participating schools.

1.1.2 Participating countries

Countries, regions and jurisdictions

The entities that participated in PISA were, in most cases whole countries, while in others they were regions of countries or separate jurisdictions. However, for ease of reference, throughout this report we refer to all participating entities as 'countries'.

Table 1.1 Countries that took part in PISA 2018

In PISA 2018, 79 countries took part. Of these, 37 were members of the OECD (marked with an asterisk in the following table). These countries were:

Countries A – G	Countries H – N	Countries P – V
Albania	Hong Kong (China)	Panama
Argentina	**Hungary***	Peru
Australia*	**Iceland***	Philippines
Austria*	Indonesia	**Poland***
Baku (Azerbaijan)	**Republic of Ireland***	**Portugal***
Belarus	**Israel***	Qatar
Belgium*	**Italy***	Romania
Bosnia and Herzegovina	**Japan***	Russian Federation
Brazil	Jordan	Saudi Arabia
Brunei Darussalam	Kazakhstan	Serbia
B-S-J-Z (China)[1]	**Korea***	Singapore
Bulgaria	Kosovo	**Slovak Republic***
Canada*	**Latvia***	**Slovenia***
Chile*	Lebanon	**Spain*[3]**
Colombia*	**Lithuania***	**Sweden***
Costa Rica	**Luxembourg***	**Switzerland***
Croatia	Macao (China)	Chinese Taipei
Cyprus[2]	Macedonia	Thailand
Czech Republic*	Malaysia	**Turkey***
Denmark*	Malta	Ukraine
Dominican Republic	**Mexico***	United Arab Emirates
Estonia*	Moldova	**United Kingdom***
Finland*	Montenegro	**United States***
France*	Morocco	Uruguay
Georgia	**Netherlands***	Vietnam[4]
Germany*	**New Zealand***	-
Greece*	**Norway***	-

Notes:

[1] B-S-J-Z (China) refers to the four Chinese provinces that participated (Beijing, Shanghai, Jiangsu and Zhejiang).

[2] Data for Cyprus was not available for analysis at the time of writing the national reports. However, Cyprus is included in the appendix tables and in the international reports.

[3] Reading data for Spain is not included in the international database or reports due to technical issues.

[4] Data for Vietnam is not fully included in the international database or reports due to a lack of consistency in the response pattern of some performance data; the OECD cannot yet assure full international comparability of the results (OECD, 2019b).

1.2 What does PISA measure?

Each round of PISA assesses pupils in reading, mathematics and science. The major domain for PISA 2018 was reading.

1.2.1 The PISA 2018 assessment framework

In each round of PISA, the OECD develops a new assessment framework for the major domain (reading in PISA 2018). This outlines the particular skills to be assessed and the way in which they will be measured. The PISA 2018 framework is available on the OECD website[1]. The framework for reading is also outlined in Chapter 2 of this report and described in more detail in Appendix A2, which also includes sample reading questions.

1.2.2 The PISA questionnaires

In addition to the PISA assessments in reading, mathematics and science, schools and pupils complete questionnaires, the content of which is also specified in the PISA 2018 framework.

The PISA pupil questionnaire[2], completed by all participating pupils, asks them about their background, their attitudes and feelings, their educational experiences and their future aspirations. In PISA 2018, pupils were asked in detail about their experiences of and attitudes towards reading, both inside and outside school.

The PISA school questionnaire is completed by the headteacher or a senior teacher and collects information on various aspects of school management and organisation and, for PISA 2018, focused in particular on the teaching of reading in schools.

1.3 How does PISA measure attainment?

In England, 5,174 15-year-old pupils in 170 schools completed a 2-hour computer-based assessment and pupil questionnaire. The majority of pupils who took part in the study were due to complete their GCSEs in 2019 while others were in the year below. While GCSEs tend to focus on assessing a pupil's knowledge based on the curriculum, PISA is

[1] PISA 2018 Assessment and Analytical Framework

[2] Referred to as the student questionnaire in international reports and databases.

designed to assess the application of the pupil's learning to real-life situations. In this section, we outline how PISA assesses pupils, and the steps taken to collect high quality data that is comparable across countries.

Differences between PISA and GCSEs

While both PISA and GCSEs assess pupils in reading, mathematics and science, there are several differences between the two assessments.

What is assessed: GCSEs (General Certificate of Secondary Education) assess pupils on content and skills defined by the national curriculum. PISA is not based on specific curriculum content in participating countries. Rather, it measures pupils' ability to apply their knowledge to solve problems in real-world situations.

The time of assessment: In England, the PISA assessment took place from October 2018 to January 2019. The majority of pupils who participated in PISA took GCSE exams in May/June 2019.

Mode of assessment: Pupils complete the PISA tests on computer, while GCSEs are paper-based examinations.

Importance of the assessment for pupils: Pupils do not receive individual results or feedback about their performance in PISA. In contrast, GCSEs are 'high stakes' exams, with pupils receiving a grade for each subject they enter.

Because of the low-stakes nature of PISA, pupils may make less effort than in examinations such as GCSEs. For this reason, pupils participating in PISA are asked to complete an 'effort thermometer' to indicate how much effort they had invested in the PISA assessment, and how much they would have invested if the scores were going to be counted in their school marks. The results are presented in Appendix F.

1.3.1 How PISA samples are chosen

Countries participating in PISA must follow strict international sampling procedures to ensure comparability between their samples. NFER worked closely with the international sampling contractor to ensure that England's sample was representative of its 15-year-old population.

NFER provided the international sampling contractor with a sampling frame (a list of all schools with eligible pupils), from which they selected a sample of schools, chosen at random to be representative of all schools in England, for example by school type and region. The aim of this is to achieve a sample of pupils which is representative of the population of 15-year-olds in schools.

The schools which had been selected in the sample were then invited to participate in the study. NFER used software supplied by the international PISA contractor to randomly select 40 pupils who met the PISA age definition within each school that agreed to take part. In England, the majority of pupils were in Year 11. The aim of the PISA sampling is to obtain a nationally representative sample of pupils in the age group, rather than a pupil sample that is representative at school level.

PISA 2018 response rates

The final school response rate for the UK was 87%. This was slightly below the OECD's target participation rate and NFER was asked to submit a non-response bias analysis, analysing differences between responding and non-responding schools, and between originally sampled schools and schools selected to replace those which had been unable to participate, from back-up samples drawn by the OECD. The OECD's Technical Advisory Group was satisfied that this analysis demonstrated that no notable bias would result from the non-response. The OECD therefore agreed that the UK data should be included as fully comparable to other countries' data in the international reports.

The minimum pupil response rate required was 80% and the final UK rate of 83% fully met this target.

Full details of sampling procedures and the numbers of participating schools and pupils are in Appendix A5.

1.3.2 How PISA assesses pupils

PISA uses a common set of assessments and questionnaires in all participating countries. Each country was responsible for adapting and translating these materials and the international contractors then verified the adapted and translated materials. All procedures affecting assessment conditions were standardised across countries and carefully monitored.

The OECD's international contractors led the development of new questions for assessing reading, the major domain in PISA 2018. Participating PISA countries were invited to submit questions that were then added to those developed by the OECD's experts and contractors. The international contractors and participating countries reviewed these questions and checked them for cultural bias. Those deemed suitable were then trialled as part of a field trial conducted during 2017 in all participating countries. If any questions proved to have been too easy or too hard in certain countries, they were dropped from the main study in all countries.

For mathematics and science, which were minor domains in PISA 2018, questions from previous cycles were used. A set of reading questions used in previous cycles was also included so that trends in performance could be measured across PISA cycles.

The PISA assessments are computer-based and each pupil sits a 2-hour assessment. The OECD introduced computer-based assessment in PISA 2015, so PISA 2018 was the first cycle of electronic delivery with reading as the major domain. Pupils were presented with a variety of question formats in the assessment. Some questions were multiple choice, some required more detailed written responses and, since the introduction of computer delivery, some interactive simulations have been included. Examples of PISA 2018 questions are in Appendix A2.

PISA is designed with the aim of providing an assessment of performance at the system (or country) level. It uses a design in which the full set of assessment materials are distributed among different units; participating pupils are presented with different sets of these units. This approach enables the OECD to obtain a much greater coverage of the content than if all pupils completed the same version of the assessment. PISA is not designed to produce individual pupil scores, so it is not necessary for each pupil to receive exactly the same set of assessment questions.

An innovation in PISA 2018 was the introduction of an approach referred to as multi-stage adaptive testing (MSAT) for the assessment of reading. This type of adaptive testing is particularly well suited for assessments that consist of units that, in turn, are composed of multiple questions, some of which may require human coding (marking). The computer bases decisions about which unit to present to a pupil, on his or her performance on a set of questions. This gives a better assessment of a pupil's ability, since the flow of assessment questions is adapted to the pupil's ability so that questions are neither too easy nor too difficult.

Differences between PISA and PIRLS

Since the main focus in PISA 2018 is on reading, it is of interest to consider differences between PISA and PIRLS, the other major international assessment of reading for pupils in schools. These differences lie mainly in the age groups included and the approach to identification of the content of assessment.

The **Progress in International Reading Literacy Study** (PIRLS) is a study of reading for pupils at age 9-10 and has a 5-yearly cycle. In the UK, England and Northern Ireland took part in the most recent PIRLS study in 2016 (McGrane *et al*., 2017; Sizmur *et al*., 2017).

The **Programme for International Student Assessment** (PISA) is a study of reading, science and mathematics at age 15 and has a 3-yearly cycle.

PIRLS is run by the IEA[3] and aims to assess the reading ability of pupils in particular year groups (grades), so is based on the curriculum content in the participating countries. The samples are grade-based and participating pupils are in Year 5 in England and Primary 6 in Northern Ireland.

PISA is run by the OECD and aims to measure the application of knowledge to real-life situations, and the preparedness of young people for society, further study and the workplace. The sample is age-based (15-year-olds).

[3] The International Association for the Evaluation of Educational Achievement

1.4 Organisation of this report

Chapters 2, 4 and 5 describe PISA results for reading, science and mathematics in England. Chapter 3 discusses pupils' responses to the pupil questionnaire, in particular, responses on attitudes towards reading and performance by pupil characteristics, such as socio-economic status. Chapter 6 presents responses by headteachers to the school questionnaire and also describes aspects of the school environment, such as bullying and school discipline. In Chapter 7 we compare and discuss the PISA results in all 4 countries of the United Kingdom.

The international tables and figures presented in the appendices of this report include the results for the United Kingdom since these are reported in all international tables. In most cases, tables and figures in the appendices also include results for England, Wales, Northern Ireland and Scotland.

In each chapter of this report, we make comparisons between the results for England and the OECD average. This is the average of the 37 members of the OECD. This is more useful than a comparison with all participating countries as it enables comparison with similarly developed countries. We also include comparisons with specific individual countries where such comparisons help to illustrate and interpret the results in England.

The OECD average

Since 2010, 7 countries have joined the OECD (Chile, Colombia, Estonia, Israel, Latvia, Lithuania, and Slovenia) meaning there are now 37 OECD members. Where applicable within this report, we will make comparisons to the average of these 37 members (referred to as the 'OECD average'). When making comparisons with previous PISA cycles, where possible, the current OECD member countries will be used as the 'OECD average', to ensure consistent comparisons over time. However, for some of the trend information, data is not available for all 37 countries, so the OECD average will be based on the countries with available data. This means the OECD averages used in this report for PISA 2015 and earlier cycles may be different to those used in previous PISA reports. The national reports for previous cycles will include a different number of countries within the OECD average, since they were based on OECD membership at the time.

More detailed analyses of international results can be found in the OECD report on PISA 2018, which also includes results for the United Kingdom (OECD, 2019b, OECD 2019c, OECD 2019d). The results from the separate countries of the UK are reported in an Annex to the international report.

The OECD and its international contractors analyse and report on the data collected in each country. This analysis includes mean scores for reading, mathematics and science, distribution of pupils' performance, and changes in performance in countries over time. The OECD also analyses and reports on a range of variables such as the effects of socio-economic background, school management and pupil attitudes.

The OECD has published full details of how this analysis is done in the Technical Report (OECD, forthcoming). The full international results are available on the OECD website.

Interpreting differences between countries

It is important to know what can reasonably be concluded from the PISA data and which interpretations would be going beyond what can be reliably supported by the results. Some important points need to be kept in mind while reading this report.

Sources of uncertainty

There are 2 sources of uncertainty which have to be taken into account in the statistical analysis and interpretation of any test results. These are described as *sampling error* and *measurement error*. The use of the term 'error' does not imply that a mistake has been made; it simply highlights the necessary uncertainty.

Sampling error stems from the inherent variation of human populations which can never be summarised with absolute accuracy. It affects virtually all research and data collection that makes use of sampling. Only if every 15-year-old in each participating country had taken part in PISA could it be stated with certainty that the results are totally representative of the attainment of the entire population of pupils in those countries. In reality, the data was collected from a sample of 15-year-olds. Therefore, the results are a best estimation of how the total population of 15-year-olds could be expected to perform in these tests. There are statistical methods to measure how good the estimation is. It is important to recognise that all data on human performance or attitudes which is based on a sample carries a margin of error.

Measurement error relates to the results obtained by each individual pupil. It takes account of variations in their score which are not directly due to underlying ability in the subject, but which are influenced by other factors related to individuals or to the nature of the tests or testing conditions.

Interpreting rank order: the importance of statistical significance

Because of the areas of uncertainty described above, interpretations of very small differences between 2 sets of results are often meaningless. Were they to be measured again it could be that the differences would turn out the other way round. For this reason, this report focuses mainly on *statistically significant* differences between mean scores rather than the simple rank order of countries. Statistically significant differences are unlikely to have been caused by random fluctuations due to sampling or measurement error.

When statistical significance is reported, it indicates that the compared mean scores are significantly different at the 5% level.

Where statistically significant differences between countries are found, these may be the result of a number of factors. The data for some of these factors were not collected in the PISA survey. Therefore, the PISA survey is only able to explain the reasons for differences between countries to a limited extent. For example, differences in school systems and educational experiences in different countries could play a part, as could a wide range of different out-of-school experiences, details of which are not included in the data collection. It is important to bear this in mind while reading this report.

It is also important to remember that changes in ranking over time may be because of changes in which countries participate in each cycle.

2 Reading

Chapter outline

This chapter reports the reading attainment of pupils in England. It draws on findings outlined in the PISA International report (OECD, 2019b) and places outcomes for England in the context of those findings. Throughout the chapter, comparisons are made between the findings for PISA 2018 and previous cycles.

Key findings

Overall reading performance

- In 2018, pupils in England achieved a mean score of 505 in reading. This was significantly above the OECD average (487).
- England's 2018 mean reading score had increased by 5 score points since 2015, and 10 score points since 2009, but these differences were not statistically significant.
- Reading scores in England and the OECD have not changed significantly since 2006. However, England now outperforms the OECD average by 18 score points, compared to 10 score points in 2015, based on current OECD membership.

Gender gap

- Girls significantly outperformed boys in all participating countries.
- England's gender gap (20 score points) was significantly lower than the OECD average (30 score points).

Attainment gap between the highest and lowest achievers

- The attainment gap in England was similar to the OECD average.
- High-achieving pupils scored significantly higher in 2018 than in 2009, when reading was last the major domain. However, the scores among the lower achievers have remained stable over time.

Proficiency levels

- England had a significantly higher proportion of pupils working at Levels 5 and 6 (of the PISA proficiency levels) than the OECD average, and a significantly lower proportion of pupils working below Level 2.

Reading subscales

- In England, pupils showed relative strengths in the reading skill of 'evaluating and reflecting' (513) but were less strong in 'understanding' (499).
- Pupils also had higher mean scores for multiple-source texts (509) than for single-source texts (500); this was also seen internationally.

Reading performance in relation to other countries

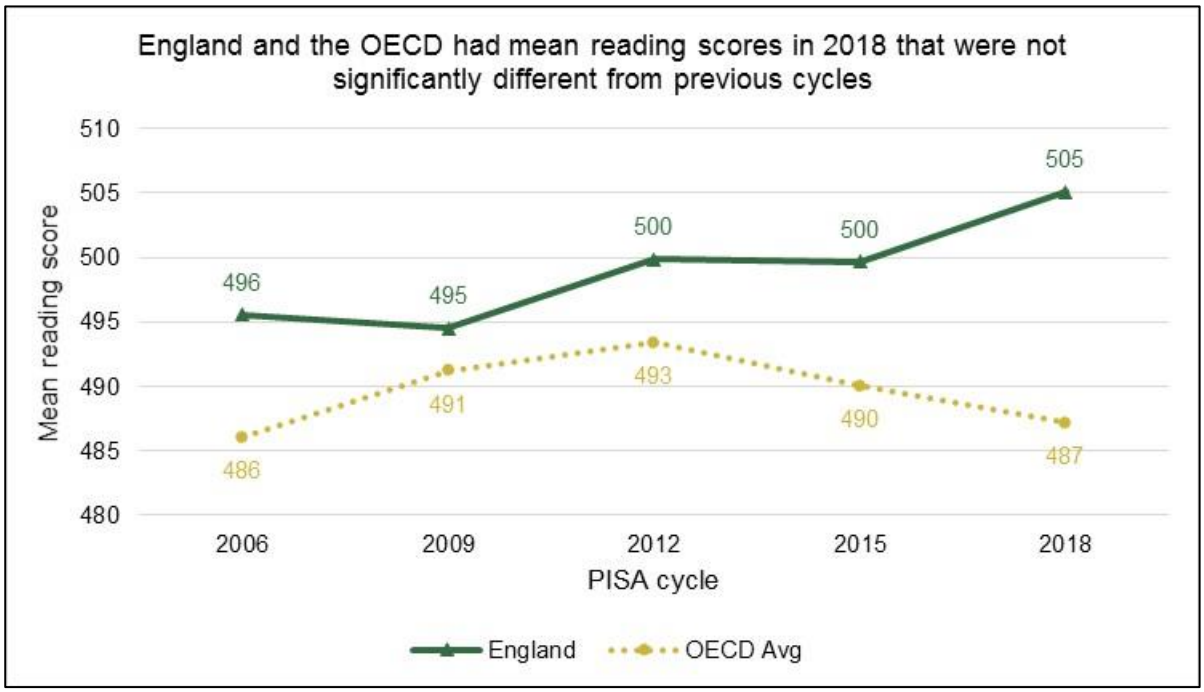
- Compared to other participating countries, 9 scored significantly higher than England (this compares with 12 in 2015). Ten countries performed at a level that was not significantly different from that of England, while the remaining 56 countries performed significantly less well.
- Of the countries that performed similarly to England in 2009, the last time reading was a major domain, 6 scored significantly below England in 2018, 6 performed similarly and 2 outperformed England.

2.1 England's performance in reading

England has maintained a similar level of performance in reading as seen in previous cycles of PISA. Whilst the score has increased, there has been no significant[4] change since 2006. In 2018, England's pupils achieved a mean score of 505 in reading, which was significantly above the OECD average (487)[5], as it was for the first time in 2015 (Jerrim *et al.,* 2016). Trends for reading are shown in Figure 2.1.

[4] When statistical significance is reported, it indicates that the compared means are significantly different at the 5% level.
[5] The 2018 OECD average is based upon the AV36a results published in the OECD International results Table 1.B1.10.

Figure 2.1 Trends over time in reading scores in England and the OECD[6]



Source: PISA 2018 database; Bradshaw *et al*., 2007; Bradshaw *et al*., 2010; Wheater *et al*., 2014; Jerrim *et al*., 2016

Key point

In 2018, England performed significantly above the OECD average for reading, as it did for the first time in 2015.

2.2 Reading in PISA 2018

'Reading literacy is understanding, using, evaluating, reflecting on and engaging with texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society' (OECD, 2019b).

Reading was the major domain of the OECD PISA study in 2018. Full details of how PISA assesses reading, including how PISA defined and measured reading literacy, and

[6] Note: the OECD average for 2018, 2015 and 2012 is based upon AV36a results presented in the OECD International results Table 1.B1.10 made up of 36 OECD countries (not including Spain, see the OECD International report for more details). See Chapter 1 for further information on the countries included in the 2018 OECD average. The OECD average for 2009 is based upon the AV35a results (excluding Austria and Spain), and the OECD average for 2006 is based upon the AV35b results (excluding the United States and Spain), both are also presented in the OECD International results Table 1.B1.10.

differences between the PISA 2018 reading test and that of previous PISA assessments are provided in Chapter 1 of the OECD International report (OECD, 2019b). A brief summary of key points[7] is provided below.

PISA conceives reading as a broad set of competencies that allows readers to engage with written information, presented in one or more texts, for a specific purpose. To engage with what they read, readers must understand what is written and integrate this with their pre-existing knowledge. They must examine the author's (or authors') intention and decide whether the text is reliable and truthful, and whether it is relevant to their goals or purpose. PISA also recognises that reading is a daily activity for most people, and that education systems need to prepare pupils to be able to adapt to the variety of scenarios in which they will need to read as adults, and be motivated and able to read for a variety of purposes.

Reading was the major domain in 2000, the first year PISA was conducted, and again in 2009 and 2018. The nature of reading has evolved significantly over the past decade, due to changes in technology, the use of electronic devices and the increasing need for readers to engage in a greater variety of reading tasks, such as triangulating different sources, navigating through ambiguity, distinguishing between fact and opinion, and constructing knowledge. As a result, the ways PISA measures competency in reading, or reading literacy, have had to adapt to these changes.

In 2009, about 85% of pupils in OECD countries reported that they had access to the internet at home. By 2018, that proportion had risen to over 95%. The rapid digitalisation of communication impacts on the kind of information literacy skills that young adults need, and has changed the ways people read and exchange information. Reading today requires the use of complex information-processing strategies, including the analysis, synthesis, integration and interpretation of relevant information from multiple sources. The nature of texts and the type of problems included in the PISA 2018 assessment of reading reflect the evolving nature of reading in increasingly digital societies.

2.2.1 Changes between 2009 and 2018 in the PISA assessment of reading

The PISA 2018 reading literacy framework was similar in many respects to the PISA 2009 reading literacy framework, which was also used in PISA 2012 and 2015. There were, however, some changes in how the reading assessment was implemented. The major differences between the 2009 and 2018 assessments were:

- a greater emphasis, in 2018, on multiple-source texts, that is, texts composed of several units of text, created separately by different authors. These types of text

[7] Adapted from the PISA 2018 International report (OECD, 2019b).

are more prevalent in the information-rich digital world, and the digital delivery of the PISA 2018 reading assessment made it possible to present them to pupils, helping to expand the range of higher-level reading processes and strategies measured. The assessments included searching for information across multiple documents, integrating across texts to generate inferences, assessing the quality and credibility of sources, and handling conflicts across sources.

- the explicit assessment of reading fluency, defined as the ease and efficiency with which pupils can read text.
- the use of adaptive testing, whereby the electronic test form that a pupil saw depended on his or her answers to earlier questions.
- the digital, on-screen delivery of text, which facilitated the first and third changes listed above. The 2009 assessment was conducted on paper, while the 2018 assessment was conducted on computer. Pupils had to use navigational tools to move between passages of text, as there was often too much text to fit onto one screen.

The PISA assessment covers different types of texts and tasks over a range of difficulty levels. It also requires pupils to use a variety of processes, or different ways in which they cognitively interact with the text. Full details of the PISA reading literacy framework, and the research that underlies it, are available in Chapter 1 of the OECD International report (OECD, 2019b).

In this chapter, we present England's performance in the PISA reading assessment and compare it with the OECD average. This will include examining mean scores, the distribution of scores, performance on the PISA reading processes, gender differences and an overview of how average reading performance has changed over time. Additionally, where relevant, the results from a range of other countries are drawn on for comparison to England.

Outcomes for the United Kingdom as a whole are presented in the International report (OECD, 2019b) and in the appendices that accompany this chapter (Appendix B). Outcomes for England (and the other 3 UK countries) were derived from the 'sub-national' level analysis carried out by the international consortium, as well as from additional analysis carried out by NFER using the international dataset. Comparisons between the 4 UK countries are provided in Chapter 7.

2.3 International results

Of the 75 other reported[8] participating countries, 9 scored significantly higher than in England (B-S-J-Z (China), Singapore, Macao (China), Hong Kong (China), Estonia, Canada, Finland, Republic of Ireland and Korea). Ten countries performed at a level that was not significantly different from that of England, while the remaining 56 countries performed significantly less well. These are shown in Table 2.1[9]. Only 4 participating countries had reading scores significantly higher than they had in 2015; these were Singapore, Macao (China), Turkey and the Republic of North Macedonia, with increases of 14, 16, 37 and 41 score points respectively.

Among OECD countries, 5 outperformed England, 9 performed similarly and 21 performed less well. This indicates that in terms of reading achievement, England, while not among the highest-achieving group of countries internationally, compares favourably with other OECD countries. Only one OECD country, Turkey, showed significant improvement in reading since 2015, but scores declined significantly in 7 OECD countries (Japan, Norway, Slovenia, Netherlands, Latvia, Luxemburg and Colombia).

Of the 9 participating countries with mean reading scores that were significantly higher than England's, 2 were English speaking (Republic of Ireland and Singapore) and one has a substantial number of English speakers (Canada). The mean scores of other English speaking countries (New Zealand, the United States, and Australia) were not significantly different from England's.

Compared to previous cycles, England was outperformed by fewer countries in 2018 than in 2015 (12 countries) (Jerrim *et al.,* 2016) and 2012 (17 countries) (Wheater *et al.,* 2013). In fact, in 2018, pupils in England performed similarly to those in 4 countries that had outperformed them in 2015 (New Zealand, Japan, Norway and Germany). Additionally, England outperformed 7 countries in 2018 that had had similar scores to England in 2015 (Slovenia, Belgium, France, Portugal, Netherlands, Switzerland and Russian Federation).

Key point

In 2018, 9 countries outperformed England in reading. This compares to 12 in 2015 and 17 in 2012. The mean reading score in England was not significantly different from the mean scores of 4 countries that had significantly outperformed England in 2015, and England outperformed 7 countries in 2018 that had had similar scores in 2015.

[8] Whilst Vietnam and Cyprus did participate in PISA 2018, their results are not included in this report. Additionally, reading results are not available for Spain. See Chapter 1 for further details of the countries included in this report.
[9] Note: Please refer to section 1.4 in Chapter 1 when interpreting these results.

Table 2.1 PISA International results for reading

Note: ^v Indicates a significant change in reading since PISA 2015, = indicates no significant change.

Participants with significantly HIGHER reading scores than England

Country	Scale score	^v	Country	Scale score	^v
*B-S-J-Z (China)**	555	=	Canada	520	=
Singapore	549	^	Finland	520	=
Macao (China)	525	^	Republic of Ireland	518	=
Hong Kong (China)	524	=	Korea	514	=
Estonia	523	=	-	-	-

Participants with SIMILAR reading scores to England (not statistically significantly different)

Country	Scale score	^v	Country	Scale score	^v
Poland	512	=	Australia	503	=
Sweden	506	=	*Chinese Taipei*	503	=
New Zealand	506	=	Denmark	501	=
United States	505	=	Norway	499	v
England	**505**	=	Germany	498	=
Japan	504	v	-	-	-

Participants with significantly LOWER reading scores than England

Country	Scale score	^v	Country	Scale score	^v
Slovenia	495	v	Hungary	476	=
Belgium	493	=	Lithuania	476	=
France	493	=	Iceland	474	=
Portugal	492	=	*Belarus*	474	=
Czech Republic	490	=	Israel	470	=
OECD Average	**487**	=	Luxembourg	470	v
Netherlands	485	v	*Ukraine*	*466*	=
Austria	484	=	Turkey	466	^
Switzerland	484	=	Slovak Republic	458	=
Croatia	*479*	=	Greece	457	=

Country	Scale score	^v	Country	Scale score	^v
Latvia	479	v	Chile	452	=
Russian Federation	479	v	Mexico	420	=
Italy	476	=	Colombia	412	v
-	-	-	Plus 31 other countries	<450	-

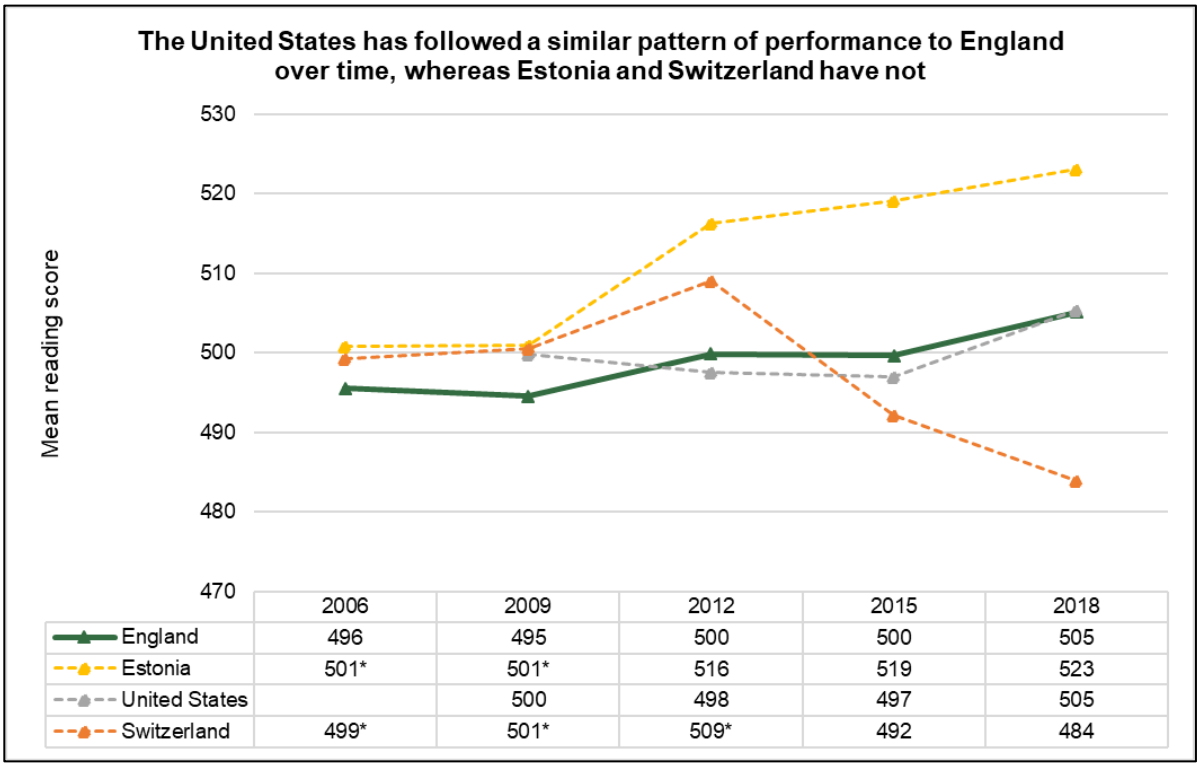
Countries not in OECD (italicised). OECD countries (not italicised). OECD countries are identified in Table 1.1 with an asterisk.

** B-S-J-Z (China) different provinces from 2015*

Source: PISA 2018 database

The last time reading was the major domain in PISA was 2009. It is useful, therefore, to look at longer term trends from 2009 and other cycles where relevant. There were 14 countries that performed similarly to England in 2009 (Bradshaw *et al.,* 2010). In 2018, 2 of these outperformed England (Estonia and Republic of Ireland), 5 performed significantly below England (Switzerland, Iceland, France, Hungary and Portugal) and 6 performed similarly to England again (Poland, the United States, Sweden, Germany, Chinese Taipei and Denmark). One country, Liechtenstein, did not participate in 2018. Whilst some of this group had significantly lower scores in 2018 than in 2009 (such as Hungary, France and Chinese Taipei), some had significantly higher scores (Estonia, Republic of Ireland and Poland) showing different patterns of performance. Figure 2.2 shows the trend in performance for 3 of these countries: one which has improved significantly since 2009, one which has significantly declined and one which has followed a similar pattern to England.

Figure 2.2 Trends in reading scores for a selection of countries that performed similarly to England in 2009



	2006	2009	2012	2015	2018
England	496	495	500	500	505
Estonia	501*	501*	516	519	523
United States		500	498	497	505
Switzerland	499*	501*	509*	492	484

* Indicates a score that is significantly different from the given country's 2018 score

Source: PISA 2018 database; Bradshaw *et al*., 2007; Bradshaw *et al*., 2010; Wheater *et al*., 2014; Jerrim *et al*., 2016

As previously mentioned, England has maintained a similar pattern of performance in reading over time. This is also the pattern for the United States, which has performed similarly to England since participating in 2009. Switzerland, however, followed a different pattern. Its 2018 mean reading score was significantly below its 2006, 2009 and 2012 mean scores, showing a decline in performance. Until 2015, Switzerland performed similarly to England: 2018 was the first time it was significantly below England.

Although scoring similarly to England in 2009, Estonia significantly outperformed England in 2012, 2015 and 2018. Estonia has been on an upward trend in terms of performance, with a 2018 score significantly higher than its 2009 score.

Key point

Fourteen countries performed similarly to England in 2009. Of those countries which also participated in 2018, 2 outperformed England, 5 performed similarly and 6 performed significantly below.

2.4 Reading subscale scores in England

As reading was the major domain in 2018, pupils' scores were analysed separately by the different processes required for reading, as well as by their overall performance. England's overall mean score for reading was 505 score points.

The PISA 2018 reading literacy framework[10] identifies 4 processes that readers use when engaging with a text. These are 'locating information', 'understanding', 'evaluating and reflecting' and 'reading fluency'. The first 3 processes were included, in some way, in previous PISA frameworks. The latter process, 'reading fluency' underpins the other 3 processes and is included for the first time in the 2018 PISA reading literacy framework.

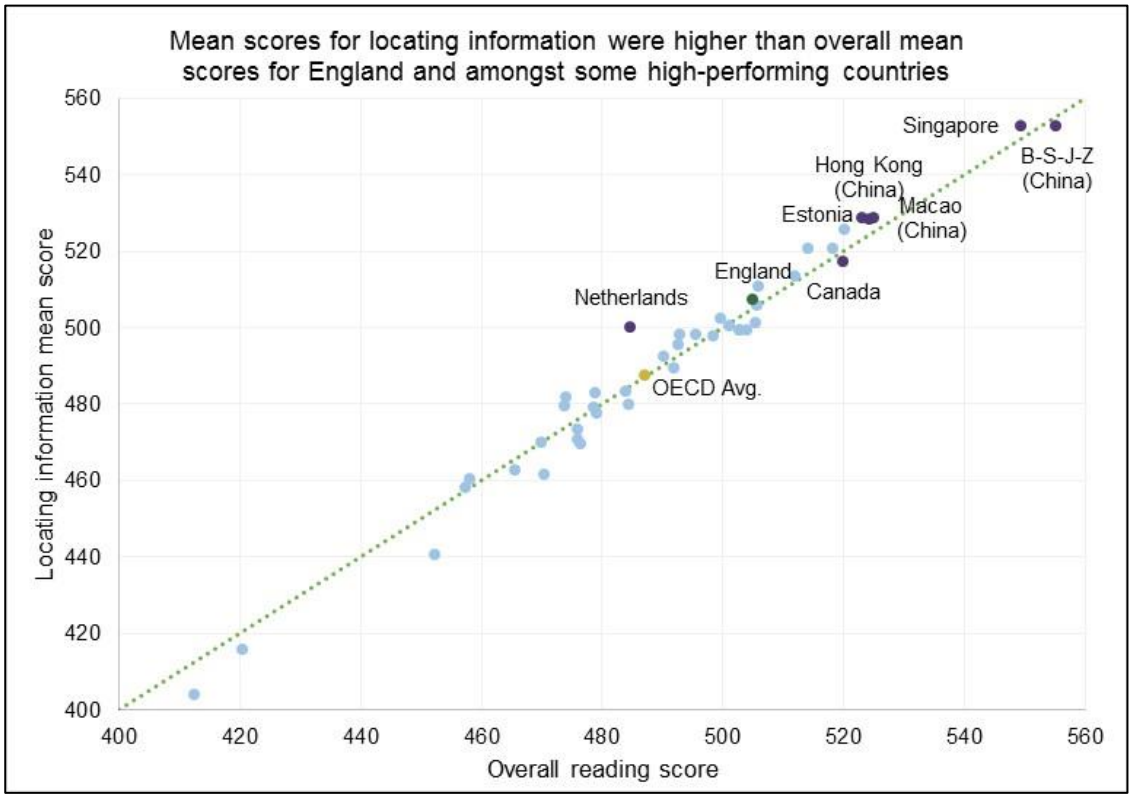
2.4.1 Locating information

The first cognitive reading process is 'locating information'. This was referred to as 'accessing and retrieving' in the 2009 PISA reading framework. Readers need to assess the relevance, accuracy and truthfulness of passages in order to find information as efficiently as possible. PISA 2018 breaks locating information into 2 cognitive processes:

- accessing and retrieving information within a piece of text, where readers need to scan a single text, retrieving a few words, phrases or numerical values. Overall comprehension of the whole text is not necessary as the target information usually appears verbatim.
- searching for and selecting relevant text, where readers need to consider several pieces of text. This has a particular place in digital reading, where the total amount of text available exceeds the quantity that readers can or need to process.

[10] Explanations of each of the subscales in this report are adapted from the PISA 2018 International report (OECD, 2019b).

Figure 2.3 Reading process subscale scores across countries: locating information



Note: This scatterplot includes all OECD countries and those with a mean score above 450

Source: PISA 2018 database

England's mean score for locating information (507) was higher than the overall mean score by 2 score points, whereas the OECD average for both was the same. In Figure 2.3, the closer a country's dot is to the diagonal line, the smaller the gap between scores. Most countries did not have a large difference in mean scores and there was no obvious pattern as to which score was higher. The Netherlands had a large difference, with a mean score for locating information that was 15 points larger than their overall mean score. Canada and B-S-J-Z (China) had scores for locating information that were slightly lower than their overall mean reading score, but this was not the pattern seen across some of the other highest-performing countries, such as Singapore, Macao (China), Hong Kong (China) and Estonia.

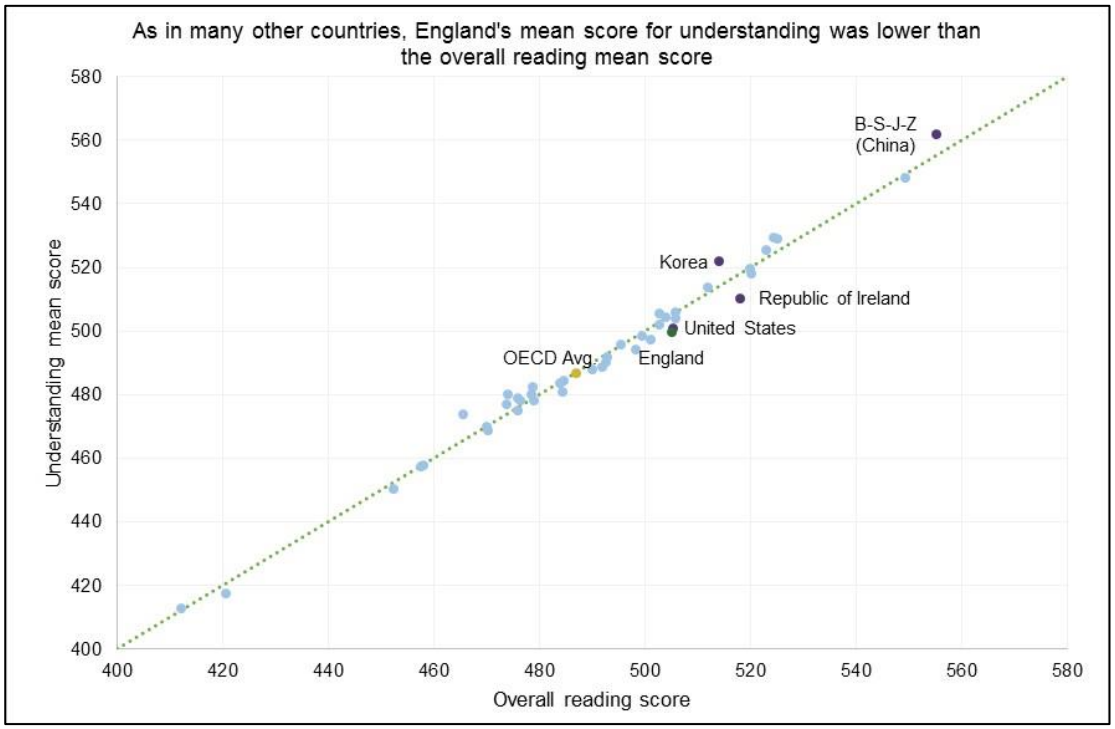
Since 2009, when reading was last the major domain, England's mean score for locating information (previously known as accessing and retrieving) has increased by 16 score points (Bradshaw *et al.,* 2010).

2.4.2 Understanding

The second process assessed in PISA is ‘understanding’, more commonly referred to as ‘reading comprehension’. In previous PISA frameworks this has been called ‘integrating and interpreting’. This is the ability to recognise the meaning conveyed in a passage. In the 2018 PISA reading literacy framework, 2 specific cognitive processes make up understanding:

- acquiring a representation of the literal meaning of a piece of text, where readers must paraphrase sentences or short paragraphs so that they match the target information desired by the task.
- constructing an integrated text representation, where readers work with longer passages to establish their overall meaning. Readers need to connect the information across various passages. This may also require readers to resolve conflicts between different texts.

Figure 2.4 Reading process subscale scores across countries: understanding



Note: This scatterplot includes all OECD countries and those with a mean score above 450

Source: PISA 2018 database

England’s pupils were weaker in understanding (499) than in locating information, with a mean 6 score points lower than their mean reading score. As Figure 2.4 shows, lower mean scores for understanding were seen in other countries such as the Republic of Ireland, the United States and with the OECD average (by 1 score point). However, high-performing countries such as Korea and B-S-J-Z (China) had mean scores in understanding that were higher than their overall mean scores, with differences of 8 and 7 score points respectively.

In 2009, pupils in England had a similar difference in mean scores as in 2018, with a mean on understanding (previously known as integrating and interpreting) 4 score points lower than the overall reading mean (Bradshaw *et al.,* 2010).

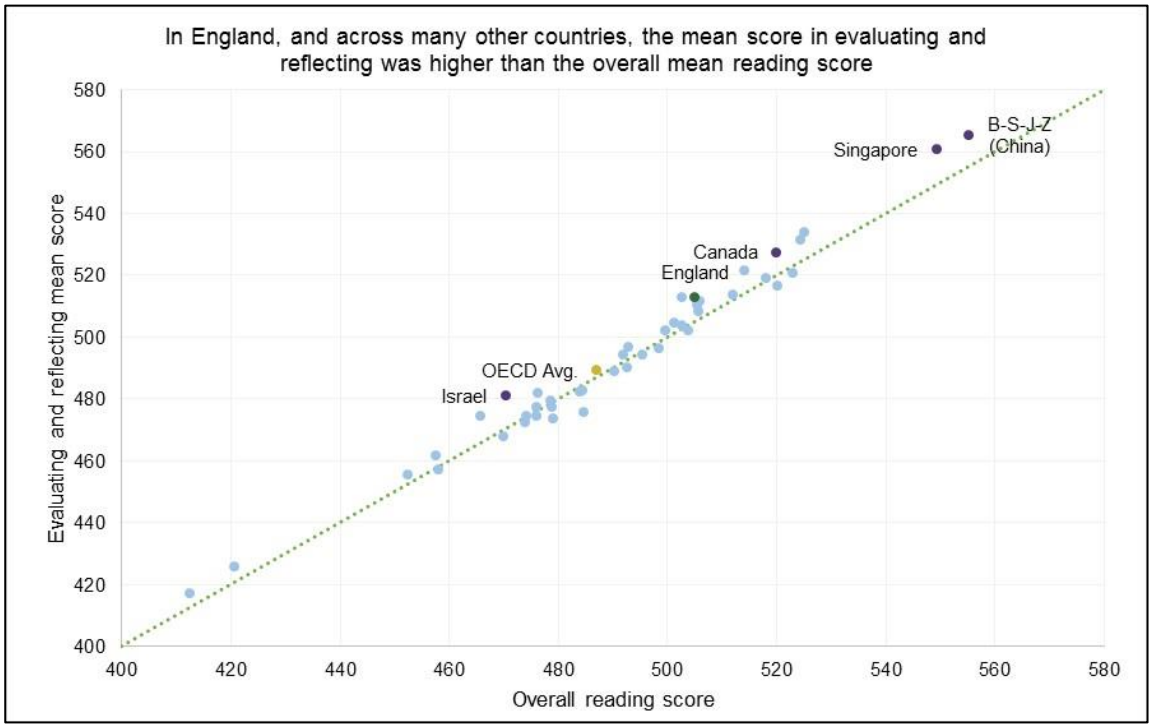
2.4.3 Evaluating and reflecting

The highest-level process assessed in PISA is 'evaluating and reflecting'. Readers need to go beyond understanding the literal or inferred meaning of a piece of text to assess the quality and validity of its content and form. This process has always been part of reading literacy but its importance has strengthened with the growth of digital reading.

There are 3 cognitive processes involved in evaluating and reflecting:

- assessing quality and credibility, where readers judge the validity of content, considering if it is accurate and / or unbiased.
- reflecting on content and form, where readers evaluate the quality and style of the text. This may require drawing on real-world knowledge and experience in order to consider different perspectives.
- detecting and handling conflict, where readers compare information across texts, recognising contradictions between pieces of text and managing such contradictions. This process is more commonly used when examining multiple-source text.

Figure 2.5 Reading process subscale scores across countries: evaluating and reflecting



Note: This scatterplot contains all countries either in the OECD or with a score above 450

Source: PISA 2018 database

England's pupils' highest score for a reading process was in evaluating and reflecting (513), with a mean that was 8 score points higher than the overall reading mean. This pattern was seen across many high-performing countries, such as Canada, Singapore, B-S-J-Z (China) and with the OECD average. Israel and Singapore both had the largest difference between mean scores (11 score points).

In 2009, England was also strongest in evaluating, with a difference of 10 score points above the overall mean (Bradshaw *et al.,* 2010).

Key point

England's pupils had mean scores for 'locating information' and 'evaluating and reflecting' that were higher than their overall mean score. Their mean score for 'understanding' was lower.

2.4.4 Reading fluency

The final process, 'reading fluency' was assessed for the first time in 2018. At the beginning of the reading assessment, pupils were presented with a variety of sentences, one at a time, and asked to determine if they made sense. Pupils had a short window in which to respond 'Yes' or 'No' before the next sentence was shown. The sentences were relatively simple and it was unambiguous whether they made sense or not. This section included sentences such as:

- Six birds flew over the trees.
- The window sang the song loudly.
- The man drove the car to the store[11].

Reading fluency was considered in pupils' overall scores but not included in the computation of subscale scores. For more information on reading fluency, see Chapter 1 of the OECD International report (OECD, 2019b).

2.4.5 Text classification

In 2009, reading texts were classified by 4 dimensions;

- medium: is the text delivered in print or electronic format?
- environment: was it composed by one author, a group of authors or disjointedly by multiple authors?
- text format: is it continuous prose, a non-continuous matrix of writing or a mixture?
- text type: why was it written and how was it organised?

In the PISA 2018 computer-based assessment of reading, all texts were read on screen and therefore the 'medium' dimension was no longer relevant. Consequently, the 2018 reading literacy framework was updated and classified texts by:

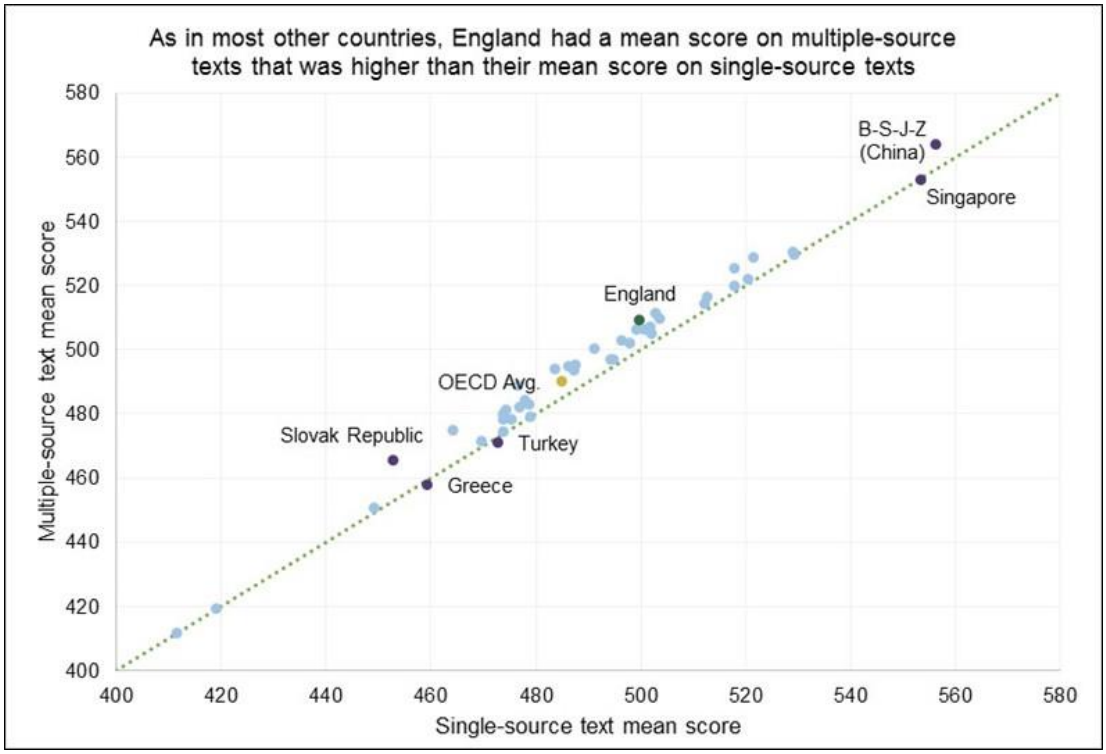
- source (similar to the previous classification of 'environment): Is the text composed of a single unit or multiple units?
- organisational and navigational structure: how readers move through all of the text when the screen can only display so much
- text format (as it was in the 2009 framework)
- text type (as it was in the 2009 framework).

[11] 'store' was adapted to 'shop' in England's version of the assessment.

2.4.6 Source

This section focuses on the source classification, that is, how countries performed on single and multiple-source texts.

Figure 2.6 Reading source subscale scores across countries: multiple-source texts vs single-source texts



Note: This scatterplot includes all OECD countries and those with a mean score above 450

Source: PISA 2018 database

As Figure 2.6 shows, England's pupils' mean score on multiple-source texts (509) was 9 score points higher than their mean score for single-source texts (500). This pattern was seen across many other countries, with the Slovak Republic and Switzerland having the largest gap of 12 score points and highest performer B-S-J-Z (China) having a gap of 8 score points. Singapore had a slightly higher mean score on single-source texts (by 1 score point), as did Greece and Turkey (both with a 2 score point difference).

Key point

Like England, most countries had higher mean scores for multiple-source texts than for single-source texts. Singapore, Turkey and Greece were exceptions to this.

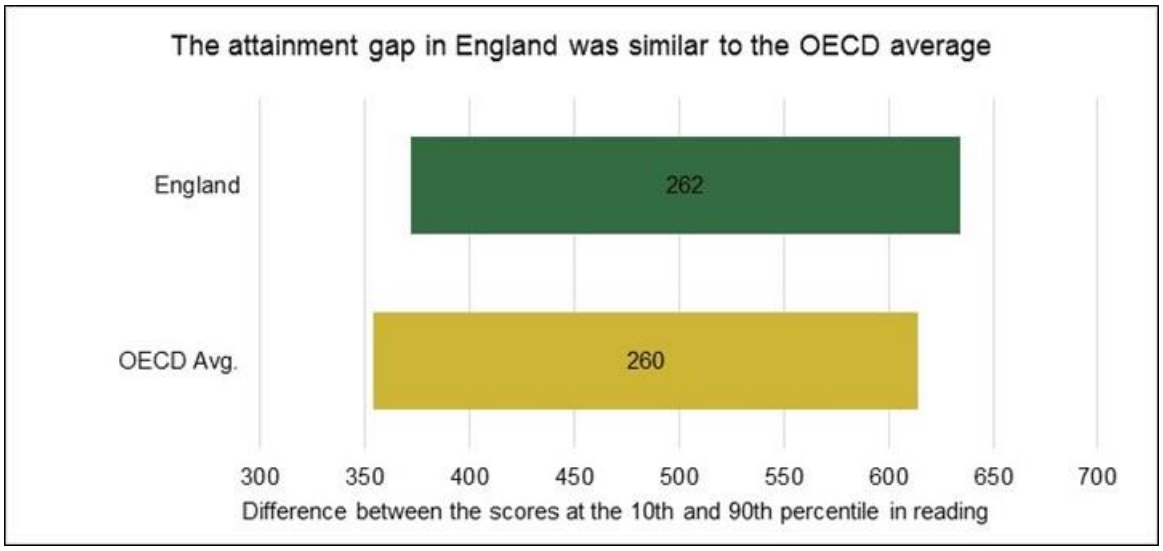
2.5 Differences between highest and lowest achievers

In addition to knowing how well pupils in England performed overall and across the different subscales assessed, it is also important to examine the spread in performance between the highest and lowest achievers. Amongst countries with similar mean scores there may be differences in the numbers of high- and low-scoring pupils (the highest and lowest achievers). A country with a wide spread of attainment may have large numbers of pupils who are underachieving as well as pupils performing at the highest levels. A country with a lower spread of attainment may have fewer very high achievers but may also have fewer low achievers.

2.5.1 Distribution of scores

The first way in which the spread of performance in each country can be examined is by looking at the distribution of scores. Appendix B shows the scores achieved by pupils at different percentiles. The 10th percentile is the score below which the lowest-performing 10% of pupils lay, while the 90th percentile is the score above which the highest-performing 10% lay. The difference between the highest and lowest achievers at the 10th and 90th percentiles is a better measure of the spread of scores for comparing countries than using the very lowest- and highest scoring pupils. The latter comparison may be affected by a small number of pupils in a country with unusually high or low scores. Comparison of the 10th and the 90th percentiles gives a better indication of the typical spread of attainment.

Figure 2.7 Attainment gap in reading scores in England and the OECD



Source: PISA 2018 database

The gap between England's highest- and lowest-achieving pupils was 262 score points, slightly larger, but not significantly different to, the OECD average of 260 score points. Lower achieving pupils in England (those at the 10th percentile) had a score of 372, while the mean score of those at the 90th percentile was 634. The OECD score at the 10th

percentile (354) was lower than England and that of the 90th percentile (614) was also below England's.

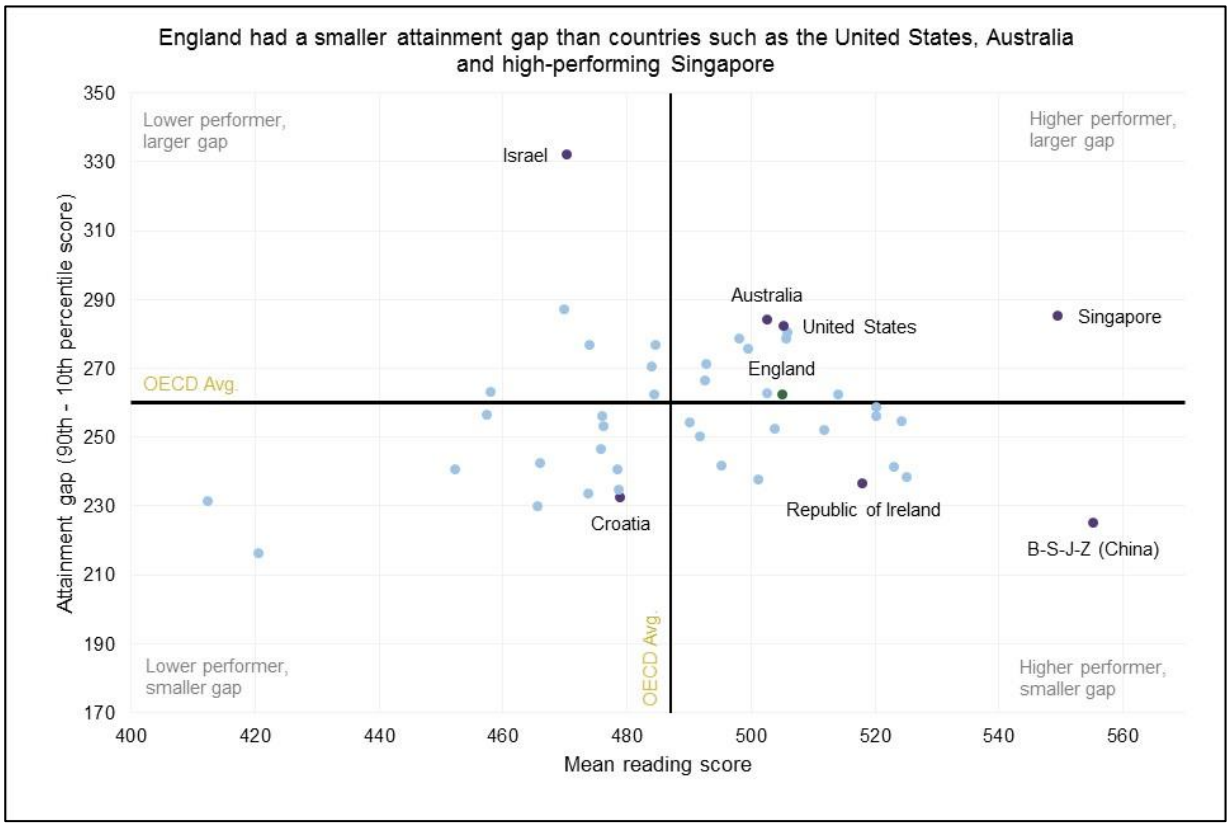
Over time, scores at the 90th percentile have changed in England. The 2018 score of pupils at the 90th percentile (634) was significantly higher than in 2009 (616). The score for pupils at the 10th percentile has not significantly changed over time, with a score of 370 in 2009 and 372 in 2018.

Key point

England's attainment gap was not statistically different from the OECD average.

Figure 2.8 compares countries' mean reading scores with the size of their attainment gap. Countries can be separated into 4 categories in relation to the OECD average: lower performing countries with a larger gap, lower performing countries with a smaller gap, higher performing countries with a larger gap and higher performing countries with a smaller gap, although some countries lie so close to the OECD average, that they may be more reasonably characterised as similarly performing, or with a similar attainment gap. England can be categorised as higher performing compared to the OECD with a similar attainment gap. Most countries clustered around the OECD average, although, some countries differed quite noticeably. For example, high-performer B-S-J-Z (China) had a lower attainment gap than many other countries, including England, whereas another high-performing country, Singapore, had a much wider gap. Israel, which scored significantly below England in reading had an attainment gap of 332 points, noticeably wider than any other country. Interestingly, England had a smaller gap than some of the countries that scored similarly overall, such as Australia and the United States.

Figure 2.8 Attainment gap in reading scores across PISA 2018 countries



Note: This scatterplot includes all OECD countries and those with a mean score above 450

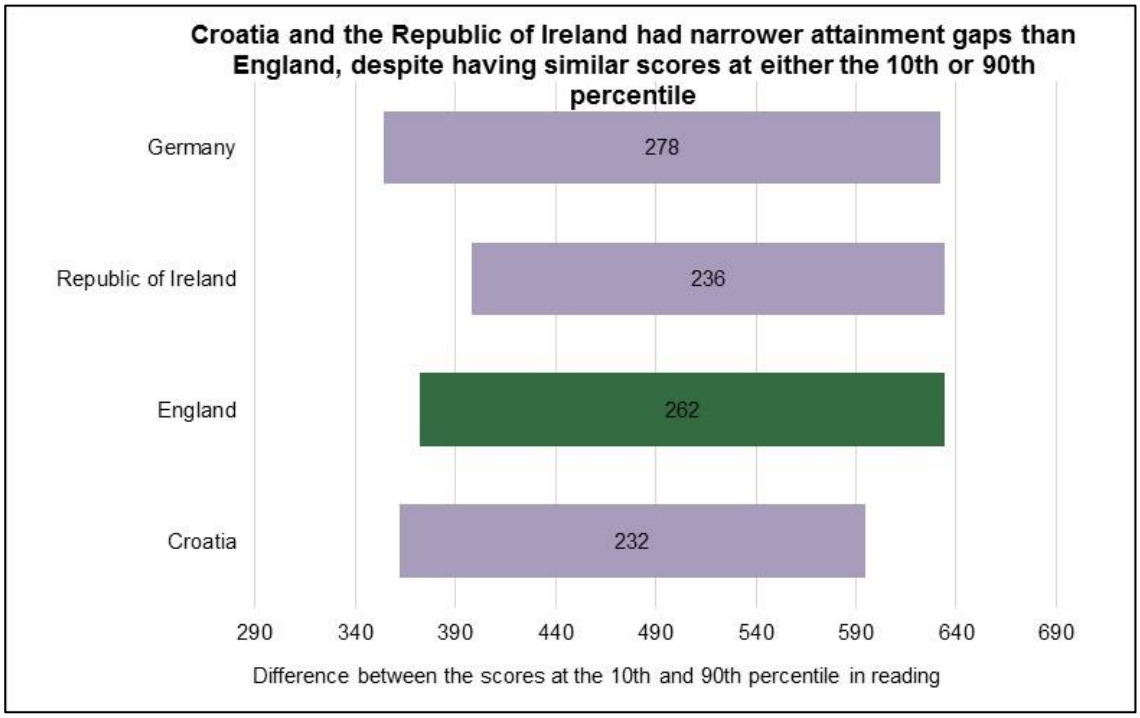
Source: PISA 2018 database

To further consider England's attainment gap and its relationship with its overall performance, scores for pupils at the 10th and 90th percentiles can be compared with those of other countries. Figure 2.9 shows countries with similar scores at either the 10th and 90th percentile to England. A country that performs similarly to England may have a different profile of performance when looking at high and low achievers. For example, scores for pupils at the 90th percentile in England and Germany are similar but pupils at the 10th percentile score lower in Germany than in England, making Germany's attainment gap wider.

Pupils at the 90th percentile in the Republic of Ireland have similar scores to England, yet those at the 10th percentile score much higher, meaning their gap is narrower than England's. This suggests their higher overall attainment, in comparison to England's, is driven by a higher performance at the lower end.

We also saw earlier how England's average score is significantly above that of Croatia's. Figure 2.9 illustrates how the difference between the 2 countries is based on higher performance in England at the 90th percentile as their scores at the 10th percentile are only 10 score points apart.

Figure 2.9 Attainment gap in countries with similar performance to England at either the 10th or 90th percentiles.



Source: PISA 2018 database

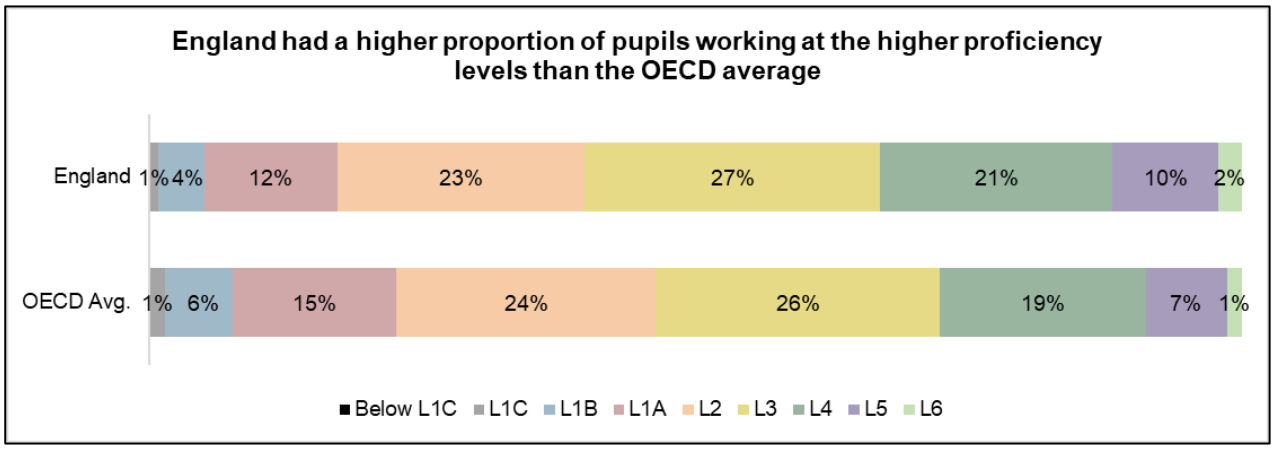
2.5.2 Performance across PISA proficiency levels

Proficiency levels for reading

The second way of examining the spread of attainment is by looking at England's performance at each of the PISA proficiency levels. The PISA proficiency levels are devised by the PISA Consortium. Reading attainment in PISA is described in terms of 8 levels of achievement (Levels 1-6, with Level 1 subdivided into 1a, 1b, and 1c). These performance levels are outlined in Appendix A3, along with the cumulative percentages at each level for the OECD average and for England. In 2018, an additional proficiency level was added, Level 1c. This was a result of the PISA for Development Programme (OECD, 2018a), which introduced less difficult questions and provided more information about the pupils who would previously have been classified as below Level 1b (see Chapter 5 of the OECD International report (OECD, 2019b) for more details).

Figure 2.10 shows the proportion of pupils at the different proficiency levels in England compared with the OECD average. Pupils who score below Level 2 are considered low performers and those that perform at Level 5 or above are considered top performers (OECD, 2019b).

Figure 2.10 Reading proficiency levels in England and the OECD



Note: All percentages are rounded.

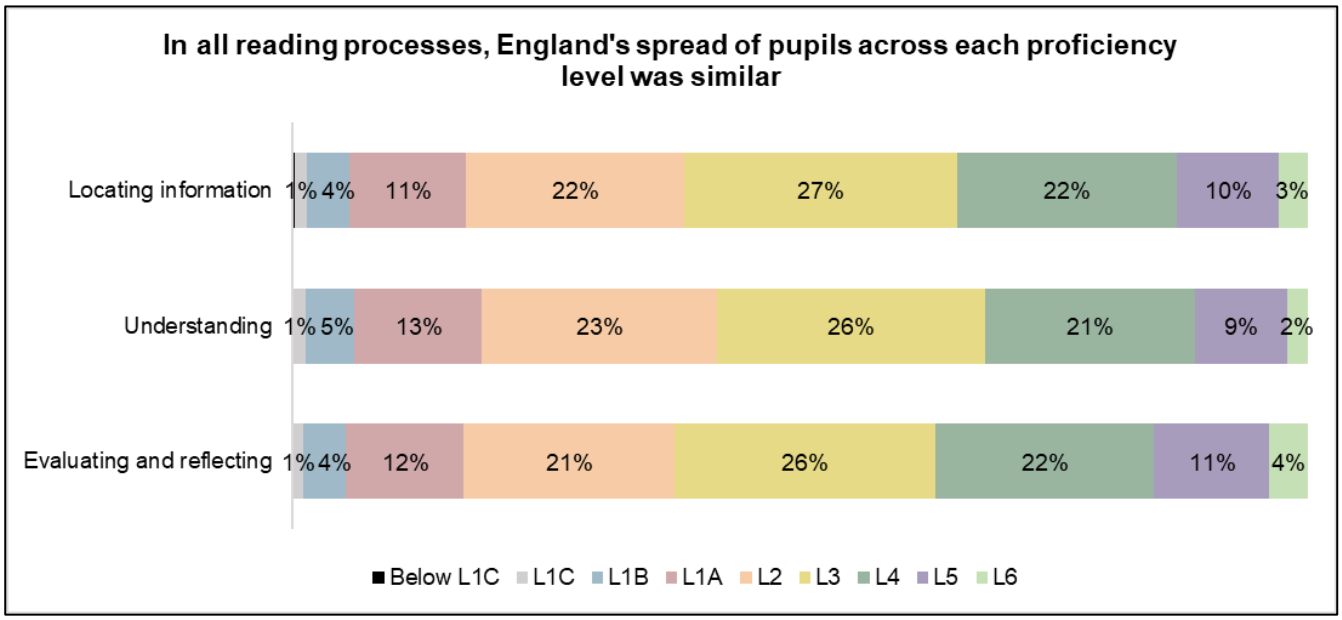
Source: PISA 2018 database

England had a significantly higher proportion of pupils working at the higher proficiency levels (Levels 5 and 6) than the OECD average, 12% and 9%[12] respectively. England had 17% of pupils working at the lower proficiency levels (below Level 2), and this was significantly lower than the OECD average of 23%[13].

The proportion of pupils at both the higher and lower proficiency levels has not significantly changed since 2015. The proportion achieving the high international benchmarks for reading in England has increased, but not significantly, from 10% in 2015 to 12% in 2018. Additionally, the proportion of pupils at Level 1a or below has changed by only 1 percentage point, from 18% in 2015 to 17% in 2018.

[12] after taking into account the rounding of figures
[13] after taking into account the rounding of figures

Figure 2.11 Reading proficiency levels by cognitive process in England



Note: All percentages are rounded.

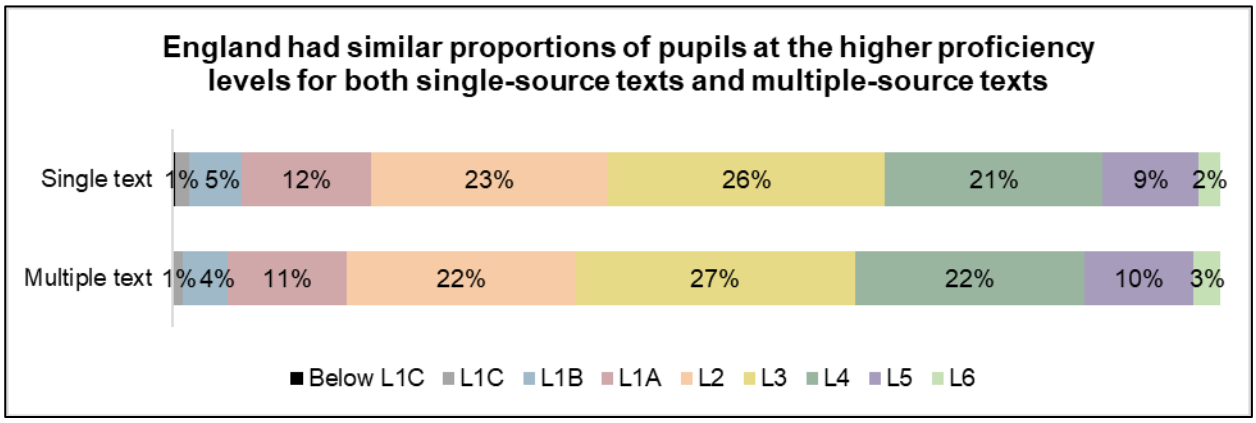
Source: PISA 2018 database

In general, pupils in England performed better in the evaluating and reflecting process and the locating information process than in understanding. Whilst all 3 processes have similar proficiency distributions, there were slightly higher proportions of pupils at the lower proficiency levels, and slightly lower proportions of pupils at the higher proficiency levels, in the understanding process than for the other 2.

The subscales for reading have changed since 2009 and are not directly comparable but, looking at locating information, understanding and evaluating and reflecting (2018), alongside 'accessing and retrieving', 'integrating and interpreting' and 'reflecting and evaluating' (2009) is possible. Similar broad patterns emerge that suggest improvements among higher-achieving pupils, but little change for lower achievers except, perhaps, a slightly lower proportion of pupils failing to demonstrate the most basic reading skills of locating and retrieving information (20% in 2009 compared with 17%[14] in 2018). The proportion of low achievers demonstrating the reading skills of interpretation and evaluation remains unchanged over time.

[14] after taking into account the rounding of figures

Figure 2.12 Reading proficiency levels by reading source in England



Note: All percentages are rounded.

Source: PISA 2018 database

In England, and across many other countries, pupils had higher scores for multiple-source texts than for single-source texts. However, the proportions of pupils at each proficiency level for both sources are similar. For example, 11% of pupils were working at the higher proficiency levels (Levels 5 and 6) for single-source texts, compared with 13% for multiple-source. Similarly, 19%[15] of pupils at the lower proficiency levels (below level 2) for single-source texts compared with 17%[16] for multiple-source.

The source subscales have a natural sequence; reading skills are developed first with single-source texts and reader's progress to multiple-source texts (OECD, 2019b). Pupils at Level 4 and above can typically draw information from multiple-source texts (see Appendix B).

2.6 Differences between boys and girls

In England, there was a significant difference between the mean reading scores for boys (495) and that for girls (515), a difference of 20 score points. This was significantly smaller than the OECD average gap of 30 points (with scores of 472 for boys and 502 for girls) as seen in Figure 2.13.

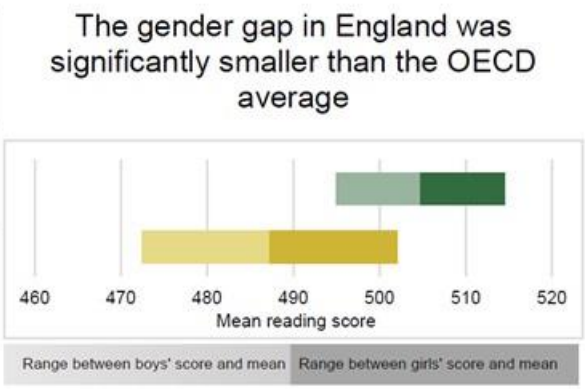
The mean score for boys was significantly higher in 2018 (495) and 2015 (488) than in 2009 (482) but mean scores for girls have remained similar over this time. However, the size of the gender gap for reading in 2018 was not significantly different from the gaps seen previously in the 2009, 2012 and 2015 cycles.

[15] after taking into account the rounding of figures
[16] after taking into account the rounding of figures

Figure 2.13 Gender differences in reading scores in England and the OECD

	Overall reading score	Mean score girls	Mean score boys	Difference girls - boys
England	505	515	495	+20*
OECD Avg.	487	502	472	+30*

*The difference is statistically significant

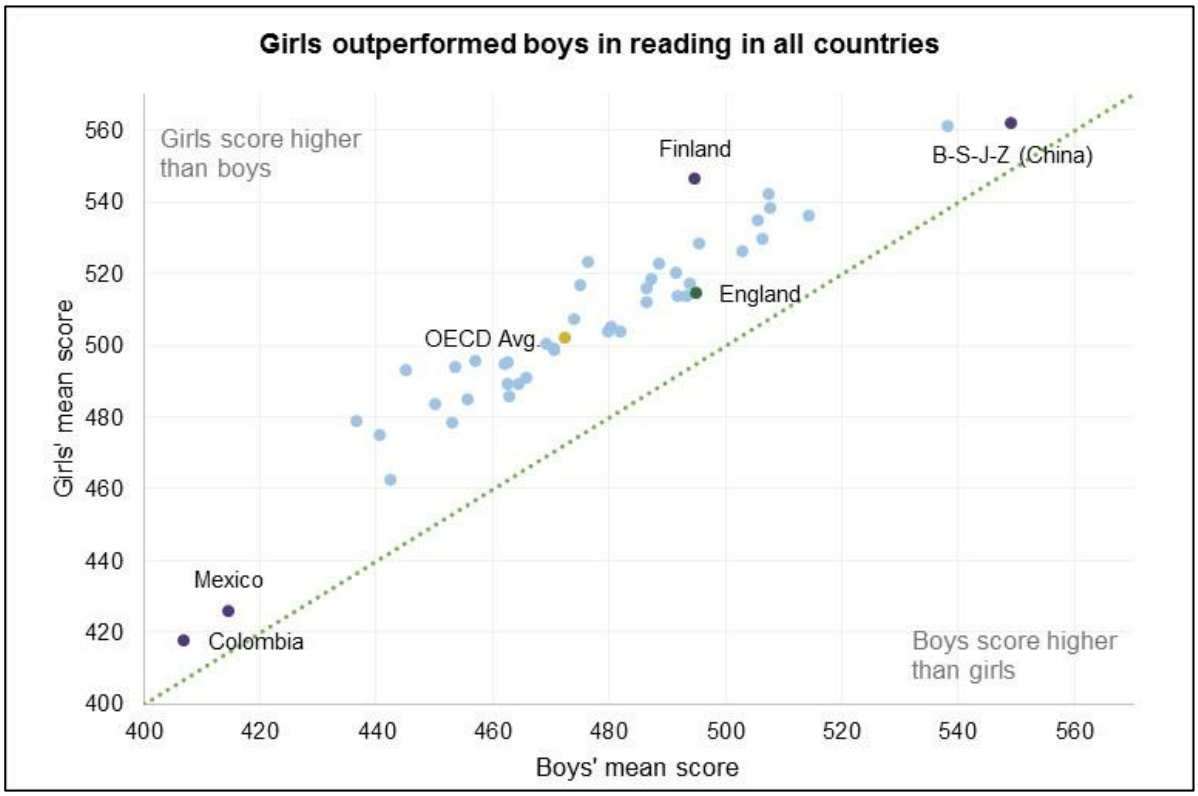


Source: PISA 2018 database

Internationally, girls significantly outperformed boys in reading in every participating country, although the gap was much wider in some countries than in others. This can be seen in Figure 2.14, where the closer a country's dot is to the diagonal line, the smaller the gap between scores for girls and boys. The smallest gender differences were seen in Colombia (10 score point difference), followed by Mexico (11 score point difference) and B-S-J-Z (China) (13 score point difference). Finland had the largest difference between reading scores of boys and girls among OECD countries, with a difference of 52 score points.

In all countries, more boys than girls failed to reach the baseline level of proficiency in reading (Level 2). In the majority of participating countries, significantly more girls than boys attained the highest levels of performance (Level 5 or 6) (see Chapter 7 of the PISA International report (OECD, 2019b)).

Figure 2.14 Gender differences in reading scores across PISA 2018 countries



Note: This scatterplot includes all OECD countries and those with a mean score above 450

Source: PISA 2018 database

Comparisons between the 4 UK countries are provided in Chapter 7.

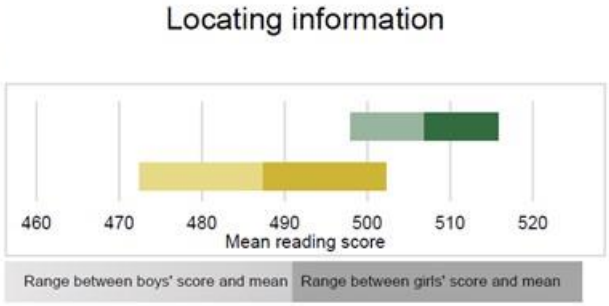
Key point

Girls significantly outperformed boys on reading in all countries, including England.

Figure 2.15 Gender differences in reading process in England and the OECD

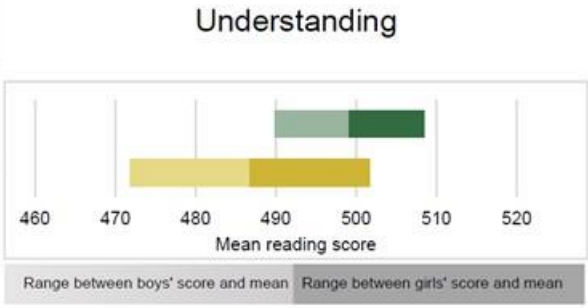
	Overall score	Mean score girls	Mean score boys	Difference girls - boys
England	507	516	498	+18*
OECD Avg.	487	502	472	+30*

*The difference is statistically significant



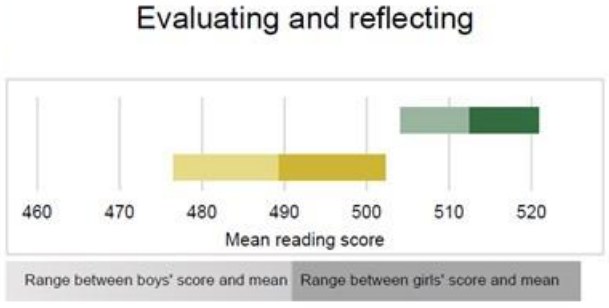
	Overall score	Mean score girls	Mean score boys	Difference girls - boys
England	499	508	490	+19*
OECD Avg.	487	502	472	+30*

*The difference is statistically significant



	Overall score	Mean score girls	Mean score boys	Difference girls - boys
England	513	521	504	+17*
OECD Avg.	489	502	477	+26*

*The difference is statistically significant



Source: PISA 2018 database

As noted in section 2.4, the performance of pupils in England varied somewhat across the 3 reading subscales of locating information, understanding and evaluating and reflecting. Pupils were relatively strong in the evaluating and reflecting subscale and performed less well in the understanding subscale. The gender difference in England was fairly evenly distributed across processes, with girls having significantly higher mean scores than boys on all 3 process subscales. The mean scores for boys' and girls' were higher in evaluating and reflecting and locating information than for understanding.

As with the overall gender gap, the size of the OECD average gap for each process was much larger than England's, and both girls and boys had average scores higher than the OECD averages on each subscale. Across OECD countries, the gender gap was

smallest in evaluating and reflecting, with a 26 point[17] difference compared to locating information and understanding where the gaps were 30 points in each. Boys in England scored better than boys from the OECD for evaluating and reflecting with a mean score 28 score points[18] higher than the OECD average for boys. The mean score for boys in England was similar to the OECD average score for girls.

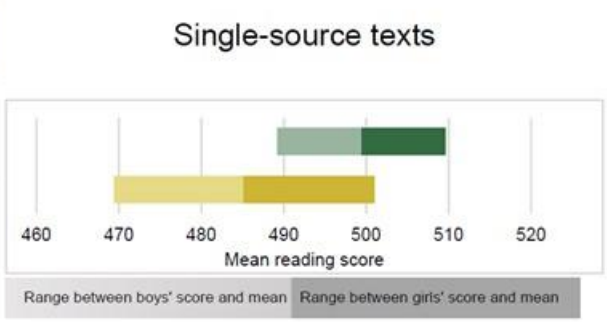
Key point

Boys in England scored, on average, 28 score points higher than the OECD average for boys for the evaluating and reflecting process.

Figure 2.16 Gender differences in reading source in England and the OECD

	Overall score	Mean score girls	Mean score boys	Difference girls - boys
England	500	510	489	+20*
OECD Avg.	485	501	469	+32*

*The difference is statistically significant



	Overall score	Mean score girls	Mean score boys	Difference girls - boys
England	509	517	501	+16*
OECD Avg.	490	503	477	+26*

*The difference is statistically significant

Source: PISA 2018 database

In England there were differences in boys' and girls' performances on single-source and multiple-source texts. Girls significantly outperformed boys for both sources with a gender gap of 20 score points[19] for single-source and 16 for multiple-source texts. This is unsurprising, given girls' higher performance in reading overall. Boys in England

[17] after taking account for the rounding of figures
[18] after taking account for the rounding of figures
[19] after taking account for the rounding of figures

performed similarly to girls in the OECD on multiple-source texts, with a 2 score point difference.

Across OECD countries, the gap between boys and girls was larger on single-source texts than on multiple-source texts, with a gender gap of 32 score points for single-source and 26 score points for multiple-source.

3 Pupils

In this chapter we first explore associations between pupil background and reading performance. We then report on pupil questionnaire responses to understand more about attitudes towards reading, experiences of reading, pupil wellbeing, and future aspirations of pupils in England, and how these compare with pupils across the OECD countries.

Key findings

Pupil background

- There was a gap in achievement between the most and least deprived pupils in England, as was the case in all participating countries. The disadvantage gap in England was similar to the OECD average.
- Pupils eligible for free school meals scored 39 points below pupils not eligible for free school meals, on average. This difference was statistically significant.
- In England, pupils with an immigrant background performed significantly less well than pupils without an immigrant background, in line with the international trend. However, when gender, and pupils' and schools' socio-economic profile is accounted for, the difference was not statistically significant.

Pupils' attitudes to reading

- Pupils in England responded with more confidence in their reading ability than pupils across the OECD countries. They were particularly confident that they were good readers and in their ability to understand difficult texts.
- They also had more negative attitudes towards reading than pupils across the OECD. A higher proportion of pupils in England agreed that they read only to get the information they need, and a lower proportion that reading is a favourite hobby, and that they like talking about books.

Pupils' experiences of reading

- Pupils in England and the OECD countries read online materials far more frequently than books or fiction. In England, 92% of pupils chatted online at least several times a week (compared to 88% on average across the OECD), whereas 37% rarely or never read books (35% across the OECD).

Pupil wellbeing

- Pupils in England were less satisfied with their lives than pupils across the OECD countries, and they were more likely to disagree that their life has a clear meaning or purpose, that they had discovered a satisfactory meaning in life, and they have a clear sense of what gives meaning.

- They were much less likely to always feel joyful and cheerful, and were more likely to sometimes or always feel worried, miserable, and sad than pupils across the OECD.

Future aspirations

- In general, pupils in England had similar expectations of their highest level of qualification as pupils across the OECD countries, but were more likely to expect to have a professional job in the future.

3.1 Pupil background

This section examines the associations between pupils' background characteristics and reading scores, in order to explore educational inequalities and how they compare with other participating countries. We consider how socio-economic background, immigrant background and language relate to reading scores.

3.1.1 Socio-economic background

Here we report on interactions between socio-economic background and reading scores using the PISA measure of socio-economic background. We also compare findings with information from the school census on eligibility for free school meals (FSM).

Socio-economic background in PISA is reported as the ESCS (economic, social and cultural status) Index. This is based on pupils' responses to questions about their parents' backgrounds and education and possessions in their homes. The Index is set to a mean of 0 across OECD countries, with a standard deviation of 1. England's mean score on the ESCS Index was +0.28 indicating that, on average, pupils in England have a higher socio-economic status than the average across OECD countries.

There are 2 different ways to think about the relationships between socio-economic status and attainment

The first is to consider the difference in attainment between average pupils with high socio-economic status and with low socio-economic status. This can be seen as the 'steepness of the slope' (the gradient of the line) when plotting the relationship between socio-economic status and attainment, as in Figure 3.1. We refer to it as the **size of the effect**.

The second is to consider how much variation in attainment there is between pupils of the same socio-economic status, or to put it another way, how strongly correlated socio-economic status is with attainment. If there is a strong correlation, then there will be less variability in the attainment of pupils with the same socio-economic status, which implies that socio-economic status is the dominant factor in determining outcomes. We refer to it as the **strength of the effect**.

Both of these perspectives are important and they do not necessarily coincide. For example, a small, strong effect would imply that it is difficult for pupils to overcome the impact of their socio-economic status, but that in practice this impact is small and so may be of lesser concern to policymakers. Conversely, a large, weak effect would imply that there are large differences between pupils from different backgrounds, but that many pupils also buck this trend – with some disadvantaged pupils nevertheless attaining highly (and some more advantaged pupils attaining poorly).

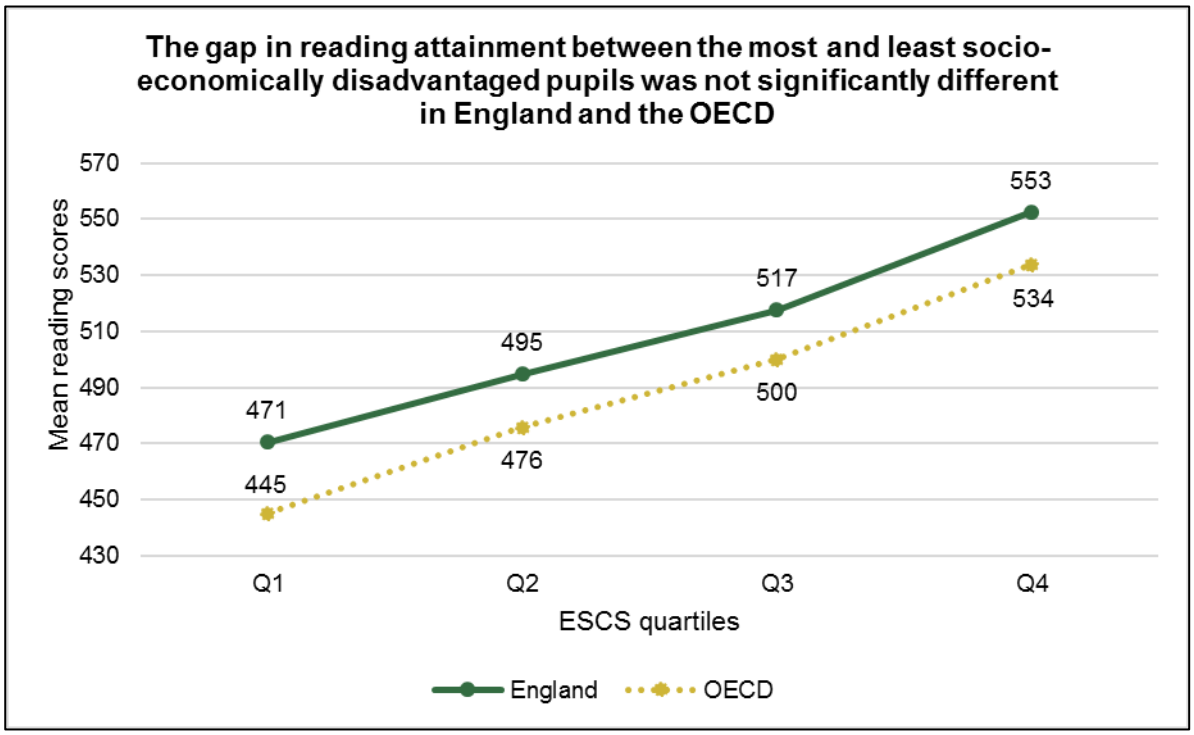
In all participating countries, there was a gap in attainment between pupils who are highest and those who are lowest on the ESCS Index, and this was also the case in England. Figure 3.1 shows the average reading performance of pupils in England when they are divided into 4 equal groups (quartiles) according to their ESCS score, compared with the OECD average[20]. More advantaged pupils achieved higher reading scores than their less advantaged peers, and this was true for each quartile.

There was an 82 score point difference in average reading performance between the most advantaged (4th quartile) and least advantaged (1st quartile) pupils in England. This was not statistically significantly[21] different from the equivalent OECD disadvantage gap, which was 89 score points. Therefore, the **size of the effect** of socio-economic status (ESCS) is similar in England and across the OECD.

[20] The 2018 OECD average is based upon the AV36a results published in the OECD International results.
[21] When statistical significance is reported, it indicates that the compared means are significantly different at the 5% level.

Given the relationship between socio-economic status and reading attainment, it is important to also consider the comparative difference in socio-economic status between the most deprived and most advantaged pupils in England and the OECD countries. The gap in socio-economic status (ESCS score) between the most and least advantaged quartiles is similar for pupils in England and the OECD (2.33 in England compared with 2.36 across the OECD). Appendix B shows the Index for comparator countries.

Figure 3.1 Reading performance by ESCS Index quartile



Source: PISA 2018 database

Whilst Figure 3.1 shows that the difference in performance between the *average* pupil from a high and low socio-economic background is large, there is also a lot of variation in performance within these groups. To gain an accurate picture of interactions between reading score and the ESCS Index, it is also necessary to look at the amount of variance in scores which can be explained by socio-economic background, or the **strength of the effect**. This shows the extent to which the scores of pupils in each country are predicted by socio-economic background, rather than by other variables. The percentage of the variance in reading performance explained by socio-economic status in England was 10%. This was not statistically significantly different from the OECD average of 12%, and indicates that ESCS has a similar impact in England and across the OECD countries on average.

We can look at similarly performing countries to see how the impact of socio-economic background differs. For instance, pupils in the United States performed similarly in reading in PISA 2018 to pupils in England, also achieving a mean score of 505. However, the difference between the most and least deprived quartiles by socio-economic background in the United States was 99 score points, 17 points larger than in England,

and the explained variance in reading performance was 12%, 2 percentage points higher than England. Therefore, socio-economic background was associated with a greater difference in reading score for pupils in the United States (size of effect), and the extent to which socio-economic background predicted reading performance was slightly greater than England (strength of effect).

The country in which the most disadvantaged pupils have the best chance of succeeding in spite of their background is high-performing Macao (China). Here, the difference in reading performance between the most and least deprived quartiles was only 31 score points and the amount of variance explained was just 2%. The gap in socio-economic status (ESCS score) between the most and least advantaged quartiles in Macao (China) is 2.32, similar to the gap in England and across the OECD. This shows that it is possible for a country to be high-performing and for the impact of socio-economic background to be low, even with a population with a similar range of socio-economic status to England.

The ESCS Index also allows us to compare the proportion of pupils who succeed academically despite their socio-economic background, that is, who are academically resilient. For the purpose of this analysis, a pupil is classified as resilient if he or she is in the bottom quarter of the ESCS Index in the country of assessment and performs in the top quarter of pupils in reading in that country[22]. In England, 14% of pupils were academically resilient, significantly higher than the 11% across the OECD countries, on average.

Key point

The gap in performance between the most and least disadvantaged pupils in England was similar to the OECD average. However, the proportion of pupils who succeed academically despite their socio-economic background, that is, who are academically resilient, was larger in England than OECD countries, on average.

The national measure usually used to understand the effects of disadvantage is eligibility for free school meals (FSM). Unlike the ESCS Index, which puts all pupils on a scale from most to least disadvantaged, eligibility for free school meals divides pupils into 2 groups – those who are eligible and those who are not. Table 3.1 below presents the mean reading score for these 2 groups of pupils. The analysis was carried out with pupil data which was matched to the England school census database. Eleven per cent of matched pupils in England were eligible for free school meals and, on average, these

[22] In the 2015 national report (Jerrim *et al*., 2016) a different definition was used, which identified the proportion of disadvantaged pupils who performed in the top quarter of pupils internationally, therefore these figures are not comparable.

pupils scored 39[23] points below pupils not eligible for free school meals. This difference was statistically significant.

Table 3.1 FSM eligibility and PISA reading scores: England

FSM eligibility	Number of pupils	Per cent	Mean score
Not eligible for FSM	4243	89	503
Eligible for FSM	500	11	463*

Notes:
* indicates a statistically significant difference from the 'not eligible for FSM' group at the 5% level
This analysis does not include 499 pupils for whom information from the National Pupil Database was not matched; 376 from 13 independent schools and 123 from 32 maintained schools/academies.

Source: PISA 2018 data matched to National Pupil Database

3.1.2 Immigration background and language

The pupil questionnaire collects information which enables us to identify whether pupils are first- or second-generation immigrants. The International report notes that the percentage of pupils across the OECD countries with an immigrant background has increased from 10% in 2009 to 12% in 2018. The performance of pupils with an immigrant background tends to be lower than their non-immigrant peers.

In OECD countries, non-immigrant pupils scored 41 points better than immigrant pupils, on average, but this difference reduced to 24 points when their socio-economic backgrounds were taken into account (OECD, 2019c). Given this context, it is interesting to examine how pupils with an immigrant background in England performed.

For the purpose of the analysis, immigrant background is defined as in the OECD International report.

- **Non-immigrant pupils** are pupils whose mother or father (or both) was/were born in the country where the pupil sat the PISA test, regardless of whether the pupil him/herself was born in that country.
- **First-generation immigrant pupils** are foreign-born pupils whose parents are also foreign-born.
- **Second-generation immigrant pupils** are pupils born in the country of assessment but whose parents are both foreign-born.

[23] after taking into account rounding of figures

Table 3.2 Immigration background and PISA reading scores: England

Immigration background	Number of pupils	Per cent	Mean score
Non-immigrant pupils	3864	78	513
First-generation immigrant pupils	425	9	488*
Second-generation immigrant pupils	626	13	492*

Note: * indicates a statistically significant difference from 'non-immigrant pupils' at the 5% level

Source: PISA 2018 national database

The proportion of pupils in England with an immigrant background (22%) was above the OECD average. In England, pupils with an immigrant background performed statistically significantly less well than non-immigrant pupils, in line with the international trend. The results in Table 3.2 do not take account of other background characteristics.

The score point difference in reading performance associated with having an immigrant background is -22 points (statistically significantly different from non-immigrant pupils) in England. However, when gender, and pupils' and schools' socio-economic profile is accounted for, this drops to a score point difference of -5 points (not statistically significantly different from non-immigrant pupils).

Key point

Pupils in England with an immigrant background performed statistically significantly less well than non-immigrant pupils, in line with the international trend. However, this difference is smaller in England than across the OECD on average, and is mostly accounted for by differences in gender, and pupils' and schools' socio-economic profile.

Pupils were also asked about home language. Table 3.3 provides the reading scores of pupils who speak English at home, compared with pupils who speak another language at home.

Table 3.3 Language spoken at home and PISA reading scores: England

Language	Number of pupils	Per cent	Mean score
English	4454	88	511
Another language	608	12	473*

Note: * indicates statistically significantly different at the 5% level

Source: PISA 2018 national database

Pupils who spoke a language other than English at home scored significantly less well in the reading assessment than pupils who spoke English at home.

3.1.3 Ethnicity

The matched England school census database provides us with ethnicity data for participating pupils. The reading attainment of pupils by their ethnic group is presented in Table 3.4 below. The majority of pupils were White and, because the number of pupils in each other ethnic group was relatively small, the level of uncertainty surrounding the estimates for these other groups (as represented by the standard error in the table) is large, compared with White pupils.

Table 3.4 Ethnicity and PISA reading scores: England

Ethnic group	Number of pupils	Per cent	Mean score	Standard error
Mixed	222	5	511	7.8
White	3406	71	505	3.5
Other	121	3	489	11.6
Asian	607	13	475*†	5.9
Black	340	7	469*†	6.7
Unclassified	46	1	500	16.3

Notes:

* indicates statistically significantly different from Mixed pupils at the 5% level

† indicates statistically significantly different from White pupils at the 5% level

Standard errors are reported to demonstrate the large confidence intervals around some ethnic groups' mean score (see Chapter 1 for more information about sources of uncertainty).

'Other' includes AOEG (Any other ethnic group) and Chinese

This analysis does not include 499 pupils for whom information from the National Pupil Database was not matched; 376 from 13 independent schools and 123 from 32 maintained schools/academies.

Source: PISA 2018 data matched to National Pupil Database

The analysis by ethnic group finds that Mixed and White pupils achieved, on average, higher mean reading scores in PISA 2018 than pupils from other ethnic groups. Mixed and White pupils significantly outperformed Asian and Black pupils. This analysis does not take account of other background characteristics, and in particular socio-economic status, which is likely to be an explanatory factor for differences in scores, as was the case for immigration background.

3.2 Pupils' attitudes to reading inside and outside school

This section reports on pupils' responses to questions about their reading activities and their attitudes to reading, and compares these to those of pupils in the rest of the OECD countries.

We do not report whether differences are statistically significant as, due to the large sample sizes, small differences can be statistically significant but not meaningful from a policy or practice perspective. Instead, we report on the size of differences. Throughout the remainder of the chapter, differences of 3 percentage points or less are described as *similar*, differences of 4 to 6 percentage points as *small*, differences of 7 to 9 percentage points as *moderate*, and differences of 10 or more percentage points as *large*.

3.2.1 Perceptions of competence in reading

Pupils were asked about their perceptions of their competence in reading. Responses of pupils who agreed or strongly agreed with each of the statements are presented for England, alongside the OECD countries, in Table 3.5.

Table 3.5 Pupils' perception of reading competence

Percentage of pupils who agreed or strongly agreed with each statement

Statement	England	OECD	Percentage point difference England-OECD
I am a good reader.	83	71	12
I am able to understand difficult texts.	76	67	9
I find it difficult to answer questions about a text.	29	26	3
I have to read a text several times before I completely understand it.	45	44	2
I read fluently.	78	77	1
I have always had difficulty with reading	19	19	0

Note: The percentage point difference column may not equal the difference between England and the OECD due to rounding.

Source: PISA 2018 database; Student Questionnaire, question ST161

Pupils in England responded with more confidence in their reading ability than pupils across the OECD. Compared with the OECD, there was a large difference in the percentage of pupils who agreed that they were good readers, and a moderate difference in the percentage agreeing that they were able to understand difficult texts. Pupils in England were most confident that they were good and fluent readers (83% and 78% respectively) and in their ability to understand difficult texts (76%), although 45% of respondents said they had to read a text several times before completely understanding it.

3.2.2 How do pupils read books?

Pupils were asked specifically about their reading of books, and whether they most often read paper books or books on a digital device. Table 3.6 compares the responses of pupils in England with pupils across the OECD countries.

Table 3.6 Pupils' reading mode preference

Percentage of pupils who read books in each mode

Reading mode	England	OECD	Percentage point difference England-OECD
I rarely or never read books.	37	35	2
I read books on digital devices more often than on paper.	16	15	1
I read paper books more often than books on digital devices.	36	36	-1
I read paper books and books on digital devices equally often.	12	13	-2

Note: The percentage point difference column may not equal the difference between England and the OECD due to rounding.

Source: PISA 2018 database; Student Questionnaire, question ST168

Responses of pupils in England were similar to pupils across the OECD. Thirty-seven per cent of pupils in England rarely or never read books, similar to 35% in the OECD. Reading paper books was more popular than reading digital books in both England and the OECD.

3.2.3 Reading engagement

Pupils were asked about their attitudes towards reading. Pupils in England had more negative attitudes than pupils across the OECD countries. A higher proportion of pupils in England agreed that they read only to get the information they need, and a lower proportion that reading is a favourite hobby and that they like talking about books; these differences were moderate. As we established in section 3.2.2, pupils in England were slightly less likely to read books than their peers across the OECD, so it is not surprising that attitudes towards reading were more negative.

The same questions were asked in 2009 and it is interesting to examine how reading attitudes have changed in England and across the OECD countries. The results are shown in Table 3.7. Compared with 2009, a similar proportion of pupils in England regarded reading as a favourite hobby; this is also the case across the OECD. On the other measures, engagement has become more negative and pupils' responses in England are more different from the OECD average than they were in 2009.

Table 3.7 Pupils' reading engagement in 2018 compared with 2009

Percentage of pupils who agreed or strongly agreed with each statement

Statement	England 2018	OECD 2018	England 2009	OECD 2009
I read only if I have to.	53	49	41	41
Reading is one of my favourite hobbies.	28	34	27	33
I like talking about books with other people.	31	37	36	38
For me, reading is a waste of time.	30	28	23	24
I read only to get information that I need.	56	50	48	46

Source: PISA 2018 database; Student Questionnaire, question ST160; PISA 2009 database

Key point

Pupils in England had less engaged attitudes towards reading than pupils across the OECD. In general, pupils in England and the OECD had more negative attitudes than in 2009, but the change in attitudes of pupils in England was greater than on average in OECD countries.

3.2.4 Time spent reading for enjoyment

The results for pupils' responses to a question about the amount of time they spent reading for enjoyment are presented, for England and the OECD countries, in Table 3.8. This table also includes the results from 2009 when the same question was asked.

Table 3.8 Pupils' responses about time spent reading in 2018 compared with 2009

Percentage of pupils who usually spent time reading for enjoyment

Time spent reading	England 2018	OECD 2018	England 2009	OECD 2009
I do not read for enjoyment	48	42	39	37
30 minutes or less a day	27	24	32	30
More than 30 minutes and less than 60 minutes a day	15	17	15	17
1 to 2 hours a day	6	11	10	11
More than 2 hours a day	5	6	4	5

Source: PISA 2018 database; Student Questionnaire, question ST175; PISA 2009 database

Almost half of pupils in England (48%) reported that they do not read for enjoyment, and only 26% that they read for more than 30 minutes a day for pleasure. The proportion of pupils in England who do not read for enjoyment has increased by 9 percentage points since 2009, compared with 5 percentage points on average across the OECD.

3.3 Pupils' experience of reading inside and outside school

3.3.1 Pupils' reading practices

Table 3.9 shows what pupils choose to read at least several times a month, in order of popularity in England. The most common reading material (on paper and on digital devices) was fiction for pupils in England and the OECD countries. There were moderate differences in reading of newspapers, magazines and comic books; smaller proportions of pupils in England read these materials, compared with their counterparts in the OECD.

Table 3.9 Pupils' responses about reading different text types in 2018 compared with 2009

Percentage of pupils who read these materials at least several times a month because they want to

Text type	England 2018	OECD 2018	England 2009	OECD 2009
Fiction	30	29	32	31
Non-fiction books	21	21	20	20
Newspapers	18	25	60	63
Magazines	10	19	60	59
Comic books	8	15	8	23

Source: PISA 2018 database; Student Questionnaire, question ST167; PISA 2009 database

The same question was asked in PISA 2009. The reading practices of pupils in England and across the OECD have remained similar for fiction and non-fiction. There has been a large reduction in the popularity of newspapers and magazines in England: in 2009, newspapers and magazines were each read by 60% of pupils at least several times a month; in 2018 this was the case for 18% and 10% of pupils, respectively. This reflects a similar pattern across the OECD countries.

3.3.2 Pupils' digital reading practices

Pupils were asked how often they read different types of online material. Table 3.10 shows that pupils read these online materials far more frequently than the materials discussed in previous sections, such as books or fiction.

In section 3.2.2 we established that pupils in England and the OECD were less likely to use digital devices to read books than to read paper books. However, in Table 3.10 we can see that pupils can readily access digital devices, for example, 92% of pupils in England chatted online at least several times a week compared with 88% across the OECD countries (a small difference). A similar, or greater, proportion of pupils in England used the internet to communicate, search for information about a particular topic, and read news frequently, compared with pupils in OECD countries.

Pupils had also been asked about their online reading in PISA 2009. In 2018, online reading had increased for all response options since 2009, except for reading emails which had declined in England and across the OECD.

Table 3.10 Pupils' responses about online reading in 2018 compared with 2009

Percentage of pupils involved in each reading activities at least several times a week

Reading activity	England 2018	OECD 2018	England 2009	OECD 2009
Chatting online	92	88	84	73
Searching for information online to learn about a particular topic	73	68	56	52
Reading news online	57	58	44	46
Searching for practical information online	51	56	33	36
Reading emails	49	37	76	64
Taking part in online group discussions or forums	32	23	21	21

Source: PISA 2018 database; Student Questionnaire, question ST176; PISA 2009 database

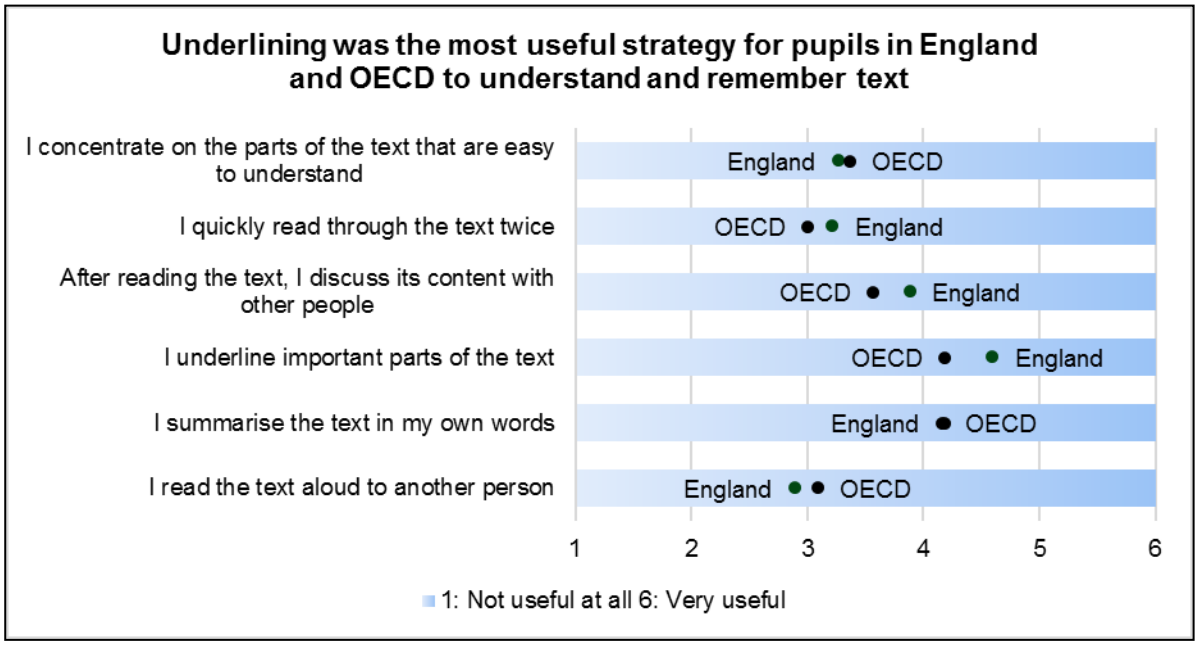
3.3.3 Metacognition

Metacognition is 'an individual's ability to think about and control his or her reading and comprehension strategies' (OECD, 2019a). In order to assess their metacognitive knowledge, in PISA 2018, pupils were asked about how useful they thought various strategies were in 3 different reading tasks. These were to:

- understand and remember text
- write a summary of a 2-page text
- respond on receipt of an unsolicited email saying they had won a competition.

In the first scenario, pupils were told their reading task was to understand and remember the information in a text and were asked to score the usefulness of 6 strategies.

Figure 3.2 Average ratings of usefulness of strategies for understanding and remembering text



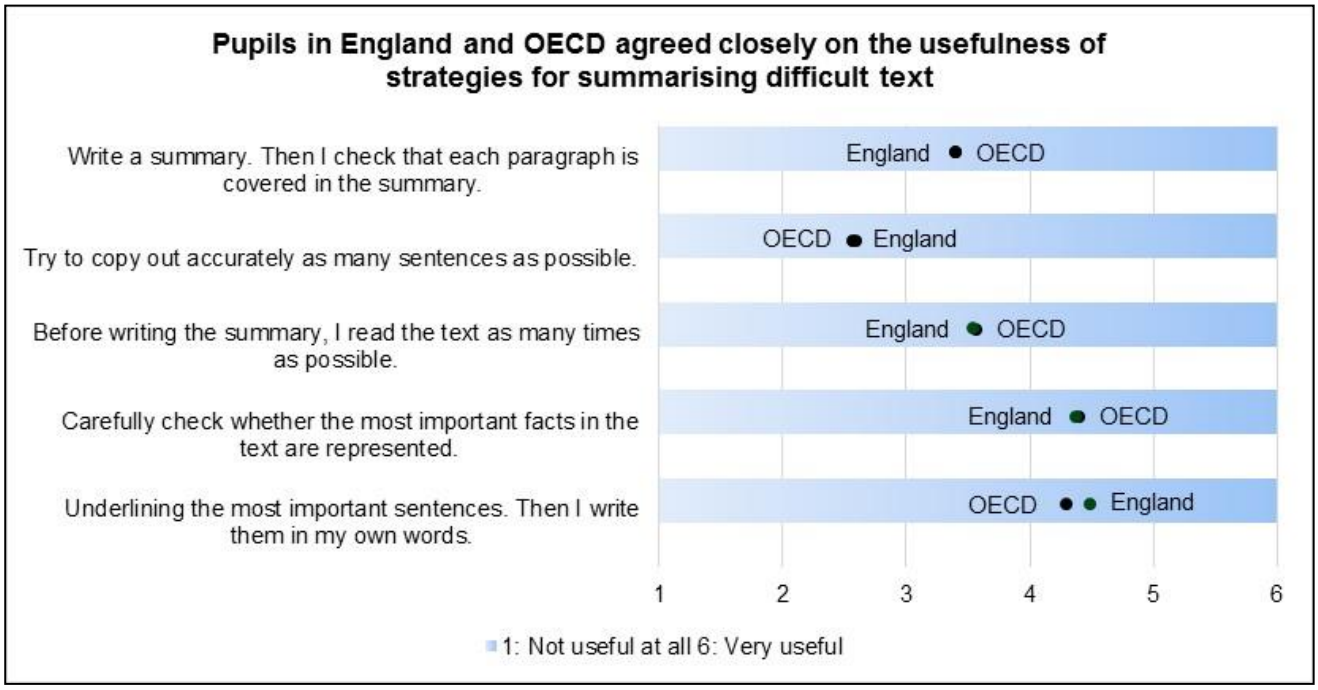
Source: PISA 2018 database; Student Questionnaire, question ST164

This question was also asked in 2009, when a rating system was developed to categorise responses into useful and less useful strategies: discussing the content with other people, underlining important parts of the text, and summarising the text were rated as better strategies than concentrating on the parts of the text that are easy to understand, quickly reading through the text twice, and reading the text aloud to another person.

In PISA 2018, underlining important parts of the text was seen as the most useful strategy by pupils in England and the OECD, although pupils in England found this a more important strategy. Pupils in England and the OECD countries also thought that summarising the text in their own words was important. Pupils in England thought that the least useful strategy was to read the text aloud to another person.

In the second scenario, pupils were told they needed to read and summarise a long and difficult 2-page text. They were asked about the usefulness of 5 strategies.

Figure 3.3 Average ratings of usefulness of strategies for summarising a difficult text



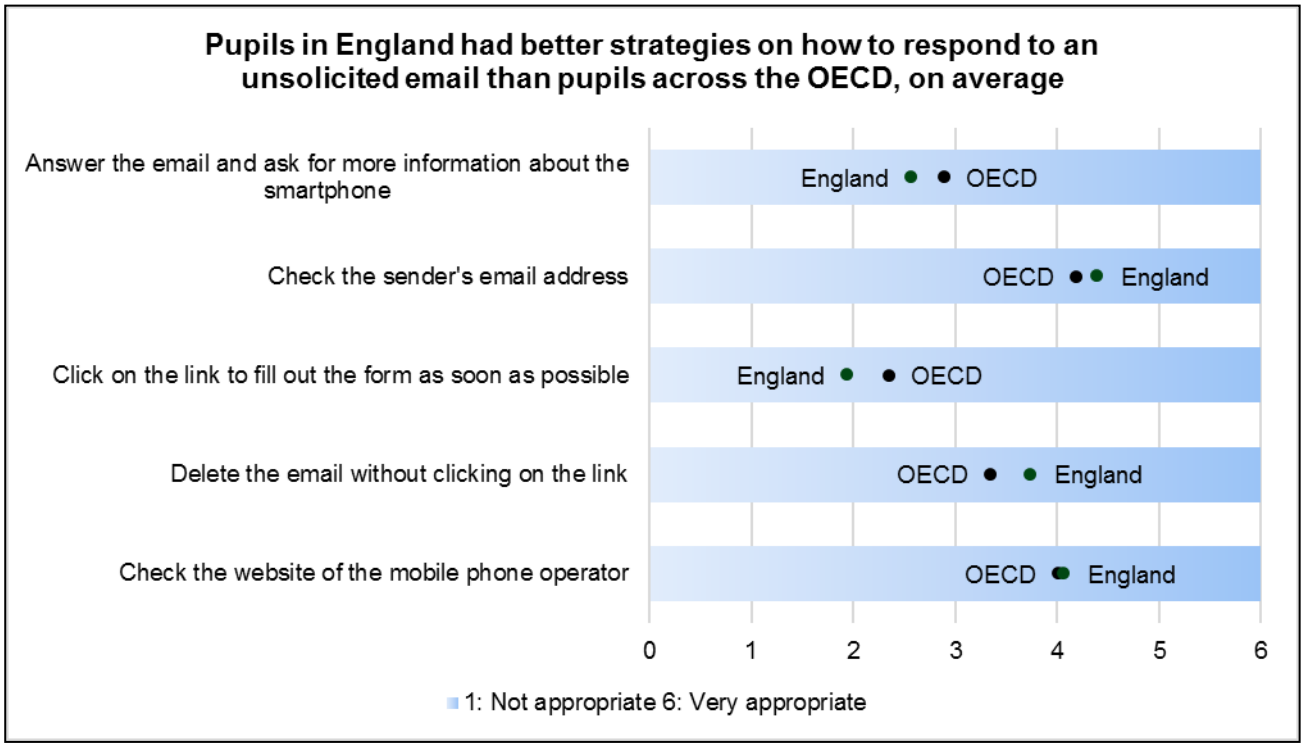
Source: PISA 2018 database; Student Questionnaire, question ST165

This question, also, was asked in 2009 and a rating system developed to categorise the usefulness of the strategies: checking whether the most important facts are represented, and underlining the most important sentences then summarising, were rated as the best 2 strategies, followed by writing a summary and checking each paragraph is covered in the summary, and reading the text as many times as possible. Trying to copy out accurately as many sentences as possible was rated as the least useful strategy.

In PISA 2018, trying to copy out accurately as many sentences as possible was not seen as a useful strategy by pupils in England or the OECD. Pupils in England and the OECD thought the most useful strategies were to underline the most important sentences to form a summary, and checking that the most important facts are represented.

The third scenario asked pupils about the appropriateness of 5 strategies in response to an unsolicited email which says that they have won a smartphone. This question was new in PISA 2018 and information on how each strategy was rated will be published after publication of the main PISA database in 2019.

Figure 3.4 Average ratings of responses to the receipt of an email telling pupils they have won a smartphone



Source: PISA 2018 database; Student Questionnaire, question ST166

Although OECD have not yet released their rating system for the responses, it is possible to divide the strategies into 'good' and 'poor' based on National Cyber Security Centre advice on receipt of a suspicious email. Clicking on a link to fill out a form with their data, and replying to the email to ask more about the smartphone were rightly seen as poor strategies, and slightly more so by pupils in England than across the OECD on average. Appropriate strategies were regarded as checking the sender's email address and the website of the sender to see if the offer was mentioned. Pupils in England were more likely, on average, to respond appropriately.

3.4 Pupil wellbeing

The pupil questionnaire collected information about pupils' wellbeing: their satisfaction with their life, to what extent their life has meaning or purpose, their subjective wellbeing, and also their experiences of bullying (discussed in Chapter 6).

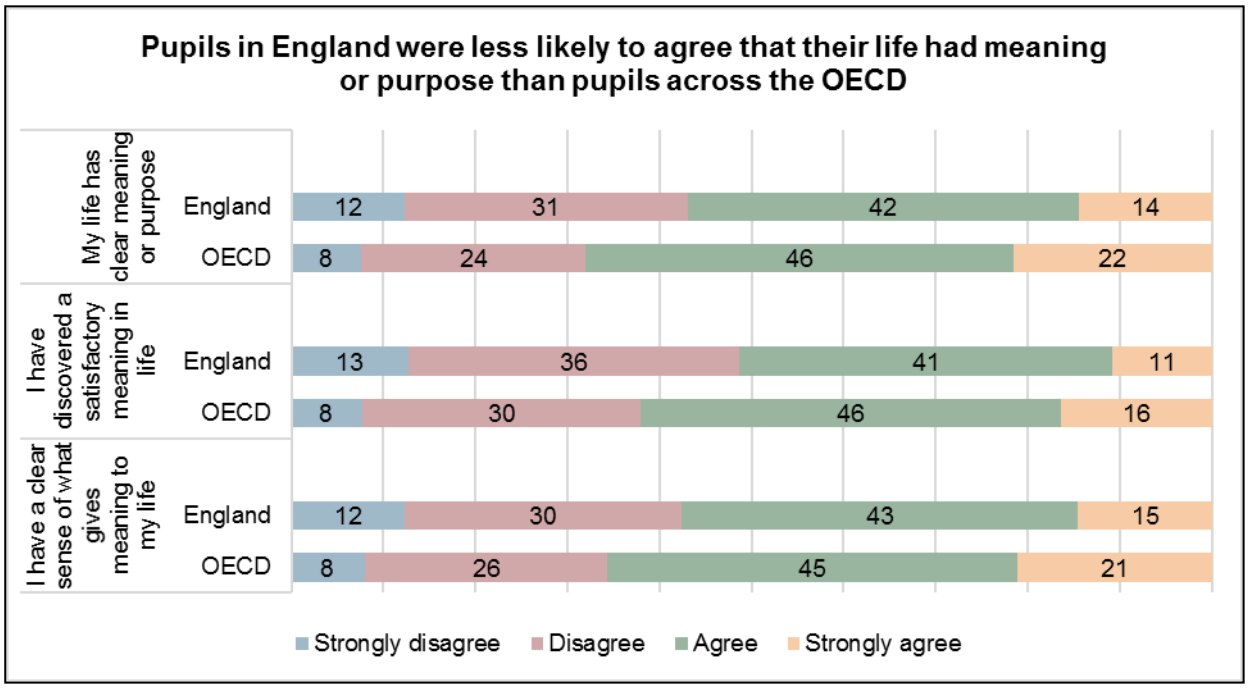
Pupils aged 15 are making the transition to adulthood and making decisions about further education and careers. This is a time which can challenge young people's wellbeing, and can also be made more challenging by poor wellbeing.

Pupils were asked to rate how satisfied they were with their life as a whole, with the minimum score of 0 and the maximum score of 10. Pupils in England were, on average,

less satisfied with their lives than pupils across the OECD countries; the average score was 6.1 in England, compared with 7.0 across the OECD.

Pupils were also asked to what extent their life had meaning or purpose. The responses of pupils in England and the OECD average are presented in Figure 3.5 below.

Figure 3.5 Percentage of pupils agreeing and disagreeing with questions about to what extent their life had meaning

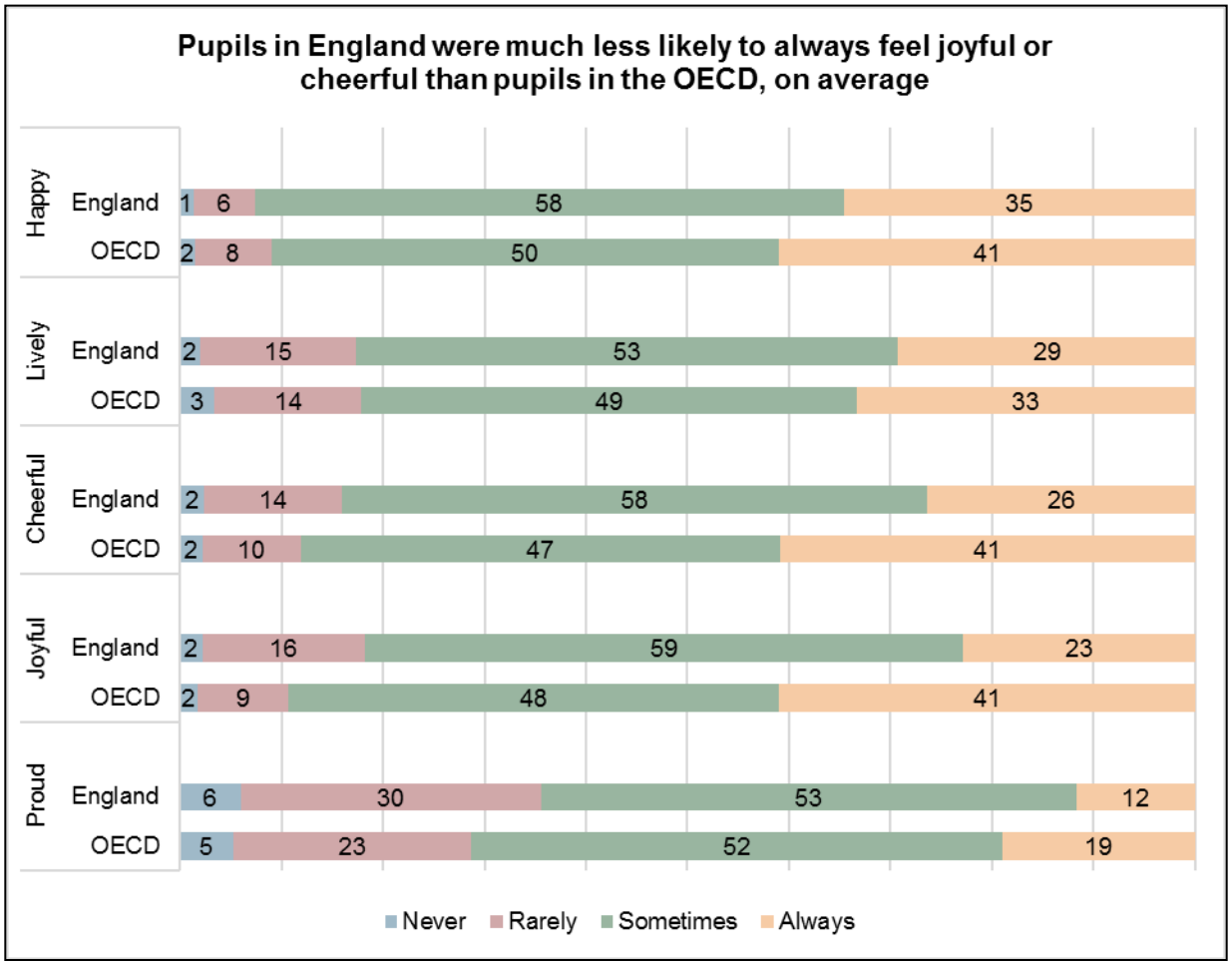


Source: PISA 2018 database; Student Questionnaire, question ST185

Pupils in England were less likely to agree or strongly agree that their life has a clear meaning or purpose (large difference), that they had discovered a satisfactory meaning in life (large difference), and that they have a clear sense of what gives meaning to their life (moderate difference) than pupils across the OECD.

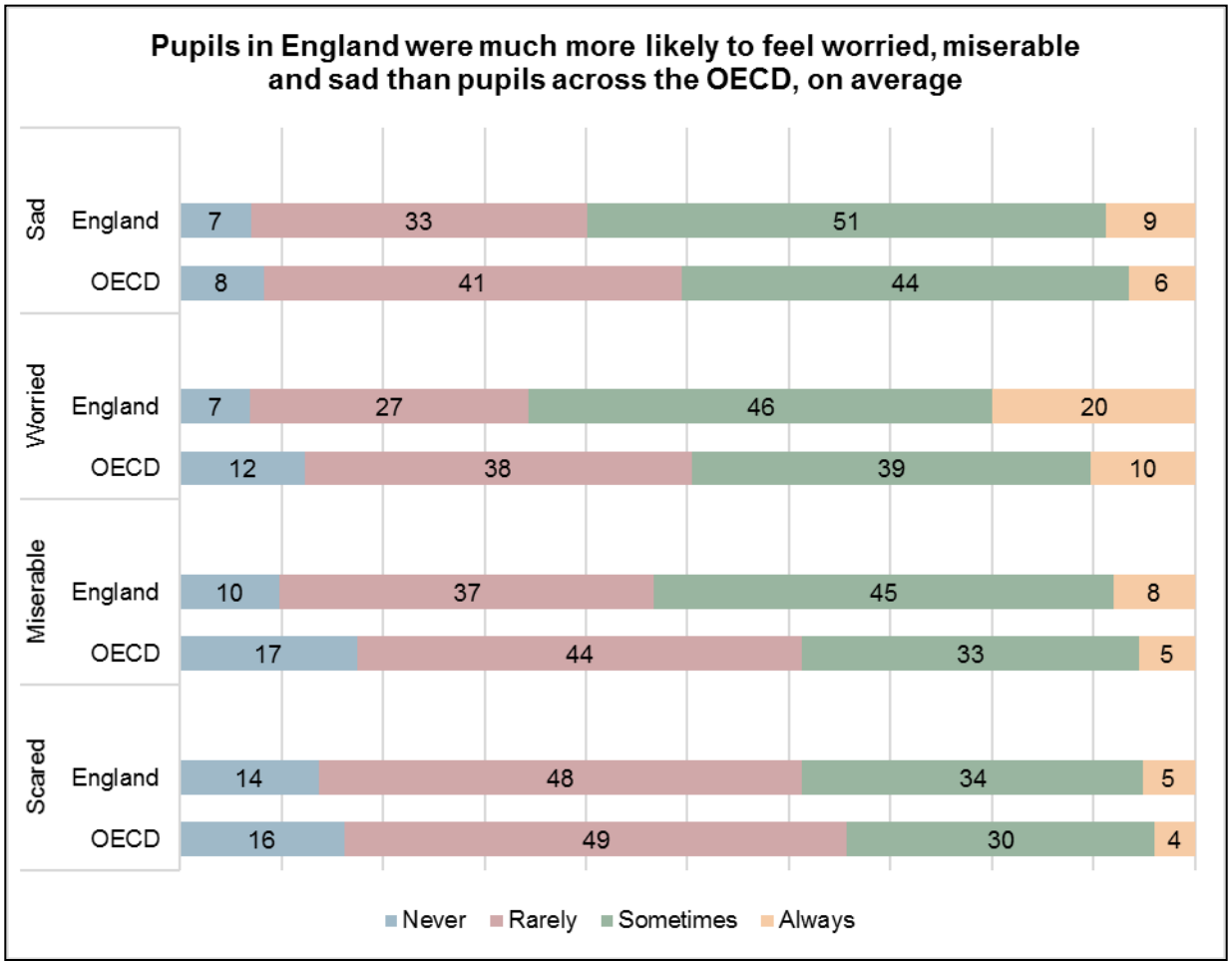
Pupils were also asked how often they felt a range of positive and negative feelings. The responses for pupils in England compared to the OECD are presented in Figure 3.6 for positive feelings and Figure 3.7 for negative feelings.

Figure 3.6 Percentage of pupils who reported never, rarely, sometimes and always for each positive feeling



Source: PISA 2018 database; Student Questionnaire, question ST186

Figure 3.7 Percentage of pupils who reported never, rarely, sometimes and always for each negative feeling



Source: PISA 2018 database; Student Questionnaire, question ST186

In England, 93% of pupils felt happy sometimes or always, compared with 91% on average in the OECD countries. However, pupils in England were less likely to feel cheerful, joyful and proud, and more likely to have negative feelings compared with pupils across the OECD. In particular, they were much less likely to always feel joyful and cheerful, and were more likely to sometimes or always feel worried, miserable and sad.

The International report (OECD, 2019d) explores wellbeing and the links with performance in more detail. It notes that the effects of experiencing more positive emotions and less negative emotions extend beyond academic attainment and are related to other positive life outcomes; and that experiencing some negative emotions is important, for instance in preventing risky behaviours.

3.5 Future aspirations

Pupils were asked about their expectations for the highest qualification they would achieve and their aspirations for the job they would be doing aged 30. The results are shown in Table 3.11. A slightly larger proportions of pupils in England expected to leave

education with GCSE-level qualifications than pupils across the OECD. In other respects, pupils in England had similar expectations of their highest level of qualification to pupils across the OECD.

Table 3.11 Pupil expectations of their highest qualification level

Percentage of pupils who expected to achieve each qualification level as their highest

Qualification level	England	OECD	Percentage point difference England-OECD
No qualifications	1	3	-1
GCSE, NVQ level 1 or 2, Vocational Qualification level 2, BTEC first diploma or certificate level 1 or 2, Apprenticeship	11	7	4
A-level (A2), AS, Vocational Qualification level 3, Advanced Apprenticeship, International Baccalaureate	16	13	3
A qualification for adults who want to go to university but don't have the necessary qualifications already (e.g. access course)	4	6	-3
Higher Education qualification below degree level, (e.g. NVQ level 4 or 5, Diploma of Higher Education, nursing qualifications or Higher levels in HNC, HND or BTEC)	13	13	0
A university degree (e.g. BA, BSc, BEd) or Master's degree (e.g. MA, MSc, MBA) or a doctorate or higher degree (e.g. MPhil, PhD)	55	58	-3

Note: The percentage point difference column may not equal the difference between England and the OECD due to rounding.

Source: PISA 2018 database; Student Questionnaire, question ST225

Pupils were also asked about the job they thought they would have at 30 years old. This was an open response question and responses were coded using the International Labour Organisation's (ILO) International Standard Classification of Occupations (ISCO-08)[24]. Table 3.12 presents their career aspirations in 10 major groups.

Table 3.12 Pupil expectations of future careers

Percentage of pupils who expected to have each type of job at 30 years old

Career expectation	England	OECD	Percentage point difference England-OECD
Armed Forces Occupations (e.g. army captain, navy rating, air force technician)	1	1	0
Managers (e.g. chief executive, government official, marketing manager, production manager, human resources manager)	4	3	1
Professionals (e.g. lawyer, accountant, teacher, computer programmer, doctor, engineer, scientist, nurse)	51	44	8
Technicians and Associate Professionals (e.g. dental assistant, nursing assistant, insurance agent, police inspector, web technician, estate agent)	10	11	-1
Clerical Support Workers (e.g. secretary, bank teller, bookkeeping clerk, call centre operator)	0	1	-1
Services and Sales Workers (e.g. waiter, hairdresser, child care worker, police officer, shop sales assistant)	6	8	-1
Skilled Agricultural, Forestry and Fishery Workers (e.g. farmer, fisherman, gardener, animal producer)	0	1	0
Craft and Related Trades Workers (e.g. carpenter, mechanic, tailor, butcher, electrician)	4	6	-2

[24] The International Standard Classification of Occupations (ISCO) organises jobs into defined sets of groups according to the tasks and duties undertaken, and enables comparisons to be made between countries.

Career expectation	England	OECD	Percentage point difference England-OECD
Plant and Machine Operators and Assemblers (e.g. miner, machine operator, bus/taxi/lorry driver)	0	1	-1
Elementary Occupations (e.g. unskilled worker or labourer, cleaner or helper, packer in a factory)	0	0	0
Not working (e.g. student, stay at home parent, retiree)	0	0	0
Do not know or vague response	6	10	-4
Blank or did not answer question	16	15	1

Note: England and OECD columns do not sum to 100 due to rounding.

The percentage point difference column may not equal the difference between England and the OECD due to rounding.

Source: PISA 2018 database; Student Questionnaire, question ST114

In general, pupils' expectations of their future careers were similar in England and the OECD. There was a moderate difference in the proportion of pupils who expected to have a professional occupation (51% in England compared with 44% across the OECD). This is interesting, given the similar proportion of pupils in England and the OECD countries that expected to complete a university degree or equivalent. It seems unlikely that a higher proportion of pupils in England will go on to be managers and professionals than in the OECD, if a similar proportion complete degree-level qualifications, as suggested by the responses in Table 3.11. The PISA International report (OECD, 2019c) finds that, across the OECD, there is misalignment between the career expectations of pupils and their expected highest level of qualification, with pupils' expectations of their future career exceeding what would usually be expected from their expected highest qualification. The responses of pupils in England show similar misalignment.

4 Science

Chapter outline

This chapter reports the science attainment of pupils in England. It draws on findings outlined in the PISA International report (OECD, 2019b) and places outcomes for England in the context of those findings. Throughout the chapter, comparisons are made between the findings for PISA 2018 and previous cycles. In 2015, science was the main focus domain for study; in 2018, it was a minor domain.

Key findings

Overall science performance

- England's mean performance score in science was 507 in 2018. This was significantly higher than the OECD average score of 489.
- The trend in the mean score for science is stable with a slight, but non-significant, decline since 2012. The score in 2018 was not significantly different from the scores for the previous 4 PISA studies.

Science performance in relation to other countries

- Ten countries had mean scores in science that were significantly higher than England's. Eight countries had mean scores that were not statistically different and England significantly outperformed the 58 remaining participating countries.
- England's relative performance was similar to that of the previous PISA study in 2015 when 9 countries scored significantly higher in science and 8 countries had scores that were not significantly different from England's.

Attainment gap between highest and lowest achievers

- In England, the gap between high and low achievers in science was larger than the OECD average, similar to the gap in 2015.
- There were no significant changes for the scores of either high or low achievers, and both groups continued to outperform the average scores for equivalent pupils in the OECD.

Proficiency levels

- England had a higher proportion of pupils working at the higher proficiency levels (levels 5 and 6) than the OECD average, and a lower proportion of pupils working below the basic proficiency level (level 2) than the OECD average.

Gender gap

- In England, boys performed slightly better than girls in science, however this difference was not significant. This compares to the OECD average of a small, but significant gender gap favouring girls.
- The science gender gap was similar to that in PISA 2015, when there was no gender gap in science (mean scores for girls and boys were the same). There was no significant change in gender gap between these cycles.

In PISA 2018 science was one of the minor domains, as reading was the focus for this cycle. Science was the focus for the previous PISA cycle in 2015. The science content in PISA 2018 reflects the framework that was developed by the OECD in 2015, and remains unchanged from that developed then.

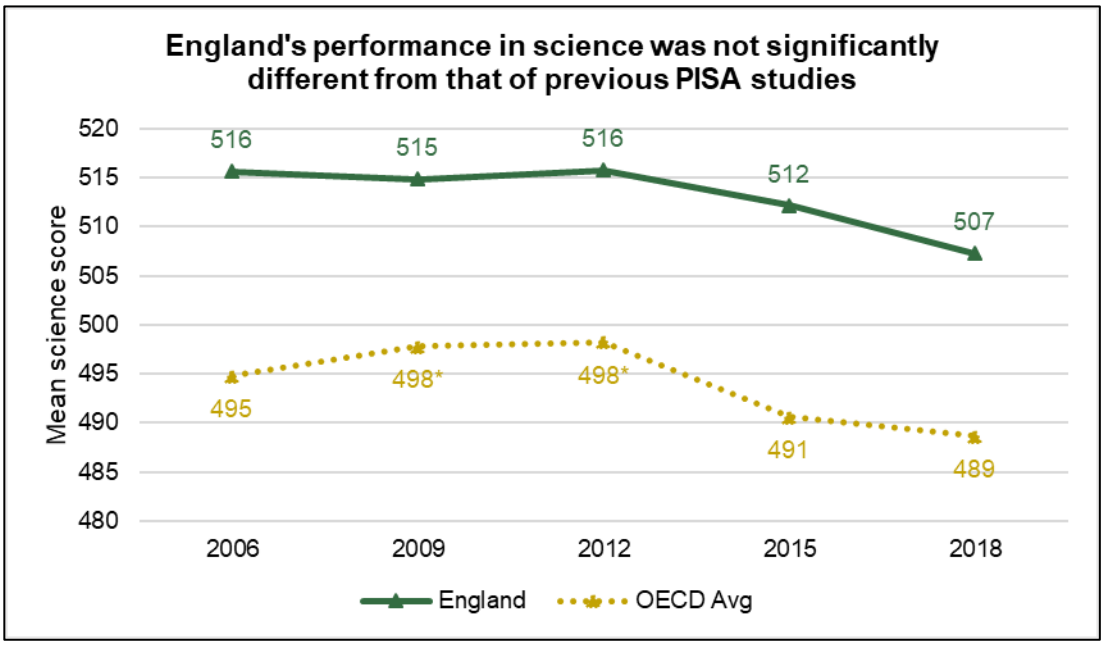
4.1 England's performance in science

Pupils in England achieved a mean score of 507 in science in PISA 2018. This represents a small decrease from that achieved in PISA 2015 (512) (Jerrim *et al.*, 2016), but this decrease is not statistically significant[25].

The performance in science in 2018 is significantly higher than the OECD average[26] score, which is 489. The OECD average for science has declined over the recent PISA cycles, from 498 in 2012 to 489 in 2018. England's mean score has maintained a relatively consistent gap of around 20 score points above the OECD average over this time period. England's 2018 mean score was also not significantly different from scores back to 2006, indicating a consistent level of performance since then.

[25] When statistical significance is reported, it indicates that the compared means are significantly different at the 5% level.
[26] The 2018 OECD average is based upon the AV37 results published in the OECD International Results Table 1.B1.12.

Figure 4.1 Trends over time in science scores in England and the OECD[27]



*The mean score of that year is statistically different from the mean score in 2018

Source: PISA 2018 database; Bradshaw *et al*., 2007; Bradshaw *et al*., 2010; Wheater *et al*., 2014; Jerrim *et al*., 2016

Key point

England's performance in science remains relatively stable and significantly above the OECD average.

4.2 International results

Results for 76[28] other participating countries were reported for science in 2018. Of these, 10 scored significantly higher than England. The majority of countries in this group were from east Asia and south-east Asia (B-S-J-Z (China), Singapore, Macao (China), Japan, Korea, Hong Kong (China) and Chinese Taipei) along with Estonia, Finland and Canada. This is equivalent to the relative position of England in 2015 when 9 countries scored significantly higher than England.

[27] Note: the OECD average for 2006, 2012, 2015 and 2018 is based upon AV37 results presented in the OECD International results Table 1.B1.12 made up of the current 37 OECD countries. See Chapter 1 for further information on the countries included in the OECD average. The OECD average for 2009 is based on the AV36b results (excluding Austria), which are also presented in the OECD International results Table 1.B1.12.

[28] Whilst Vietnam and Cyprus did participate in PISA 2018, their results are not included in this report. See Chapter 1 for further details of the countries included in this report.

Of the 8 countries whose scores were not significantly different from England's, the majority were from Europe (Poland, Slovenia, Netherlands, Germany, and Sweden) with the remainder being English-speaking countries (New Zealand, Australia and the United States). England's mean score in science was significantly higher than the remaining 58 countries, a large majority of the participating countries.

Among the other English-speaking participating countries, Singapore and Canada (which has a substantial proportion of English speakers) scored significantly higher than England, whilst the Republic of Ireland scored significantly lower than England.

Among the 37 countries that are members of the OECD (and whose performance contributes to the OECD average), 5 countries performed significantly better than England, and all of the 8 countries whose performance was comparable to England are OECD members. Of the OECD members in the study, 12 had a significant drop in science performance from 2015 to 2018, compared to only 2 (Poland and Turkey) that had a significant increase. This is reflected in the fall of the OECD average score from 491 to 489 over this period.

All of these results are presented in Table 4.1.

Table 4.1 PISA International results for science

Note: ^v Indicates a significant change in science since PISA 2015, = indicates no significant change.

Participants with significantly HIGHER science scores than England

Country	Scale score	^v	Country	Scale score	^v
*B-S-J-Z (China)**	590	=	Finland	522	v
Singapore	551	=	Korea	519	=
Macao (China)	544	^	Canada	518	v
Estonia	530	=	*Hong Kong (China)*	517	=
Japan	529	v	*Chinese Taipei*	516	v

Participants with SIMILAR science scores to England (not statistically significantly different)

Country	Scale score	^v	Country	Scale score	^v
Poland	511	^	Germany	503	=
New Zealand	508	=	Australia	503	v
England	**507**	=	United States	502	=
Slovenia	507	v	Sweden	499	=
Netherlands	503	=	-	-	-

Participants with significantly LOWER science scores than England

Country	Scale score	^v	Country	Scale score	^v
Belgium	499	=	Luxembourg	477	v
Czech Republic	497	=	Iceland	475	=
Republic of Ireland	496	=	*Croatia*	472	=
Switzerland	495	v	*Belarus*	471	=
France	493	=	*Ukraine*	469	=
Denmark	493	v	Turkey	468	^
Portugal	492	v	Italy	468	v
Norway	490	v	Slovak Republic	464	=
Austria	490	=	Israel	462	=
OECD Average	**489**	=	*Malta*	457	v
Latvia	487	=	Greece	452	=
Spain	483	v	Chile	444	=
Lithuania	482	=	Mexico	419	=
Hungary	481	=	Colombia	413	=
Russian Federation	478	v	plus 30 other countries	<450	-

Countries not in OECD (italicised). OECD countries (not italicised). OECD countries are identified in Table 1.1 with an asterisk.
** B-S-J-Z (China) different provinces from 2015*

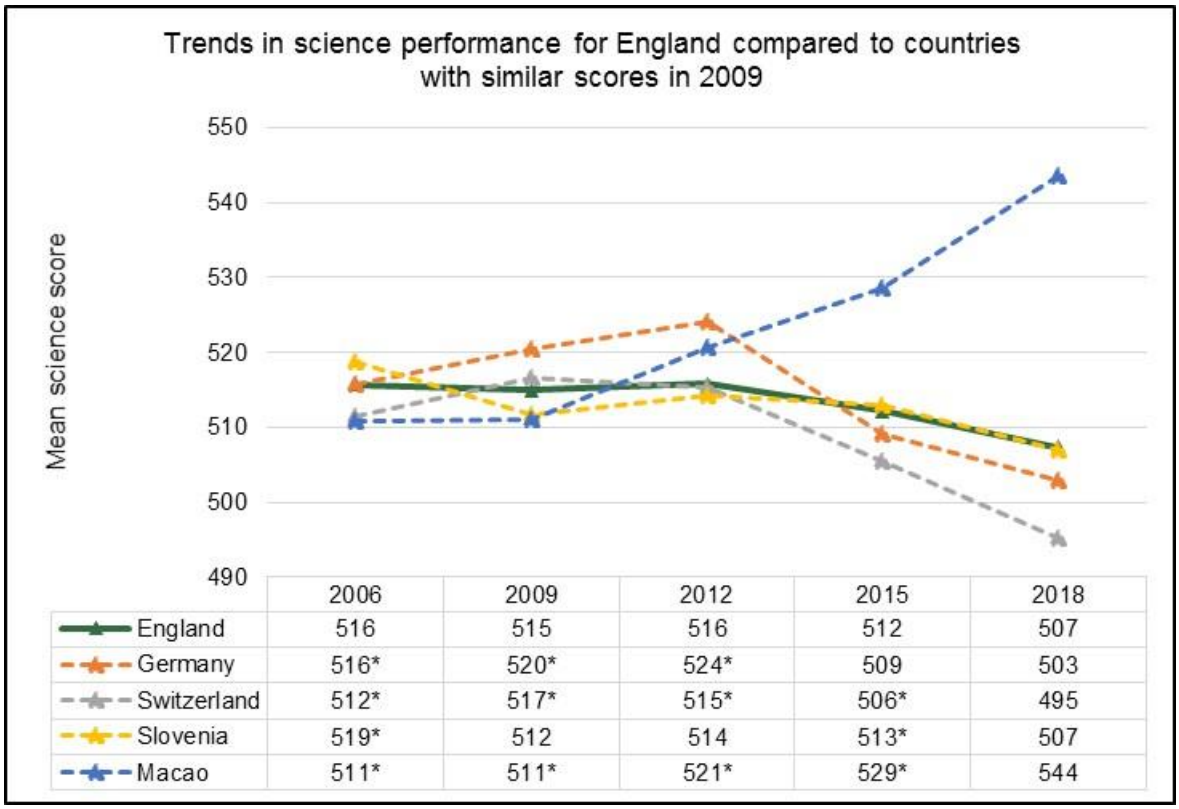
Source: PISA 2018 database

Figure 4.2 illustrates the trends in performance for England since 2006, alongside the trends for a number of other countries. These countries have been selected from the group of countries whose mean science score was not significantly different from that of England in 2009. This allows us to compare how other countries' performance has developed over the past 3 cycles from a similar starting point. The 2009 study was chosen as this allows the opportunity to observe medium-term trends, and to consider the potential impact of curriculum reforms during this period (for example the introduction of the revised 2014 curriculum for key stage 4 and GCSE science).

In 2009, 8 countries (with trend data over this period) had mean scores in science that were not significantly different from those in England (Bradshaw *et al.,* 2010). Tracking the performance of these countries to 2018, England's performance has remained in line with half of this group. Two of these countries, both from east Asia, performed significantly higher than England in 2018: Macao (China) and Chinese Taipei. The performance of 2 countries from this group was significantly lower than England's in 2018: the Republic of Ireland and Switzerland. England's performance in 2018 was still not significantly different from that of the remaining 4 countries: Netherlands, Germany,

Slovenia and Poland. Figure 4.2 compares the trends in performance for 4 of these countries to that of England.

Figure 4.2 Trends in science scores for a selection of countries that performed similarly to England in 2009



	2006	2009	2012	2015	2018
England	516	515	516	512	507
Germany	516*	520*	524*	509	503
Switzerland	512*	517*	515*	506*	495
Slovenia	519*	512	514	513*	507
Macao	511*	511*	521*	529*	544

*The difference (from 2018) is statistically significant.

Source: PISA 2018 database; Bradshaw *et al*., 2007; Bradshaw *et al*., 2010; Wheater *et al*., 2014; Jerrim *et al*., 2016

The performance of Macao (China) in science increased steadily from 2009 and it was ranked in the top 3 high performers in 2018. Switzerland, whilst scoring similarly to England in 2009, had a mean score significantly below that of England in 2018, whilst Germany and Slovenia have maintained similar scores to England over this period. As previously noted, the science score for England has remained relatively stable over this period, with a slight, but non-significant decline. This seems to also be the pattern for most of the other countries in this comparator group, although Germany and Switzerland have seen steeper declines, particularly since 2012. The performance of Slovenia has remained very similar to that of England.

It is also informative to look at the long-term trends of countries that performed significantly better and worse than England in 2009. Of the 9 countries that performed significantly better than England in 2009 (Bradshaw *et al.,* 2010) and also took part in the 2018 study, only 2 (New Zealand and Australia) did not have significantly higher mean scores than England in 2018, while the rest continued to outperform England. Of the countries that had mean scores significantly below England in 2009, only 2 (Sweden and

the United States) had improved their relative position and had scores not significantly different from England in 2018, while the rest remained below England. Overall, this indicates that the long-term relative position of pupils in England in PISA studies in science is stable, with only small changes in the pattern of countries performing above and below them.

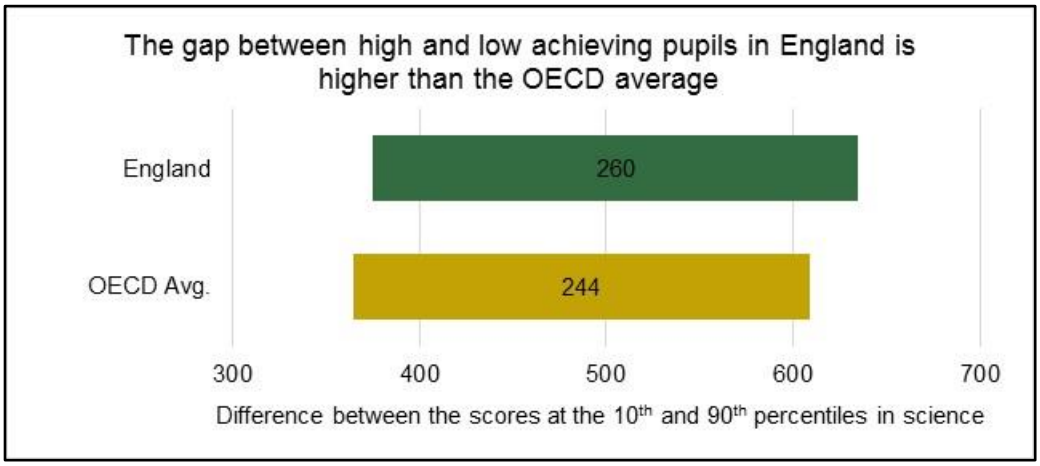
4.3 Differences between highest and lowest achievers

In addition to knowing how well pupils in England performed overall, it is also important to examine the spread in performance between the highest and lowest achievers. Amongst countries with similar mean scores there may be differences in the numbers of high- and low-scoring pupils (the highest and lowest achievers). A country with a wide spread of attainment may have large numbers of pupils who are underachieving as well as pupils performing at the highest levels. A country with a lower spread of attainment may have fewer very high achievers but may also have fewer very low achievers.

4.3.1 Distribution of scores

The first way in which the spread of performance in each country can be examined is by looking at the distribution of scores. Appendix C shows the scores achieved by pupils at different percentiles. The 10th percentile is the score below which the lowest-performing 10% of pupils lay, while the 90th percentile is the score above which the highest-performing 10% lay. The difference between the 10th and 90th percentiles is a better measure of the spread of scores for comparing countries than using the very lowest and highest scoring pupils. Such a comparison may be affected by a small number of pupils with unusually high or low scores. Comparison of the 10th and the 90th percentiles gives a better indication of the typical spread of attainment.

Figure 4.3 Attainment gap in science scores in England and the OECD



Source: PISA 2018 database

The gap between the scores at the 10th and 90th percentile in England was 260 score points. This is significantly higher than the OECD average attainment gap of 244. Pupils at the 10th percentile in England had a score of 375; higher than the OECD average of 365. Pupils at the 90th percentile had a score of 635, which is also higher than the OECD average of 609. This indicates that performance of pupils at both the lower and higher ability ranges in England was higher than the OECD average, especially for the more able pupils.

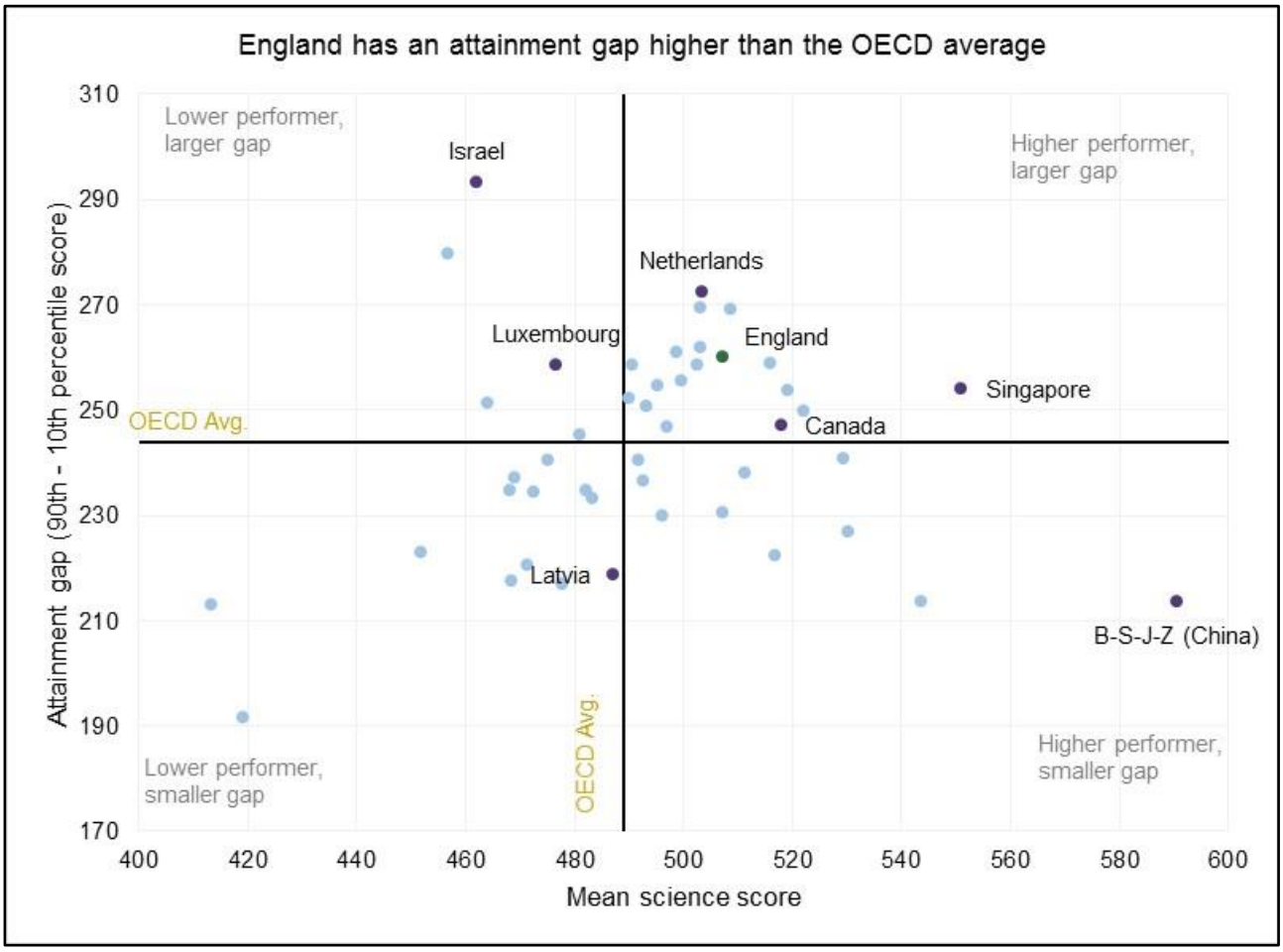
The attainment gap in England in 2018 was similar to that of 2015 (264 points), when both the score at the 90th percentile (642) and the 10th percentile (378) were not significantly different to the scores for 2018. This indicates that scores have fallen slightly, but not significantly, at both ends of the ability scale.

Key point

The attainment gap for England was significantly above the OECD average.

Figure 4.4 compares countries' mean science scores with the size of their attainment gap. Countries can be separated into 4 categories in relation to the OECD average: lower performing countries with a larger gap, lower performing countries with a smaller gap, higher performing countries with a larger gap, and higher performing countries with a smaller gap, although some countries lie so close to the OECD average, that they may be more reasonably characterised as similarly performing, or with a similar attainment gap.

Figure 4.4 Attainment gap in science scores across PISA 2018 countries



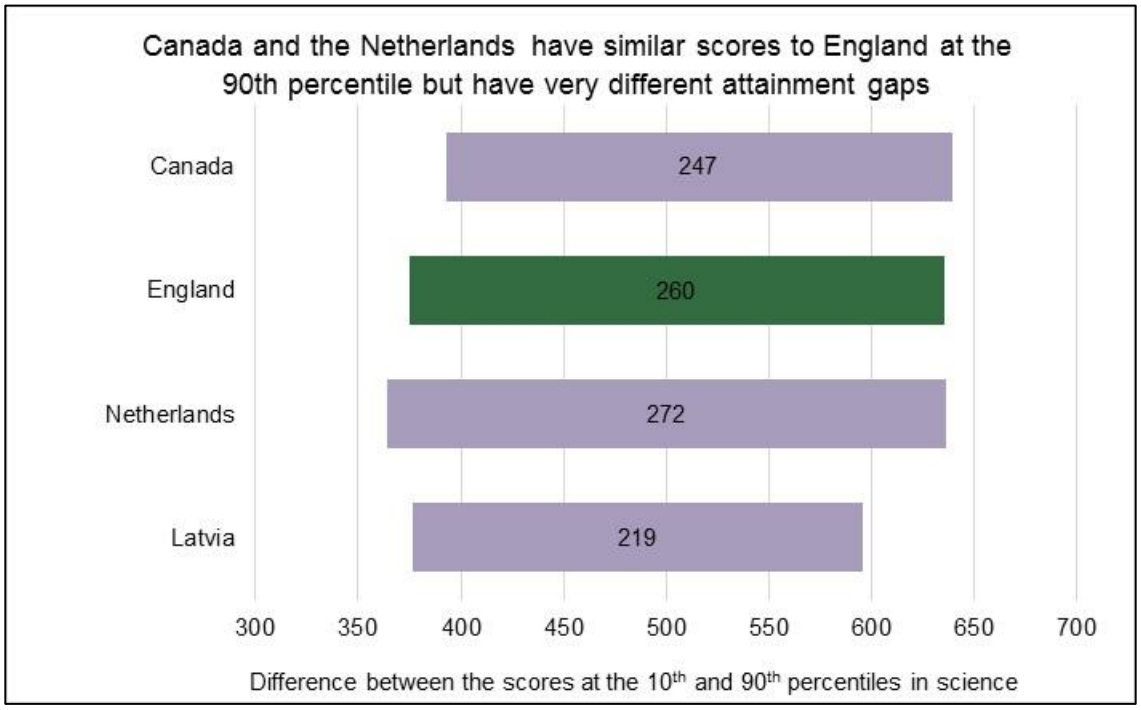
Note: This scatterplot contains all countries either in the OECD or with a mean score above 450

PISA 2018 Results (Volume I), PISA 2018 database

The scatterplot indicates that there is no clear relationship between high science score and attainment gap. For example, whilst the highest scoring country, B-S-J-Z (China) has a very low attainment gap, the second highest scoring country, Singapore, has an above average attainment gap. These differences are seen also with scores for those countries below the OECD average, such as Latvia which has a low attainment gap comparable to B-S-J-Z (China), whilst Israel, with a lower mean score, has the highest attainment gap of these countries.

England sits in quadrant II of this scatterplot, alongside OECD countries including Singapore and Canada, as a country with a mean score and an attainment gap above the OECD averages. In further considering England's attainment gap and its relationship with overall performance, scores for pupils at the 10th and 90th percentiles can be compared with those of other countries. Figure 4.5 shows countries with similar scores at either the 10th or 90th percentile compared to England (these countries are also marked on Figure 4.4).

Figure 4.5 Attainment gap in countries with similar performance to England at either the 10th or 90th percentiles



Source: PISA 2018 database

In both Canada and the Netherlands pupils at the 90th percentile had mean scores in science that were close to those of pupils in England. However, Canada, a country that performed significantly higher than England, had a lower attainment gap with a score higher than that of England at the 10th percentile. In contrast, the Netherlands had a larger attainment gap, owing to the lower performance of pupils at the 10th percentile, which also resulted in the mean score for the Netherlands being lower than that of England. Latvia is an example of a country that had comparable performance to England at the 10th percentile, but whose attainment gap was below the OECD average as pupils performed less well than those in England at the 90th percentile. As a result, Latvia's mean score was significantly lower than that in England. This serves to illustrate the potential trade-offs to be made between policy that seeks to improve average performance by targeting lower or higher performers.

4.3.2 Performance across PISA proficiency levels

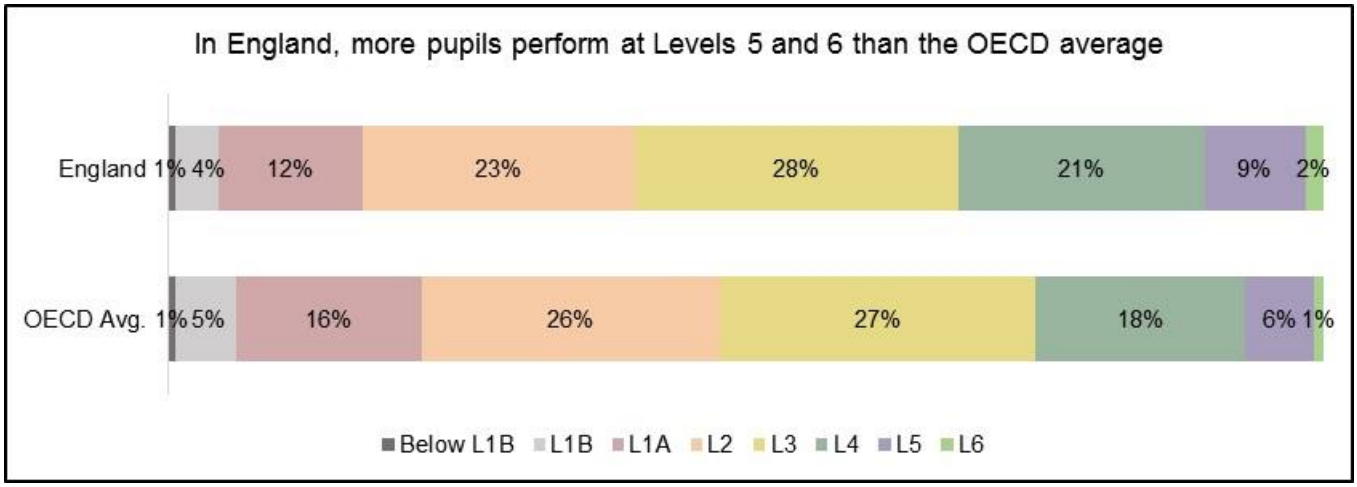
Proficiency levels for science

The second way of examining the spread of attainment is by looking at England's performance at each of the PISA proficiency levels. The PISA proficiency levels for science are devised by the PISA Consortium. They are categorised as 7 levels of achievement (Levels 1-6, with Level 1 subdivided into 1a and 1b) which describe the abilities of pupils performing at each of these levels. The proficiency levels are outlined in

Figure 4.6 which also shows the cumulative percentages at each level for the OECD average and for England.

Pupils who score below Level 2 (L2) are considered low performers and those that perform at Level 5 (L5) or above are considered top performers (OECD, 2019b). A significantly larger proportion of pupils in England performed at or above Level 5 (10%[29]) than the OECD average (7%). Additionally, a significantly lower proportion of pupils performed below Level 2 (17% in England compared to 22% across the OECD). Compared to the performance of pupils in England in PISA 2015, these figures were not significantly different.

Figure 4.6 Science proficiency levels in England and the OECD



Note: All percentages are rounded.

Source: PISA 2018 database

4.4 Differences between boys and girls

In England, boys performed slightly better than girls in science, but this difference was not statistically significant. Boys achieved a mean score of 509 while that for girls was 506. This gender gap was similar to the OECD average, which saw a significant average score difference of 2 score points in favour of girls.

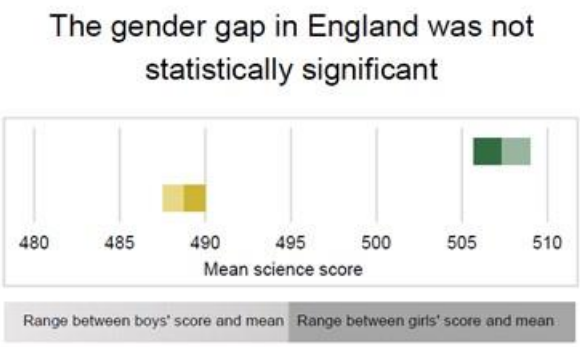
The PISA 2018 mean science scores for girls and boys in England were consistent with the 2015 results for science, where there was no gender gap and both boys and girls achieved a mean score of 512 (Jerrim *et al.,* 2016). There were no significant changes in the gender gap or the performance of boys and girls from 2015 to 2018.

[29] after taking into account the rounding of figures

Figure 4.7 Gender differences in science scores in England compared to the OECD average

	Overall science score	Mean score girls	Mean score boys	Difference girls - boys
England	507	506	509	-3
OECD Avg.	489	490	488	+2*

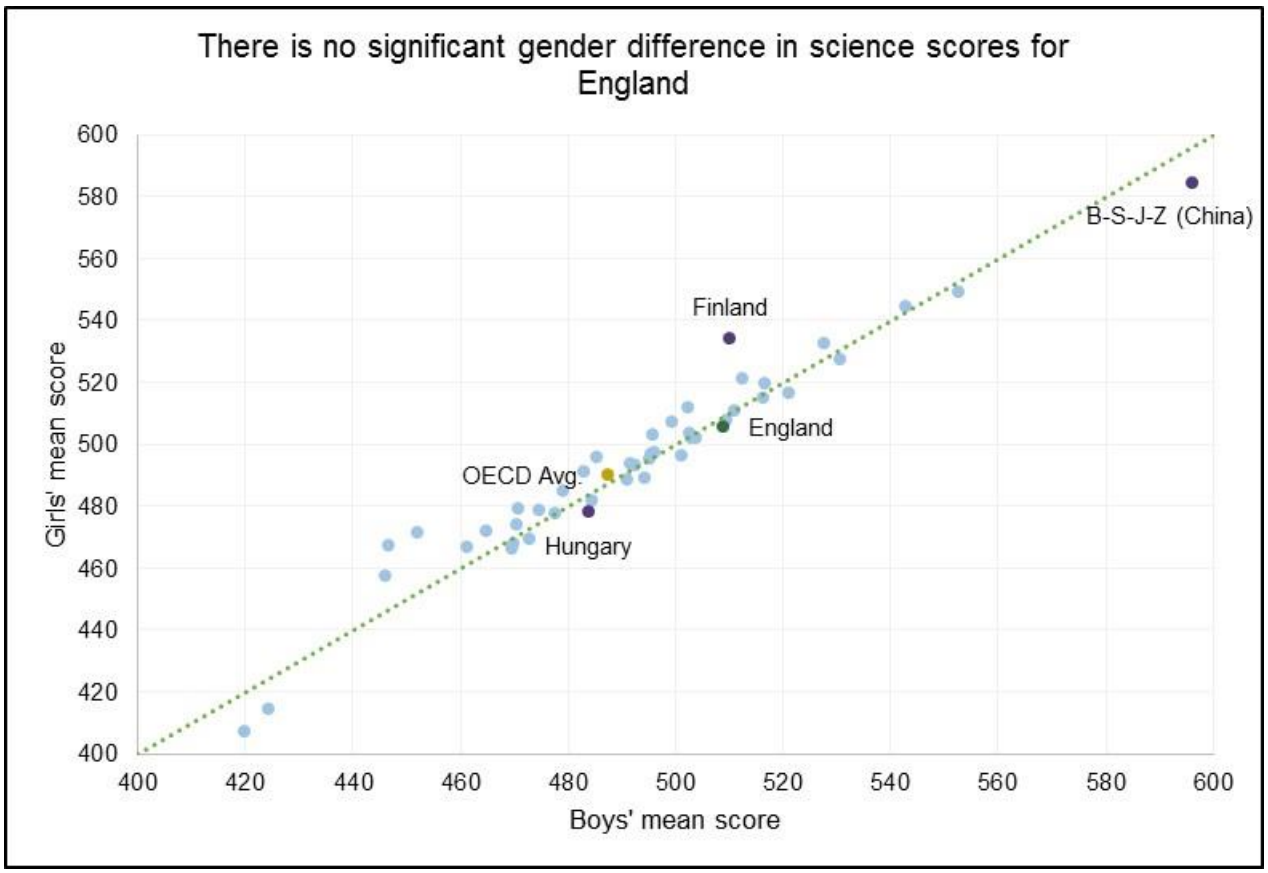
*The difference is statistically significant



Source: PISA 2018 database

Figure 4.8 provides a scatterplot of the mean score for girls against the mean score for boys. For science, countries are scattered either side of the line of equality, with girls overall performing very slightly better than boys, as shown by the OECD average. This illustrates that England performed very close to the OECD average, but is one of the minority of countries, such as Hungary, that slightly favours boys in science, although as mentioned this difference is not significant.

Figure 4.8 Gender differences in science scores across PISA 2018 countries



Note: This scatterplot contains all countries either in the OECD or with a mean score above 450

Source: PISA 2018 database

Like England, most countries display minimal gender gaps. However, some of the high performing countries had the largest gender gaps with the top performer, B-S-J-Z (China), significantly favouring boys and Finland, another high performer, significantly favouring girls.

5 Mathematics

Chapter outline

This chapter reports the mathematics attainment of pupils in England. It draws on findings outlined in the PISA International report (OECD, 2019b) and places outcomes for England in the context of those findings. Throughout the chapter, comparisons are made between the findings for PISA 2018 and previous cycles. As in 2015, mathematics was a minor domain in 2018.

Key findings

Overall mathematics performance

- England achieved a mean score of 504 in 2018 which was significantly higher than the OECD average of 489.
- England's performance in mathematics improved significantly since 2015. This was the first time England significantly improved in mathematics; performance had been stable from 2006 to 2015.

Mathematics performance in relation to other countries

- The number of countries outperforming England decreased from 19 in 2015 to 12 in 2018. England performed similarly to a number of countries which had previously outperformed them in PISA 2015.
- The composition of the top performing group of countries remains similar to previous cycles, dominated by east and south-east Asian countries.

Attainment gap between highest and lowest achievers

- Lower achievers' scores in mathematics improved significantly compared with PISA 2015. This improvement has slightly reduced the gap between the higher and lower achievers, since 2015.
- England had a similar spread of attainment to the OECD average. Some of the top performing countries had a wider spread of attainment, while others had a narrower spread.

Proficiency levels

- Compared with the OECD average, England had a significantly higher proportion of pupils working at the highest PISA proficiency levels (Levels 5 and 6) and a significantly lower proportion at the lowest levels (below Level 2).
- The percentage of pupils in England at proficiency below Level 2 has decreased significantly (by 3 percentage points) since 2015. The percentage of pupils achieving Levels 5 or 6 has increased slightly, but not significantly, since 2015 (by 2 percentage points).

Gender gap

- Boys significantly improved in mathematics performance since 2015. Girls also improved but that change was not statistically significant.
- In England, boys performed significantly better than girls. This was also the case for the OECD average.

5.1 England's performance in mathematics

In PISA 2018, mathematics was one of the minor domains, as reading was the major domain for this cycle. Mathematics was most recently the major domain in 2012 (and will next be the major domain in 2021). The mathematics content tested in PISA 2018 is described in the OECD 2012 mathematics framework, which was developed by the OECD for PISA 2012, and will be updated again for PISA 2021.

The mathematics performance of pupils in England has improved significantly; pupils performed statistically significantly[30] better in mathematics in 2018 than in 2015. They also performed significantly better than in 2009. Additionally, although not statistically significant, performance in 2018 was also notably higher than in 2006 and also in 2012, when mathematics was the major domain and a larger volume of data on performance on the mathematics subscales was gathered.

Key point

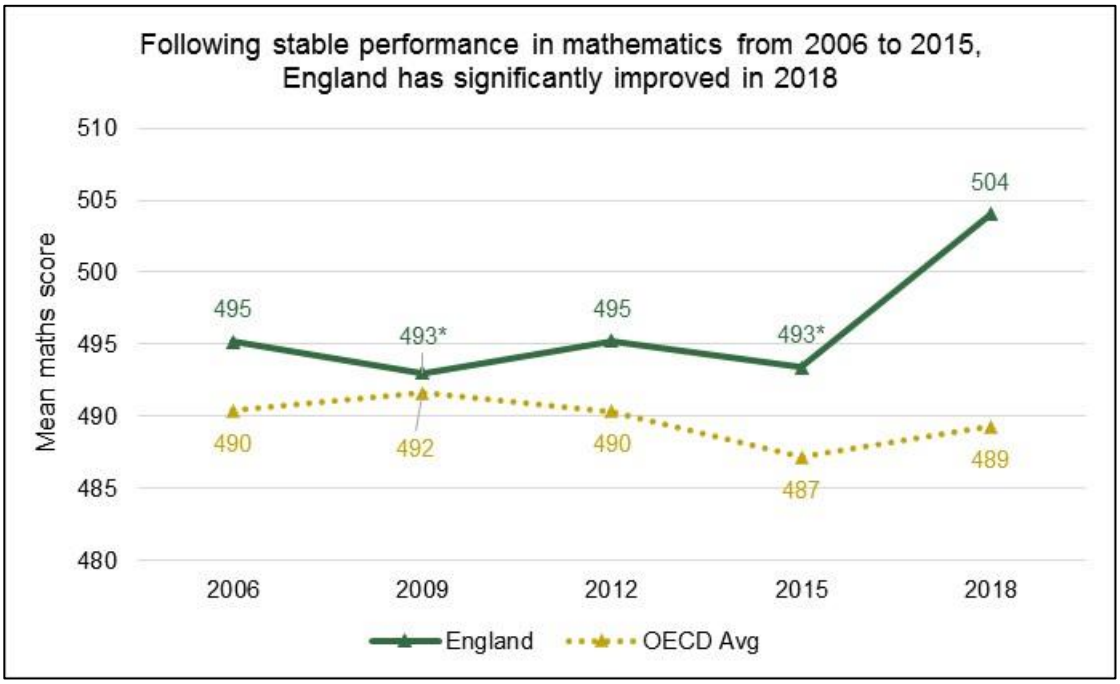
England's performance in mathematics was significantly better in 2018 than in 2015.

Pupils in England achieved a mean score of 504 in mathematics in PISA 2018. This was significantly above the OECD average[31] score of 489. In England's PISA 2015 National Report (Jerrim *et al.*, 2016), performance in 2015 was reported as not significantly different from the OECD average. However, when we retrospectively calculate the OECD average for 2006 to 2015 based on current OECD membership[32] we find that England's performance in mathematics was significantly higher than this OECD average in 2015.

[30] When statistical significance is reported, it indicates that the compared means are significantly different at the 5% level.
[31] The 2018 OECD average is based upon the AV37 results published in the OECD International results Table 1.B1.11.
[32] The OECD average for 2006, 2012 and 2015 and 2018 is based upon the AV37 results presented in the OECD International results Table 1.B1.11, made up of the current 37 OECD countries. See Chapter 1 for further information on the countries included in the OECD average. The OECD average for 2009, based upon AV36b results (excluding Austria), is also presented in the OECD International results Table 1.B1.11.

Therefore, in 2018, England's mean scored remained significantly above the OECD average.

Figure 5.1 Trends over time in mathematics scores in England and the OECD



*Indicates a score that is significantly different from the given country's 2018 score

Source: PISA 2018 database; Bradshaw *et al*., 2007; Bradshaw *et al*., 2010; Wheater *et al*., 2014; Jerrim *et al*., 2016

5.2 International results

Of the 76[33] other reported participating countries in PISA 2018, only 12 scored significantly higher than England and, as in previous cycles, most of the top-performing countries were from east or south-east Asia and Europe: B-S-J-Z (China), Singapore, Macao (China), Hong Kong (China), Chinese Taipei, Japan, Korea, Estonia, the Netherlands, Poland, Switzerland and Canada. Ten countries performed at a level that was not significantly different from that of England, while the remaining 54 countries performed significantly less well. These results are shown in Table 5.1.

Only 7 countries in Table 5.1 made significant improvements in their mathematics performance since 2015. Alongside England, these were Macao (China), Poland, Latvia, Iceland, Turkey and the Slovak Republic. Chinese Taipei and Malta both had scores that were significantly below their scores in 2015.

[33] Whilst Vietnam and Cyprus did participate in PISA 2018, their results are not included in this report. See Chapter 1 for further details of the countries included in this report.

Key point

The number of countries outperforming England has decreased by 7 since 2015. England now performs similarly to an additional 7 European countries.

Among OECD countries, 7 outperformed England, 10 performed similarly and 19 performed less well. This indicates that England, although not among the very highest achieving group of countries internationally, compares favourably with other OECD countries. As well as England, 5 other OECD countries showed significant improvement in mathematics performance since 2015 (Poland, Latvia, Iceland, Turkey and Slovak Republic) while no OECD countries' scores declined significantly. The results are presented in Table 5.1.

Table 5.1 PISA International results for mathematics

Note: ^v Indicates a significant change in mathematics since PISA 2015, = indicates no significant change.

Participants with significantly HIGHER mathematics scores than England

Country	Scale score	^v	Country	Scale score	^v
*B-S-J-Z (China)**	591	=	Korea	526	=
Singapore	569	=	Estonia	523	=
Macao (China)	558	^	Netherlands	519	=
Hong Kong (China)	551	=	Poland	516	^
Chinese Taipei	531	v	Switzerland	515	=
Japan	527	=	Canada	512	=

Participants with SIMILAR mathematics scores to England (not statistically significantly different)

Country	Scale score	^v	Country	Scale score	^v
Denmark	509	=	Norway	501	=
Slovenia	509	=	Germany	500	=
Belgium	508	=	Republic of Ireland	500	=
Finland	507	=	Czech Republic	499	=
England	**504**	^	Austria	499	=
Sweden	502	=	-	-	-

Participants with significantly LOWER mathematics scores than England

Country	Scale score	^v	Country	Scale score	^v
Latvia	496	^	Hungary	481	=
France	495	=	United States	478	=
Iceland	495	^	*Belarus*	472	=
New Zealand	494	=	*Malta*	472	v
Portugal	492	=	*Croatia*	464	=
Australia	491	=	Israel	463	=
OECD Average	**489**	=	Turkey	454	^
Russian Federation	488	=	*Ukraine*	453	=
Italy	487	=	Greece	451	=
Slovak Republic	486	^	Chile	417	=
Luxembourg	483	=	Mexico	409	=
Spain	481	=	Colombia	391	=
Lithuania	481	=	plus 30 other countries	<450	-

Countries not in OECD (italicised). OECD countries (not italicised). OECD countries are also identified in Table 1.1 with an asterisk.
B-S-J-Z (China) different provinces from 2015

Source: PISA 2018 database

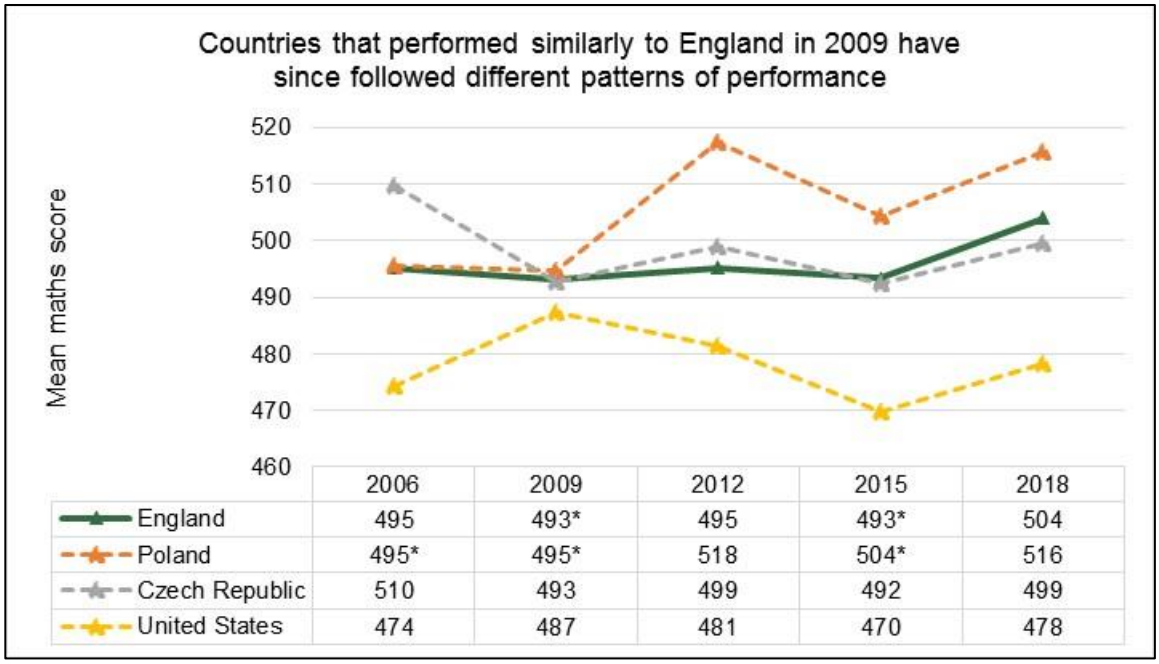
Mathematics was last the major domain in 2012, but in order to look at long-term trends in mathematics performance it is useful to look at performance over the previous 3 cycles of PISA, from 2009.

As noted above (Figure 5.1), mathematics performance in England has significantly improved since both 2009 and 2015. In 2009, 12 countries performed similarly to England (Bradshaw *et al.,* 2010). Five of these countries performed similarly to England in 2018 (Norway, Austria, Sweden, the Czech Republic and the Republic of Ireland), 6 performed significantly below (France, Slovak Republic, Hungary, Luxembourg, the United States and Portugal) and one scored significantly above (Poland).

Figure 5.2 illustrates the contrasting trajectories for 3 of these countries since 2009. Poland is the only country that performed similarly to England in 2009, but whose pupils significantly outperformed those in England in 2018. In all 3 cycles since 2009, Poland has significantly outperformed England, with its sharpest increase in performance occurring in 2012. Performance in Poland dipped in 2015 but rose again in 2018, so performance has not been stable but has followed an overall upward trend. The Czech Republic has performed similarly to England in all PISA cycles since 2009, though, unlike England, its improvement from 2015 to 2018 was not statistically significant. The United

States has shown a downward trend in performance since 2009 and scored significantly below England in 2012, 2015 and 2018.

Figure 5.2 Trends in mathematics scores for countries that performed similarly to England in 2009



	2006	2009	2012	2015	2018
England	495	493*	495	493*	504
Poland	495*	495*	518	504*	516
Czech Republic	510	493	499	492	499
United States	474	487	481	470	478

* Indicates a score that is significantly different from the given country's 2018 score

Source: PISA 2018 database; Bradshaw *et al*., 2007; Bradshaw *et al*., 2010; Wheater *et al*., 2014; Jerrim *et al*., 2016

In 2009, there were 20 countries that significantly outperformed England. In 2018, England performed significantly above 3 of these 20 countries and was no longer significantly different to a further 5. Eleven of these 20 countries still outperformed England in 2018 (in addition to Poland which had not been significantly different to England in 2009) and one country did not participate in 2018 (Liechtenstein). Furthermore, in 2009, 32 countries performed significantly below England, and in 2018 none of these countries performed similarly to, or better than, England. These results demonstrate England's relative strength in performance over time.

Looking at more recent changes in performance, a similar pattern can be seen. In 2018, pupils in England performed similarly to those in 7 countries that had performed significantly higher than them in 2015. Furthermore, no additional countries outperformed England in 2018 than had done so in 2015 or 2012.

5.3 Differences between highest and lowest achievers

In addition to knowing how well pupils in England performed overall, it is also important to examine the spread in performance between the highest and lowest achievers. Amongst countries with similar mean scores there may be differences in the numbers of high- and

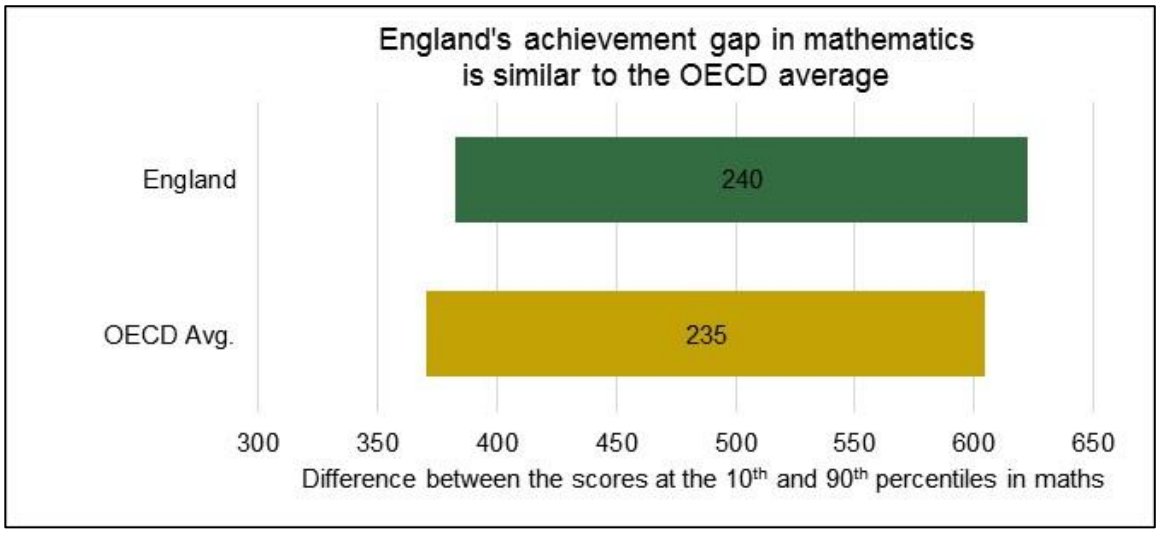
low-scoring pupils (the highest and lowest achievers). A country with a wide spread of attainment may have large numbers of pupils who are underachieving as well as pupils performing at the highest levels. A country with a lower spread of attainment may have fewer very high achievers but may also have fewer very low achievers.

5.3.1 Distribution of scores

The first way in which the spread of performance in each country can be examined is by looking at the distribution of scores. Appendix D shows the scores achieved by pupils at different percentiles. The 10th percentile is the score below which the lowest-performing 10% of pupils lay, while the 90th percentile is the score above which the highest-performing 10% lay. The difference between the highest and lowest achievers at the 10th and 90th percentiles is a better measure of the spread of scores for comparing countries than using the very lowest and highest scoring pupils. Such a comparison may be affected by a small number of pupils in a country with unusually high or low scores.

Pupils at the 10th percentile in England had a score of 383, while those at the 90th percentile had a score of 623, a difference of 240 score points. The difference in performance in England is slightly, but not significantly, wider than the OECD average, of 235 score points, as shown in Figure 5.3.

Figure 5.3 Attainment gap in mathematics scores in England and the OECD



Source: PISA 2018 database

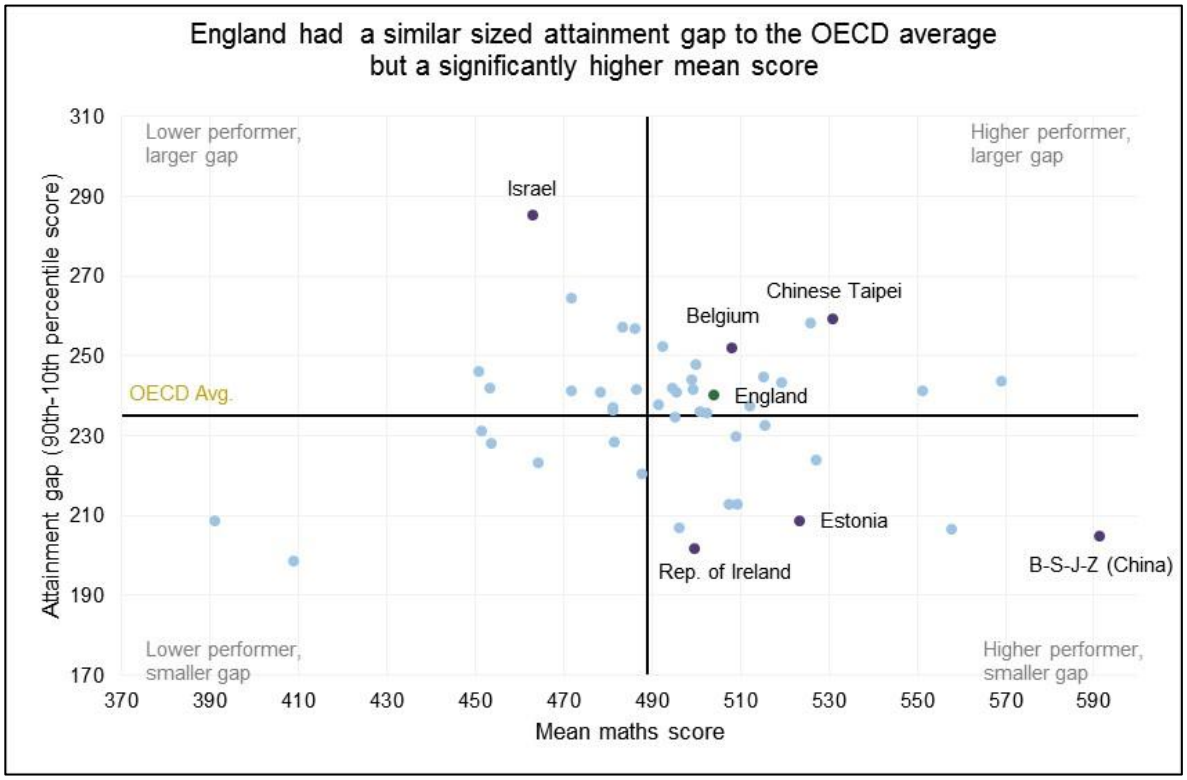
In England, pupils at the 10th percentile achieved significantly higher scores than in 2015, when their score was 369. Pupils at the 90th percentile also achieved higher scores than in 2015, when their score was 613, but this difference was not significant. Therefore, the attainment gap is smaller than it was in 2015 (when it was 245 score points) and this is due to the lower achievers improving at a greater rate than the higher achievers.

Key point

In England, lower achievers made a greater improvement in mathematics than higher achievers, reducing the gap between them since 2015.

Figure 5.4 compares countries' mean mathematics scores with the size of their attainment gap. Countries can be separated into 4 categories in relation to the OECD average: lower performing countries with a larger gap, lower performing countries with a smaller gap, higher performing countries with a larger gap, and higher performing countries with a smaller gap, although some countries lie so close to the OECD average, that they may be more reasonably characterised as similarly performing, or with a similar attainment gap. England falls into the third category as it had a higher score than the OECD average and a slightly (but not significantly) wider attainment gap. Although most countries cluster around the OECD average, some differ quite noticeably. For example, high-performing B-S-J-Z (China) had a smaller attainment gap than many other countries (205 points). Conversely, another high-performing country, Chinese Taipei, had a much wider gap of 259 points. Israel, which scored significantly below England in mathematics, had an attainment gap of 285 points, noticeably wider than any other country.

Figure 5.4 Attainment gap in mathematics scores across PISA 2018 countries



Note: This scatterplot contains all countries either in the OECD or with a mean score above 450

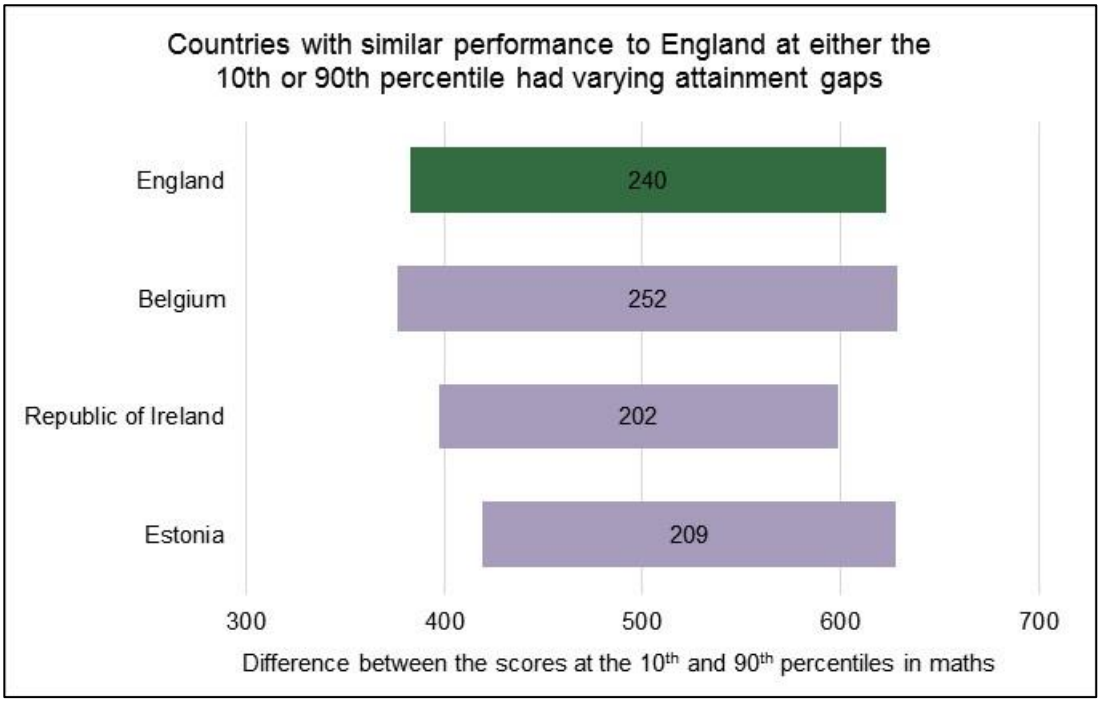
Source: PISA 2018 database

To further consider England's attainment gap and its relationship with overall performance, scores for pupils at the 10th and 90th percentiles can be compared with those of other countries. Figure 5.5 shows countries with similar scores to England at either the 10th or 90th percentile.

The overall mean scores achieved by England, Belgium and the Republic of Ireland were not significantly different. At both the 10th and 90th percentiles, pupils in Belgium and England scored similarly, though in Belgium the score was slightly lower at the 10th percentile and slightly higher at the 90th. This resulted in Belgium having a larger attainment gap. In comparison, pupils in the Republic of Ireland scored higher at the 10th percentile and lower at the 90th percentile than in England, resulting in a much smaller attainment gap (202). Therefore, countries with similar mean scores had different profiles of performance when looking at high and low achievers.

In Estonia, the high-achieving pupils, at the 90th percentile, scored similarly to those in England, but at the 10th percentile they scored higher. This smaller gap in attainment drove their higher overall mean score, which was significantly above England's.

Figure 5.5 Attainment gap in countries with similar performance to England at either the 10th or 90th percentiles



Source: PISA 2018 database

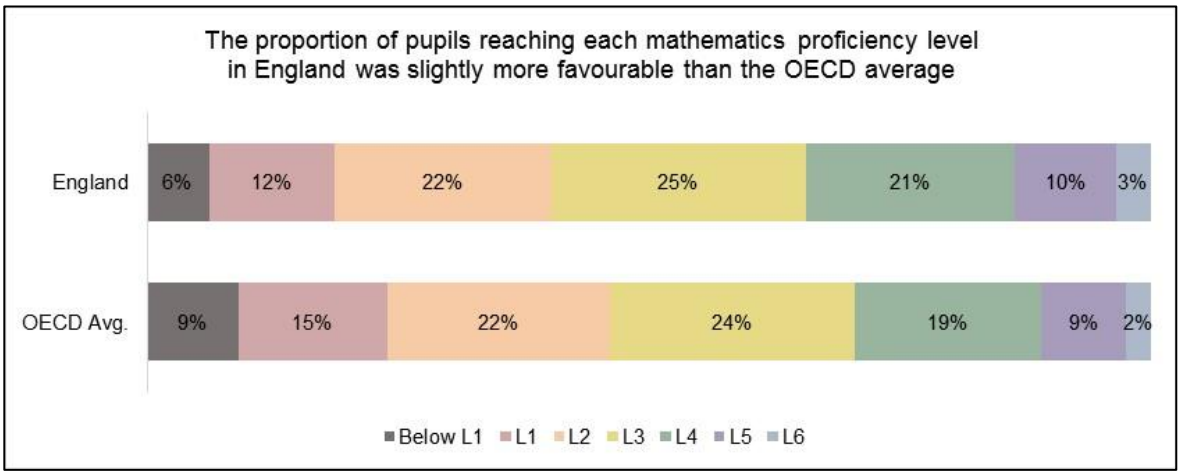
5.3.2 Performance across PISA proficiency levels

Proficiency levels for mathematics

The second way of examining the spread of attainment is by looking at England's performance at each of the PISA proficiency levels. The PISA proficiency levels for mathematics are devised by the PISA Consortium. There are 6 levels of achievement which describe the abilities of pupils performing at each of these levels. These performance levels are outlined in Appendix A3, along with the cumulative percentages at each level for the OECD average and for England. Pupils who score below Level 2 are considered low performers in mathematics and those that perform at Level 5 or above are considered top performers (OECD, 2019b).

Figure 5.6 shows that, compared with the OECD average, England had a significantly higher proportion of pupils working at the highest proficiency levels (Levels 5 and 6), with 14%[34] compared with 11% across the OECD. Additionally, England had a significantly lower proportion at the lowest proficiency levels (below Level 2), at 19%[35] compared to 24% on average across the OECD.

Figure 5.6 Mathematics proficiency levels in England and the OECD



Source: PISA 2018 database

Since 2015, the proportion of pupils in England working at the lower proficiency levels (below Level 2) has decreased significantly, by 3 percentage points. Those working at the higher levels (Levels 5 and 6) has increased slightly, but not significantly, by 2[36] percentage points. This shows an upward trend in performance.

[34] after taking into account the rounding of figures
[35] after taking into account the rounding of figures
[36] after taking into account the rounding of figures

5.4 Differences between boys and girls

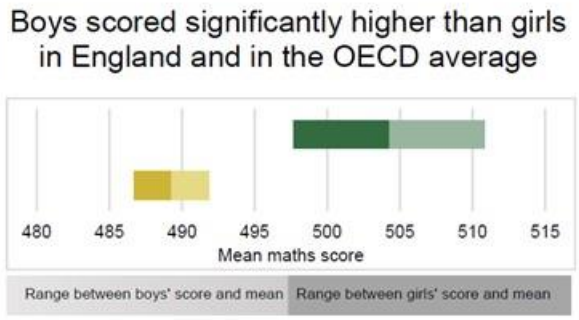
In England, boys performed significantly better than girls in mathematics, by 13 score points. Boys achieved a mean score of 511 while girls achieved a mean score of 498.

Figure 5.7 shows that there was also a significant difference, favouring boys, on average across the OECD. This difference was slightly, though not significantly, smaller than England's, at 5 score points. In England, both boys and girls scored higher than the OECD average.

Figure 5.7 Gender differences in mathematics scores in England and the OECD

	Overall maths score	Mean score girls	Mean score boys	Difference girls - boys
England	504	498	511	-13*
OECD Avg.	489	487	492	-5*

*The difference is statistically significant



Source: PISA 2018 database

The gender gap of 13 score points is similar to the gap in 2015 (12 points), when it was also statistically significant (Jerrim *et al.,* 2016). Boys' performance improved significantly since 2015, when they achieved 500. Girls' performance also increased, from 487 in PISA 2015, but this change was not statistically significant.

Key point

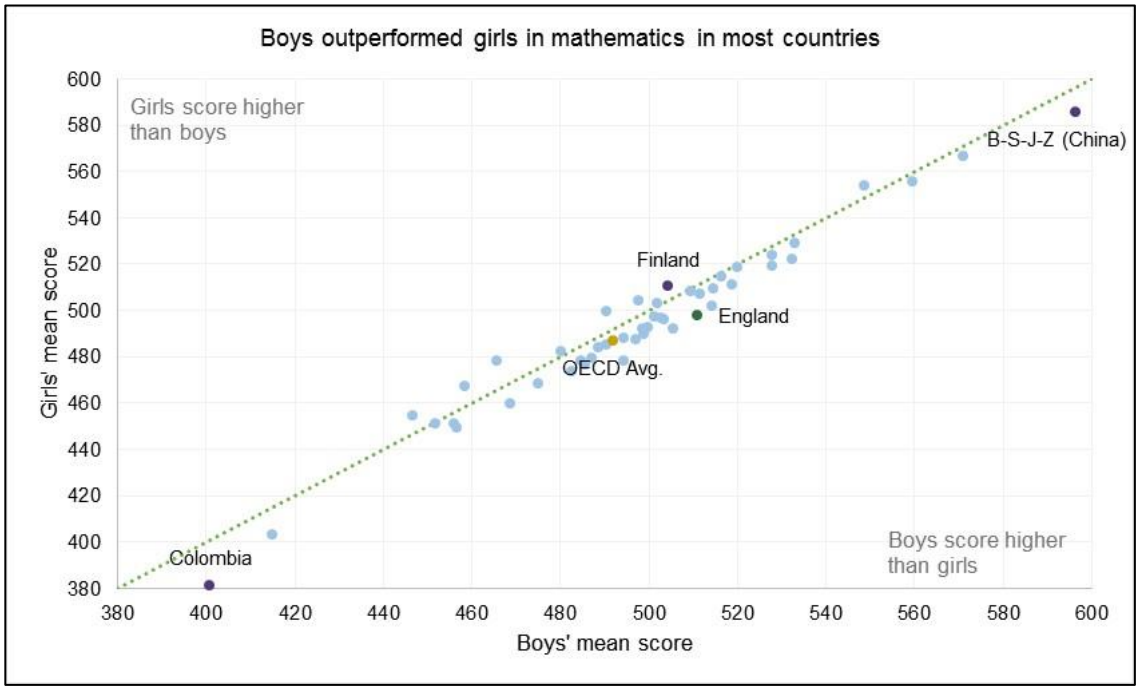
Boys' continued to perform significantly better in mathematics than girls, as they did in PISA 2015.

In most countries, boys scored higher than girls in mathematics and this difference was statistically significant in 31 countries. In a smaller number of countries, girls performed better than boys and this difference was significant in 13. The difference in performance between girls and boys can be seen in Figure 5.8.

The largest significant gender difference in favour of boys was found in Colombia, which had a difference of 20 score points. The top-performing country of B-S-J-Z (China) also had a significant gender difference in favour of boys, of 11 score points. However, the other 4 of the top 5 performing countries did not have significant gender differences. Among OECD countries, Japan had the largest significant difference in favour of boys (10 score points).

Qatar had the largest significant gender difference in favour of girls, with a difference of 24 score points. This was a larger difference than in all countries where boys performed significantly better. (N.B. Qatar is not shown on Figure 5.8 as its mean score was below 450.) Finland was the highest scoring country that had a gender difference that significantly favoured girls, with a difference of 6 score points.

Figure 5.8 Gender differences in mathematics scores across PISA 2018 countries



Note: This scatterplot contains all countries either in the OECD or with a mean score above 450

Source: PISA 2018 database

Comparisons between the 4 constituent countries of the UK are provided in Chapter 7.

6 Schools

Chapter outline

This chapter draws on responses to the PISA school and pupil questionnaires to describe aspects of ability grouping, assessment practices, parental engagement, school climate and school resources.

Key findings

Variation in reading performance

- In England, there was less variation in reading scores *between* schools but more variation *within* schools compared with the OECD average.

Grouping by ability

- Most headteachers in England reported that their schools grouped pupils by ability into different classes for some subjects and grouped pupils by ability within classes for some subjects. On average across the OECD countries, it was more common for schools not to group pupils by ability for any subject than it was in England.

Use of assessments

- Almost all schools in England used assessments of pupils in Years 10 and 11 to inform parents, guide learning, adapt teaching, monitor school progress, and identify areas of instruction to be improved. Across the OECD on average, assessments of pupils were generally less commonly used to inform decisions in schools than in England.

Pupils' behaviour at school

- Hindrances to learning caused by the behaviour of pupils or teachers were less commonly reported by headteachers in England than in the OECD on average. The most commonly reported cause of hindrance to pupils' learning in England was pupils not paying attention, which was nevertheless more common in the OECD countries than in England.

- Rates of incidence of bullying reported by pupils in England were similar to those reported on average across the OECD, but pupils in England expressed a higher degree of disapproval of bullying behaviours. Around a fifth of pupils reported that the most commonly reported bullying behaviour (being made fun of) had happened to them at least monthly over the previous year. The proportion, on average, across the OECD countries was lower, at 14%.
- Pupils in England were more likely to report that their fellow pupils were competitive than cooperative. The reverse was the case for the OECD on average. Pupils in England expressed a higher degree of competition among pupils than those across the OECD on average. The level of cooperation reported by pupils in England was lower than the level reported across the OECD on average.

Schools' resources

- Schools in England, on average, reported a greater availability of ICT resources than schools across the OECD countries.
- Generally, headteachers in England reported that their schools were better prepared to enhance learning and teaching using digital devices than schools across the OECD, for example, having sufficient digital devices for teaching and sufficient technical staff.
- Headteachers in England were generally less likely than those in other OECD countries to report that teaching was hindered by inadequate or poorly qualified teachers or support staff. The proportions of schools reporting inadequacies in equipment or infrastructure were similar for England and the OECD average.

Extra-curricular activities

- A greater proportion of headteachers in England reported that their schools provided extra-curricular activities for pupils in the PISA age group than schools across the OECD on average.

6.1 Variation in scores within and between schools

The measure of variation in reading scores achieved by pupils can be considered in 2 ways: the amount of variation between pupils who attend the same school (within-school variation), and the amount of variation between pupils grouped by the school they attend (between-school variation). Small between-school variations indicate that there is little difference in reading achievement between the groups of pupils at different schools, which would typically be characteristic of a comprehensive education system. Large between-school variations would be expected in a selective system in which pupils are admitted on the basis of aptitude for a particular course of education.

The International report for PISA 2018 (OECD, 2019c) provides information about the total variation in reading performance across OECD countries. Based on this measure, it also gives the variation in reading performance for each participating country overall, and for within- and between-school variation. This is described as a percentage of the average total variation in performance across OECD countries (rather than as a percentage of each individual country's total variation).

Across the OECD, 29% of the average variation in reading performance was observed between schools. The remaining 71% of the variation was due to within-school differences. In England, the amount of between-school variation was lower at 19% of the OECD total, but higher within schools at 86% of the OECD total[37]. This indicates that reading achievement varied less from school to school in England than across the OECD on average.

Comparison with the OECD average

This chapter reports on the responses of headteachers to the school questionnaire and pupils to the pupil questionnaire. These are compared to the average responses from headteachers or pupils from across the OECD[38].

In this section, we do not report whether differences are statistically significant as, due to the sample sizes, small differences can be statistically significant but not meaningful from a policy or practice perspective. Instead, we report on the size of differences. Throughout the remainder of the chapter, differences of 3 percentage points or less are described as *similar*, differences of 4 to 6 percentage points as *small*, differences of 7 to 9 percentage points as *moderate*, and differences of 10 or more percentage points as *large*.

6.2 School management and policies

6.2.1 School admissions

Headteachers were asked which factors were taken into consideration when admitting pupils to their schools. The factors shown in Table 6.1 may be used as the basis for

[37] For each participating country, the OECD reported the variation in reading performance as a percentage of the total variation in performance across OECD countries. As a result, a country's within- and between-school variation will not typically sum to 100%, reflecting the fact that its total variation will typically be higher or lower than the OECD average. For England, the total variation in reading performance was 105%: 19% between-school variation and 86% within-school variation. The sum of the between-school and within-school variation for the OECD does equal 100%.
[38] For analyses of questions from the questionnaires, the 2018 OECD average is based upon the AVG results published in the OECD International results.

school admissions or for other purposes in preparation for pupils' first years in secondary education. The most common factor considered by schools for pupils' admission in England was place of residence; just over half of the headteachers in England (52%) said they always considered this factor, compared with just over two-fifths of headteachers across the OECD (41%).

A third of headteachers across the OECD countries (33%) reported that they always considered pupils' records of academic performance (or entrance tests) when admitting pupils to their schools. In England, these were reported to be always taken into consideration by nearly a fifth (18%) of headteachers. Other factors were less commonly considered than place of residence in England, with the second most popular factor (selected by 32% of headteachers) being family members who were current or former pupils at the school. This factor was less commonly taken into account across the OECD, with 20% of headteachers reporting that it was always considered.

Table 6.1 School admissions, reported by headteachers

Percentage of headteachers who always considered the following factors when pupils are admitted to their school

Factor	England	OECD	Percentage point difference England-OECD[39]
Residence in a particular area	52%	41%	11
Preference given to family members of current or former students	32%	20%	12
Student's record of academic performance (including 11-plus and entrance exams)	18%	33%	-15
Parents' endorsement of the instructional or religious philosophy of the school	15%	16%	-1
Recommendation of feeder schools	13%	14%	-1
Whether the student requires or is interested in a special programme	5%	22%	-16
Other	22%	11%	11

Source: PISA 2018 database; School Questionnaire, question SC012

[39] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.

6.2.2 Grouping policies

Headteachers were asked how common it was for pupils to be grouped *into different classes* or *within classes* at their schools. As shown in Table 6.2, in England, grouping *into different classes* for some subjects was more common than grouping for all subjects or not grouping for any subject. Nine in 10 of the schools in England (92%) reported that they grouped pupils by ability *into different classes* for some subjects. Grouping by ability into different classes for some subjects was less common across the OECD on average than it was in England, with just under half of headteachers (46%) reporting that this was the case in their schools. Among the highest-performing countries, it was less common than in England for headteachers to report grouping into different classes for some subjects (for example Macao (China) 44%, England 92%), and more common to report not grouping into different classes for any subject (for example Macao (China) 48%, England 1%). There was a more mixed picture among the highest-performing countries when considering how many schools grouped pupils into different classes by ability for all subjects, with some countries reporting this more frequently than England (7%) (for example Hong Kong (China) 13%) and others less so (for example Estonia 1%).

Grouping *within classes* for some subjects was more common in England than grouping within classes for all subjects or not grouping within classes for any subject. Just over two-thirds of headteachers (68%) in England reported that pupils were grouped by ability *within classes* for some subjects. This was more common than across the OECD, where, on average, just over half of headteachers (51%) reported grouping by ability within classes for some subjects. When compared with England, the highest-performing countries were more likely to group within classes for all subjects (for example Singapore 9%, England 2%). There was a more mixed picture among the highest-performing countries when considering how many schools grouped pupils within classes by ability for some subjects; some countries reported this more frequently than England (68%) (for example Hong Kong (China) 75%) and others less so (for example Korea 55%). Similarly, not grouping by ability within classes also showed a mixed picture, with some countries reporting this more frequently than England (30%) (for example Korea 42%) and other less frequently (for example Singapore 21%).

Differences between countries in grouping by ability may be a consequence of other factors in the school system, such as the selection of pupils to different schools on the basis of preference, or aptitude to follow a particular course of secondary education.

Table 6.2 Grouping of pupils by ability, reported by headteachers

Percentage of headteachers who reported each grouping policy in Years 10 and 11

Grouping policy	England All subjects	OECD All subjects	England Some subjects	OECD Some subjects	England No subjects	OECD No subjects
Students are grouped by ability into different classes.	7%	9%	92%	46%	1%	45%
Students are grouped by ability within their classes.	2%	6%	68%	51%	30%	43%

Source: PISA 2018 database; School Questionnaire, question SC042

6.2.3 Equity-oriented policies

Headteachers were asked about pupils who spoke a language at home that was different from the language of instruction, and how they were integrated into mainstream classes. As shown in Table 6.3, just over four-fifths of headteachers in England (81%) indicated that pupils with a 'heritage' language other than English attended mainstream classes, and received additional periods of instruction aimed at developing their language skills. This was the most common provision for such pupils, both in England and on average across the OECD (where the proportion of headteachers reporting this practice was 58%). The second most common provision in schools in England (reported by 64% of headteachers) was for classroom assistants to provide support to pupils in mainstream classes.

Table 6.3 Pupils with English as an additional language

Percentage of headteachers who reported that their school offers any of the following options to pupils in Years 10 and 11 whose heritage language is not English *('Heritage language' is a language learnt at home that a student acquired as a mother tongue before learning English, or alongside English.)*

Type of support for pupils with EAL	England	OECD	Percentage point difference England-OECD
These students attend mainstream classes and receive additional periods of instruction aimed at developing their language skills (e.g. reading literacy, grammar, vocabulary, communication) in English.	81%	58%	23
These students are given support by classroom assistants in mainstream classes.	64%	n/a[40]	
Class size is reduced to cater to the special needs of these students.	29%	17%	12
Before transferring to mainstream classes, these students attend a preparatory programme aimed at developing their language skills (e.g. reading literacy, grammar, vocabulary, communication) in English.	28%	25%	3
Before transferring to mainstream classes, these students receive some instruction in school subjects in their heritage language.	9%	9%	0
These students receive significant amounts of instruction in their heritage language aimed at developing proficiency in both languages.	5%	7%	-2

Source: PISA 2018 database; School Questionnaire, question SC150

[40] No OECD average is available because this option was only included in the School Questionnaire used in the UK.

6.2.4 Assessment and accountability

Headteachers were asked about the purposes of assessments taken by pupils in Years 10 and 11; the results are shown in Table 6.4.

In England, assessments were used for 5 main purposes, with 96% or more of schools reporting using Year 10 and 11 assessments for: informing parents, guiding learning, adapting teaching, monitoring school progress, and identifying areas of instruction to be improved. These were the same 5 most common purposes across the OECD countries, but the proportions of schools using them across the OECD on average were lower than in England (between 78% and 95%).

For all but one of the possible options given, around three-quarters of schools, or more, in England (74% or more) used pupil assessments for this reason. The exception was using assessments to make decisions about pupils' retention or promotion, which just over half of headteachers in England (52%) said they did, compared with just under three-quarters of headteachers (72%) across the OECD on average.

Table 6.4 Use of school assessments, reported by headteachers

Percentage of headteachers who reported that their school uses assessments of pupils in Years 10 and 11 for each purpose

Purpose	England	OECD	Percentage point difference England-OECD[41]
To guide students' learning	99%	91%	7
To inform parents about their child's progress	99%	95%	4
To adapt teaching to the students' needs	98%	87%	12
To monitor the school's progress from year to year	97%	78%	19
To identify aspects of instruction or the curriculum that could be improved	96%	78%	17
To group students for instructional purposes	91%	49%	41
To compare the school to local or national performance	90%	57%	33
To make judgements about teachers' effectiveness	85%	44%	42
To compare the school with other schools	79%	46%	33
To award certificates to students	74%[42]	69%	5
To make decisions about students' retention or promotion	52%	72%	-21

Source: PISA 2018 database; School Questionnaire, question SC154

[41] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.
[42] 74% of headteachers in England reported that Year 10 and 11 assessments were used for awarding certificates to pupils. It might be expected that this percentage would be closer to 100% because of GCSE examinations. The result might be due to headteachers interpreting this question differently, for example, considering Year 10 and Year 11 assessments separately, or considering school level assessments rather than GCSEs.

6.3 School climate

6.3.1 Teacher and pupil behaviour affecting school climate

Headteachers were asked to indicate the extent to which learning at their schools was hindered by the behaviour of pupils and the behaviour of teachers. The findings are shown in Table 6.5.

In England, for all but one of the 11 reasons given, headteachers were less likely to report that the issues listed in this question hindered pupils' learning (to some extent or a lot) than headteachers, on average, across the OECD countries. For both England and the OECD, the main cause of hindrance to pupils' learning was reported to be pupils not paying attention; nearly three-fifths of headteachers reported this across the OECD countries (59%) compared with two-fifths in England (40%). The second most common cause of hindrance reported in the OECD, pupil truancy, was much less of an issue in England (38% for the OECD, compared with 20% in England). Of the causes of hindrance relating to staff behaviour rather than pupil behaviour, the most common cause in England, reported by 28% of headteachers, was teachers not meeting individual pupils' needs; the OECD average was similar at 30%.

Table 6.5 Pupil and teacher behaviour for learning, reported by headteachers

Percentage of headteachers who reported that the learning of pupils is hindered to some extent or a lot by each behaviour

Behaviour	England	OECD	Percentage point difference England-OECD[43]
Pupil behaviours	-	-	-
Students not paying attention	40%	59%	-19
Student truancy	20%	38%	-18
Students lacking respect for teachers	11%	22%	-10
Students skipping classes	9%	34%	-25
Students intimidating or bullying other students	4%	12%	-8
Student use of alcohol or illegal drugs	3%	10%	-7
Teacher behaviours	-	-	-
Teachers not meeting individual students' needs	28%	30%	-2
Teacher absenteeism	20%	18%	2
Staff resisting change	10%	29%	-19
Teachers not being well prepared for classes	5%	13%	-8
Teachers being too strict with students	3%	12%	-10

Source: PISA 2018 database; School Questionnaire, question SC061

[43] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.

Key point

Headteachers in England reported fewer hindrances to teaching caused by either pupil behaviour or teacher behaviour than headteachers across the OECD on average.

6.3.2 Parental engagement

Headteachers were asked about the proportion of pupils' parents that had participated in school-related activities in the previous academic year. The results are shown in Table 6.6.

On average, headteachers reported that over two-thirds of parents in England (71%) had discussed their child's progress with a teacher on the teacher's initiative during the last academic year. Across the OECD, the mean percentage reported by headteachers was lower, at 57%. Just over two-fifths of parents in England (41%) were reported to have discussed their child's progress on their own initiative, which matched the OECD average (41%). Headteachers in England were less likely than headteachers across the OECD countries to report that parents participated in school governance, or that they volunteered to help with physical or extra-curricular activities at school. The OECD average for participation in school governance was 17% of parents, compared with 4% in England.

Table 6.6 Parental engagement, reported by headteachers

Proportion of pupils' parents (or guardians) who have participated in each school-related activity during the last academic year (mean percentage)

School activity	England	OECD	Percentage point difference England-OECD[44]
Discussed their child's progress on the initiative of one of their child's teachers	71%	57%	13
Discussed their child's progress with a teacher on their own initiative	41%	41%	-1
Volunteered in physical or extra-curricular activities (e.g. building maintenance, carpentry, gardening, school play, sports, field trip)	6%	12%	-7
Participated in local school governance, e.g. as a parent governor	4%	17%	-12

Source: PISA 2018 database; School Questionnaire, question SC064

6.3.3 Extra-curricular activities

Headteachers were asked to indicate which of a series of extra-curricular activities were available to pupils in Years 10 and 11 at their schools. Generally, schools in England were more likely than schools across the OECD, on average, to offer the extra-curricular activities listed in Table 6.7.

The most common extra-curricular activities available to pupils in Years 10 and 11 in England were sports activities, art clubs, volunteering, musical groups, and school plays or musicals; more than 90% of headteachers in England reported that their schools offered these. All but one of these were also the most common activities on average across the OECD countries (with lectures replacing school plays in the top 5 across the OECD), but were less common than in England, with between 60% and 91% of schools offering them on average across the OECD. The 2 activities less common in England than the OECD countries were collaboration with local libraries (England 17%, OECD 49%) and collaboration with local newspapers (England 14%, OECD 27%).

[44] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.

Table 6.7 Extra-curricular activities, reported by headteachers

Percentage of headteachers who reported that their school offers each activity to pupils in Years 10 and 11

School activity	England	OECD	Percentage point difference England-OECD[45]
Sports teams or sports activities	100%	91%	9
Art club or art activities	98%	66%	32
Volunteering or service activities, e.g. a local community volunteering programme, Duke of Edinburgh's Award	96%	74%	22
Band, orchestra, instrumental group or choir	94%	63%	31
School play or school musical	92%	60%	33
Lectures and/or seminars (e.g. guest speakers such as writers or journalists)	83%	74%	9
Debating club or debating activities	72%	40%	32
Book club	71%	37%	34
School clubs or school competitions for foreign languages	70%	n/a[46]	
School yearbook, newspaper or magazine	65%	50%	16
Collaboration with local libraries	17%	49%	-33
Collaboration with local newspapers	14%	27%	-14

Source: PISA 2018 database; School Questionnaire, question SC053

[45] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.
[46] No OECD average is available because each country selected its own final option for this question. Consequently, this option was only included in the School Questionnaire used in the UK.

6.3.4 Disciplinary climate

In the Student Questionnaire, pupils were asked to indicate how often 5 disruptive events occurred in their English lessons (or lessons in their language of instruction, for non-English speaking countries). As shown in Table 6.8, there was little difference between the responses of pupils in England and pupils in the OECD countries on average. All of the disruptive events were reported to occur by at least 15% of pupils in England in all or most English lessons. The most commonly disruptive event reported by pupils, happening in most or every lesson, was noise and disorder. This was reported by a third of pupils in England (33%), which was similar to the OECD average (31%).

Table 6.8 Disruption in English lessons, reported by pupils

Percentage of pupils who reported each type of disruption in most or every English lesson(s)

Type of disruption	England	OECD	Percentage point difference England-OECD[47]
There is noise and disorder.	33%	31%	2
Students don't listen to what the teacher says.	30%	29%	0
The teacher has to wait a long time for students to settle down.	25%	26%	-1
Students don't start working for a long time after the lesson begins.	19%	24%	-6
Students cannot work well.	15%	19%	-4

Source: PISA 2018 database; Student Questionnaire, question ST097

6.3.5 Bullying

Pupils were asked how often they had experienced a series of bullying behaviours in the previous 12 months at school. The results are shown in Table 6.9.

On average, across OECD countries, 23% of pupils reported being bullied at least a few times a month. In England, the percentage was slightly greater, at 27% (OECD, 2019d). Of the 6 bullying behaviours listed in this question, at least 5% of pupils in England

[47] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.

reported that they had experienced them a few times a month or once or more a week over the previous 12 months.

Generally, the rates of incidence of bullying reported by pupils in England were similar to those reported on average across the OECD countries. The behaviour most commonly reported in both England and the OECD was *Other students made fun of me*. A fifth of pupils in England (20%) reported that this had occurred a few times a month or once or more a week at school over the previous 12 months, compared to 14% across the OECD.

An index of exposure to bullying was constructed by the OECD from pupils' responses to the statements in Table 6.9. Pupils were classified as being *frequently bullied* if they were among the 10% of pupils with the highest values on the index across all PISA countries. On average, across OECD countries, 8% of pupils were classified as being frequently bullied. In England, the proportion was similar, at 11% (OECD, 2019d).

Table 6.9 Experience of bullying, reported by pupils

Percentage of pupils who had the following experiences at school at least a few times a month, during the past 12 months (Some experiences can also happen electronically, for example on social media.)

Experience at school	England	OECD	Percentage point difference England-OECD
Other students made fun of me.	20%	14%	6
Other students left me out of things on purpose.	11%	9%	2
Other students spread nasty rumours about me.	10%	10%	0
I was threatened by other students.	7%	6%	1
I got hit or pushed around by other students.	6%	7%	-1
Other students took away or destroyed things that belonged to me.	5%	7%	-2

Source: PISA 2018 database; Student Questionnaire, question ST038

Pupils were also asked about their attitudes towards bullying. Table 6.10 shows that pupils in England and across the OECD, on average, expressed a high degree of disapproval of bullying behaviours. Between 89% and 96% pupils in England agreed or strongly agreed with the 5 statements about bullying. In each case, the percentage was around 7 percentage points greater than the proportion for the OECD average.

Table 6.10 Attitudes towards bullying, reported by pupils

Percentage of pupils who agreed or strongly agreed to each statement

Statement	England	OECD	Percentage point difference England-OECD[48]
I like it when someone stands up for other students who are being bullied.	96%	90%	6
It is wrong to take part in bullying.	95%	88%	7
It is a good thing to help students who can't defend themselves.	94%	88%	6
I feel bad when I see other students being bullied.	93%	87%	7
It irritates me when nobody defends students who are being bullied.	89%	81%	8

Source: PISA 2018 database; Student Questionnaire, question ST207

Key point

Pupils in England reported experiencing bullying at school to a similar extent to pupils across the OECD on average.

6.3.6 Competitiveness and cooperation

Pupils were asked 2 similarly worded questions, either about competition between, or cooperation among, the pupils at their school. The results are shown in Tables 6.11 and 6.12.

Across the OECD countries, pupils indicated that the statements about cooperation between pupils better reflected the behaviour and attitudes of pupils in their schools than the statements about competition. For example, 62% of pupils across the OECD indicated that it was true that *It seems that students cooperate with each other*, compared with 50% for the statement *It seems that students compete with each other*. In England, pupils were slightly more likely to agree with the statements about competition over the equivalent statements about cooperation, for example, 66% of pupils in England reported that *It seems that students compete with each other*, compared with 59% who

[48] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.

said that *It seems that students cooperate with each other*. The statement that was supported by the highest proportion of pupils in England for their school was *Students feel that they are being compared with others*. Just over two-thirds of pupils in England (68%) reported this was true. For the similar statement about cooperation, *Students feel that they are encouraged to cooperate with others*, the percentage of pupils in England who felt that this was true was 56%.

Generally, pupils in England were more likely to feel that the statements about competition were very true or extremely true for their schools than pupils, on average, across the OECD. For example, 57% of pupils in England felt it was true that *Students seem to value competition*, compared with 48% across the OECD. For the statements about cooperation, pupils in England were slightly less likely to feel that they were true of pupils at their school than pupils across the OECD, on average. For example, 49% of pupils in England felt it was true that *Students seem to value cooperation*, compared with 57% across the OECD.

Table 6.11 Competition amongst pupils, reported by pupils

Percentage of pupils who thought each statement was very or extremely true

Statement	England	OECD average	Percentage point difference England-OECD
Students seem to value competition.	57%	48%	9
It seems that students compete with each other.	66%	50%	16
Students seem to share the feeling that competing with each other is important.	54%	44%	10
Students feel that they are being compared with others.	68%	55%	13

Source: PISA 2018 database; Student Questionnaire, question ST205

Table 6.12 Cooperation between pupils, reported by pupils

Percentage of pupils who thought each statement was very or extremely true

Statement	England	OECD	Percentage point difference England-OECD
Students seem to value cooperation.	49%	57%	-8
It seems that students cooperate with each other.	59%	62%	-3
Students seem to share the feeling that cooperating with each other is important.	52%	60%	-8
Students feel that they are encouraged to cooperate with others.	56%	60%	-4

Source: PISA 2018 database; Student Questionnaire, question ST206

Key point

Pupils in England reported greater competition than cooperation among pupils at their school, on average. Pupils in England reported a greater level of competition between pupils at their school than the OECD average. The level of cooperation among pupils reported by pupils in England was slightly lower than the OECD average.

6.4 Resources

6.4.1 ICT

Headteachers were asked about the number of pupils and the ICT resources in their schools. The results are shown in Table 6.13.

On average, schools in England participating in PISA had more pupils in the PISA-age grade[49] than the OECD average, with an average of 181 Year 11 pupils per school compared with 157 for the OECD average.

Schools in England, on average, reported a greater availability of ICT resources than schools across the OECD, as shown in Table 6.13. For example, for every group of 30 Year 11 pupils in England, there were, on average, 43 computers available for them to

[49] The PISA-age grade is the modal grade for 15-year-old pupils in each participating country. In England, this is Year 11.

use at school for educational purposes. In contrast, across the OECD countries, there were insufficient computers available for each pupil in the PISA-age grade to have access to one at the same time: for every 30 pupils, there were on average 21 computers available. A similar picture was found for the number of computers with internet connection available for teachers; there were 17 such computers available for each group of 10 full-time or part-time teachers at schools in England on average. This compares with 8 computers with internet connection for each group of 10 teachers at schools across the OECD, on average.

Nearly all computers in school that were available to pupils to use for educational purposes had internet access; on average, only 2%, both in England and across the OECD, were not connected to the internet. Nearly a third of the computers in England (30%) were laptop or tablet computers. Across the OECD, this average was greater at nearly half (49%).

These findings indicate that schools in England were generally better resourced with ICT equipment than schools, on average, across the OECD. This is also seen in terms of being prepared to enhance learning and teaching using digital devices, where headteachers across the OECD generally reported a lower level of preparedness than headteachers in England. This was shown by the responses to a related but separate question, in which headteachers were asked the extent to which they agreed with a series of statements about their school's capacity to enhance learning using digital devices. The results are shown in Table 6.14.

The biggest differences, as reported by headteachers, between schools in England and the OECD average were for having sufficient ICT technicians (England 71%, OECD 54%); having an effective online learning support platform (England 67%, OECD 54%); and having sufficient internet bandwidth (England 79%, OECD 68%). The only item for which the OECD average was considerably greater than that for England concerned providing incentives to teachers to integrate digital devices into teaching, which a quarter of headteachers in England (25%) agreed or strongly agreed was the case, compared with nearly three-fifths (57%) of headteachers across the OECD, on average. This difference may have been due to teachers having already integrated digital devices into teaching or because incentives were not necessary.

Table 6.13 ICT equipment in school, reported by headteachers

Mean number of pupils and ICT equipment reported by headteachers for Year 11

Student-computer ratio	England	OECD	Difference England-OECD
At your school, what is the total number of students in Year 11?	181	157	24
Number of computers available to these pupils for educational purposes, for each group of 30 Year 11 pupils	43	21	22
Number of these computers connected to the internet, for each group of 30 Year 11 pupils	42	20	22
Number of these computers that are portable (e.g. laptop, tablet), for each group of 30 Year 11 pupils	13	10	3
Number of computers with internet connection available for teachers in your school for each group of 10 full-time and part-time teachers[50]	17	8	9

Source: PISA 2018 database; School Questionnaire, question SC004

[50] Calculated using the number of teachers reported in Table 6.17 (question SC018)

Table 6.14 Preparedness for using ICT, reported by headteachers

Percentage of headteachers who agreed or strongly agreed with each statement about their school's capacity to enhance learning and teaching using digital devices (including desktop computers, laptops, tablet computers or interactive whiteboards)

Statement	England	OECD	Percentage point difference England-OECD[51]
The availability of adequate software is sufficient.	82%	71%	11
The school's internet bandwidth or speed is sufficient.	79%	68%	12
Teachers have the necessary technical and pedagogical skills to integrate digital devices into teaching.	73%	65%	9
The number of digital devices connected to the internet is sufficient.	72%	67%	5
The school has sufficient qualified technical assistant staff.	71%	54%	17
The number of digital devices for teaching is sufficient.	70%	59%	11
Digital devices at the school are sufficiently powerful in terms of computing capacity (i.e. they are not too slow or do not crash frequently).	70%	68%	1
An effective online learning support platform is available.	67%	54%	13
Teachers have sufficient time to prepare lessons that integrate digital devices.	64%	61%	3
Effective professional resources for teachers to learn how to use digital devices are available.	63%	65%	-1
Teachers are provided with incentives to integrate digital devices in their teaching.	25%	57%	-31

Source: PISA 2018 database; School Questionnaire, question SC155

[51] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.

Headteachers were also asked about the existence of policies and procedures supporting the use of digital devices at their schools. As shown in Table 6.15, the proportion of headteachers in England who reported that their schools had in place such policies and procedures was similar to the proportion of headteachers, on average, across the OECD. There were 3 large differences. The first 2 were related to e-safety: 95% of headteachers in England reported that they had a scheme in place to prepare pupils for responsible internet behaviour, and 85% had a specific policy about the use of social networks. This compares to 60% and 52% respectively for the OECD on average. The third difference concerned having a written statement about the use of digital devices, which was the case for 95% of schools in England compared with 62% across the OECD.

Table 6.15 ICT policies and procedures, reported by headteachers

Percentage of headteachers who reported their school has each ICT policy or procedure

ICT policy or procedure	England	OECD	Percentage point difference England-OECD[52]
A specific scheme to prepare students for responsible internet behaviour	95%	60%	36
Its own written statement about the use of digital devices	95%	62%	32
A specific policy about using social networks (e.g. Facebook) in teaching and learning	85%	52%	33
Regular discussions with teaching staff about the use of digital devices for pedagogical purposes	58%	63%	-5
Its own written statement specifically about the use of digital devices for pedagogical purposes	51%	46%	5
A scheme to use digital devices for teaching and learning in specific subjects	48%	48%	0
Scheduled time for teachers to meet to share, evaluate or develop teaching materials and approaches that employ digital devices	44%	44%	1

[52] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.

ICT policy or procedure	England	OECD	Percentage point difference England-OECD[52]
A specific scheme to promote collaboration on the use of digital devices among teachers	35%	36%	-1

Source: PISA 2018 database; School Questionnaire, question SC156

6.4.2 Problems due to resource shortages

Headteachers were asked about the extent to which teaching was hindered by a number of factors related to staffing or physical resources. The results are shown in Table 6.16.

Generally, headteachers in England were less likely than those in schools in the OECD countries to report that their school's capacity to provide teaching was hindered by a lack of support staff or inadequate or poorly qualified teachers or support staff. The proportions of schools reporting inadequacies in equipment or infrastructure were similar for England and the OECD average. The most commonly reported issue in England was a lack of physical infrastructure; this was reported to hinder teaching, at least to some extent, by 34% of headteachers in England. The average proportion across the OECD was similar, at 33%. Across the OECD, the most commonly reported cause of hindrance to teaching related to staff, was a lack of support staff (33%). In England, the percentage was lower at 19%.

Table 6.16 Resource shortages, reported by headteachers

Percentage of headteachers who reported that their school's capacity to provide teaching was hindered to some extent or a lot by each resource shortage

Resource shortage	England	OECD average	Percentage point difference England-OECD[53]
A lack of physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems)	34%	33%	1
Inadequate or poor quality physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems)	33%	33%	0
A lack of teaching staff	27%	27%	0
A lack of educational material (e.g. textbooks, IT equipment, library or laboratory material)	26%	28%	-2
Inadequate or poor quality educational material (e.g. textbooks, IT equipment, library or laboratory material)	22%	25%	-3
A lack of support staff	19%	33%	-14
Inadequate or poorly qualified teaching staff	9%	15%	-6
Inadequate or poorly qualified support staff	6%	17%	-10

Source: PISA 2018 database; School Questionnaire, question SC017

Key point

Headteachers in England were generally less likely than headteachers across the OECD, on average, to report that teaching was hindered by inadequate or poorly qualified staff. The level of insufficiencies in physical resources reported in England was similar to the OECD average.

[53] The sum of the difference and the OECD average may not equal the percentage for England due to rounding.

6.5 Teachers

6.5.1 Teacher qualifications

Headteachers provided information about the numbers of full- and part-time teachers at their schools and their levels of qualifications. The results are presented in Table 6.17.

In England, the average number of full-time teachers at secondary schools was 66; for part-time teachers, the figure was 16. Teachers across the OECD were more likely to have a Master's degree qualification than teachers in England, which may reflect system-level differences in requirements for teaching.

Among schools in England, nearly three-quarters of teachers (72%) had attended a programme of professional development in the previous 3 months. This was greater than the OECD average of just over half (53%). A programme of professional development was defined as: *a formal programme designed to enhance teaching skills or pedagogical practices. It may or may not lead to a recognised qualification. The programme must last for at least one day in total and have a focus on teaching and education.*

Table 6.17 Teacher qualifications, reported by headteachers

Mean[54] number of teachers reported on school staff (Including both full-time and part-time teachers. A full-time teacher is employed at least 90% of the time as a teacher for the full school year. All other teachers should be considered part-time. Regarding the qualification level, please refer only to the teacher's highest qualification level.)

Number of teachers	England Full-time	OECD Full-time	England Part-time	OECD Part-time
Teachers in TOTAL	66	55	16	14
Teachers with Qualified Teacher Status	62	50	15	11
Teachers with a university Bachelor's degree (e.g. BA, BSc, BEd) qualification	60	33	14	7
Teachers with a university Master's degree (e.g. MA, MSc, MBA) qualification	11	24	2	6
Teachers with a doctorate or higher degree (e.g. MPhil, PhD) qualification	3	2	1	0

Source: PISA 2018 database; School Questionnaire, question SC018

[54] Columns may not sum to the total number of teachers. This tables reports the rounded weighted averages reported by headteachers for each part of the question and is not adjusted for cases in which the response for *Teachers in TOTAL* was exceeded by the responses to the rest of the question.

7 PISA in the UK

Chapter outline

This chapter describes some of the main outcomes of the PISA survey in England, Wales, Northern Ireland and Scotland. In particular, it outlines where there were differences in attainment in reading, science and mathematics, in the range of attainment, in the pattern of gender differences, or in responses to the school and pupil questionnaires.

Key findings

Performance in reading, mathematics and science

- There were no significant differences between mean scores for reading in England, Scotland and Northern Ireland. All 3 countries were significantly above the OECD average. The mean score in Wales was significantly lower than the other countries of the UK but not significantly different from the OECD average.
- In science, the mean score in England was significantly higher than the rest of the UK and was significantly above the OECD average. Northern Ireland, Scotland and Wales had mean scores that did not significantly differ from each other or from the OECD average.
- England's mean score in mathematics was significantly higher than the rest of the UK and was also above the OECD average. Mean scores in Northern Ireland, Scotland and Wales did not differ significantly from each other or from the OECD average.

Gender differences

- In all countries of the UK, girls significantly outperformed boys in reading, as was the case across the OECD. In science, girls significantly outperformed boys in Northern Ireland but there were no significant gender differences in England, Wales or Scotland. In mathematics, boys significantly outperformed girls in England and Scotland but there were no significant differences in Wales or Northern Ireland.

Trends in performance

- All countries of the UK show a stable trend in reading, apart from a significant improvement in Scotland since PISA 2015, which followed a similarly sized decrease between 2012 and 2015.
- In science there has been a decline in performance over successive cycles of PISA in Scotland, Wales and Northern Ireland, all of which had mean scores that were significantly lower than those in PISA 2006.

- In mathematics, both England and Wales show an improving trend across successive PISA cycles, while Scotland has declined and Northern Ireland has remained broadly stable.

Schools

- Whilst headteachers and principals in all UK countries agreed some purposes of assessments were to guide pupils' learning and adapt teaching to pupils' needs, more headteachers in Wales and England reported using assessments to make judgements about teacher effectiveness.
- Headteachers in England responded more favourably towards their school's capacity to enhance learning and teaching using digital devices than the other UK nations.
- Headteachers in Scotland were more likely than those in England, Wales and Northern Ireland to report pupil truancy and teacher absenteeism as hindering their capacity to provide teaching.
- Headteachers in Wales reported greater shortages or inadequacies of educational materials (for example textbooks, IT equipment etc.) than headteachers and principals in Northern Ireland, England and Scotland.
- Principals in Northern Ireland were more likely to report a lack of physical infrastructure than headteachers in England, Wales and Scotland. They also reported more inadequacies with the physical infrastructure of their schools.

Pupils

- The gap in reading attainment between the most and least disadvantaged pupils (as measured by the PISA ESCS Index) was significantly smaller in Northern Ireland, Wales and Scotland compared to the OECD average but the difference in England was not significantly different.
- Pupils in Wales, Northern Ireland and Scotland were significantly more able to overcome the effects of socio-economic background compared with the OECD average.
- Pupils in all countries of the UK had more negative attitudes towards reading than the OECD average, but pupils in England reported that they read more than those in the other countries of the UK.
- Pupils in all UK countries reported that they were less satisfied with their lives than the OECD average.
- Pupils in England, Wales, Northern Ireland and Scotland had lower expectations of their highest level of qualification than pupils across the OECD.

Full results for the UK as a whole are in the PISA International report (OECD 2019b, 2019c, 2019d).

7.1 Reading

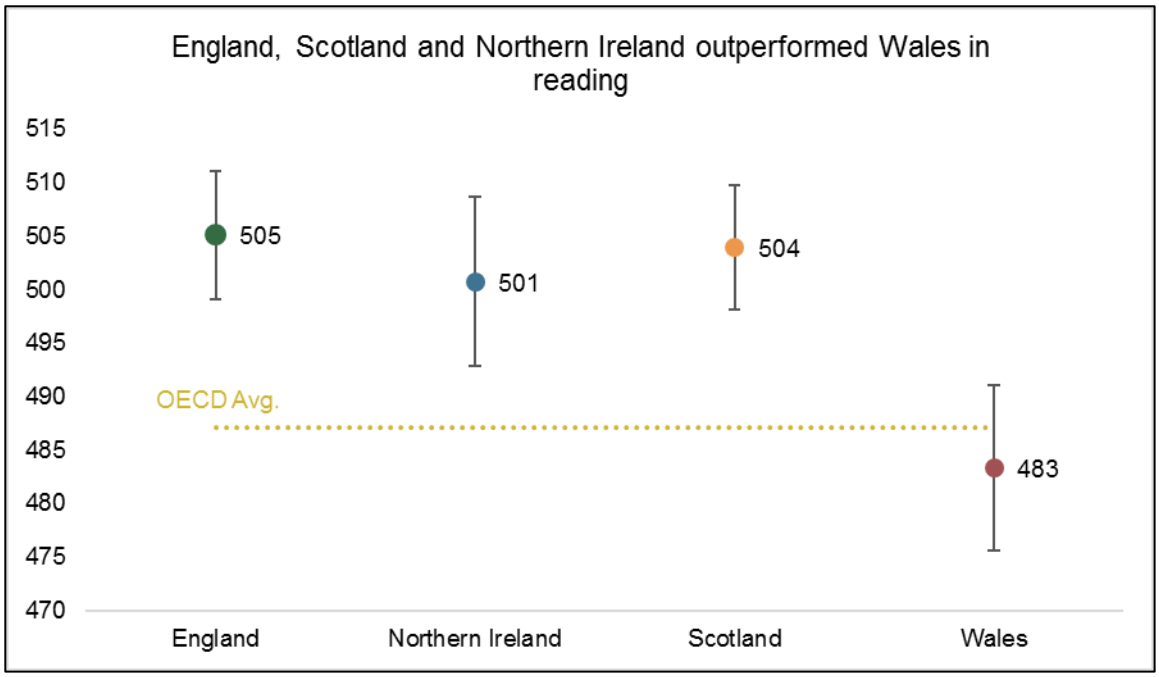
This section compares the findings outlined in Chapter 2 with the comparable findings for the other countries of the UK. Full data can be found in Appendix B.

7.1.1 Mean scores in reading

Figure 7.1 and Table 7.1 summarise the mean scores for each of England, Wales, Northern Ireland and Scotland on the reading achievement scale, and indicate which differences were statistically significant[55] (S).

There were no significant differences between mean scores in England, Northern Ireland and Scotland, which were all statistically significantly higher than the OECD average[56] of 487. The lowest attainment in the UK was in Wales, where the mean score was significantly lower than the other countries of the UK, and not statistically different from the OECD average.

Figure 7.1 Mean reading scores across the UK



Source: PISA 2018 database

[55] When statistical significance is reported, it indicates that the compared means are significantly different at the 5% level.
[56] The 2018 OECD average is based upon the AV36a results published in the OECD International results Table 1.B1.10.

Table 7.1 Mean scores for reading

Country	Mean	England	Northern Ireland	Scotland	Wales
England	505	-	NS	NS	**S**
Northern Ireland	501	NS	-	NS	**S**
Scotland	504	NS	NS	-	**S**
Wales	483	**S**	**S**	**S**	-
OECD average	487	**S**	**S**	**S**	NS

S Indicates a significant difference between mean scores
NS Indicates mean scores are not significantly different

Source: PISA 2018 database

Key point

There were no significant differences between mean scores for reading in England, Northern Ireland and Scotland. The mean score in Wales was significantly lower than the other countries of the UK but did not differ significantly from the OECD average.

On the 3 reading subscales, there was a more varied pattern of differences. Scores in these areas and the significance of the differences between UK countries and the OECD averages are shown in Tables 7.2 to 7.4.

On the ‘understanding’ scale, scores in England, Northern Ireland and Scotland did not differ significantly from each other and were significantly above the OECD average. Scores in Wales were significantly lower than the other countries of the UK but not significantly different from the OECD average.

On the ‘locating information’ and ‘evaluating and reflecting’ scales, scores in England, Northern Ireland and Scotland, again, did not differ significantly from each other and were significantly above the OECD average. Wales, while still significantly lower than England, was not significantly different from Scotland, Northern Ireland or the OECD average.

Table 7.2 Mean scores on the ‘locating information’ scale

Country	Mean	England	Northern Ireland	Scotland	Wales
England	507	-	NS	NS	**S**
Northern Ireland	505	NS	-	NS	NS
Scotland	507	NS	NS	-	NS
Wales	494	**S**	NS	NS	-
OECD average	487	**S**	**S**	**S**	NS

S Indicates a significant difference between mean scores
NS Indicates mean reading are not significantly different

Source: PISA 2018 database

Table 7.3 Mean scores on the ‘understanding’ scale

Country	Mean	England	Northern Ireland	Scotland	Wales
England	499	-	NS	NS	**S**
Northern Ireland	495	NS	-	NS	**S**
Scotland	499	NS	NS	-	**S**
Wales	479	**S**	**S**	**S**	-
OECD average	487	**S**	**S**	**S**	NS

S Indicates a significant difference between mean scores
NS Indicates mean scores are not significantly different

Source: PISA 2018 database

Table 7.4 Mean scores on the ‘evaluating and reflecting’ scale

Country	Mean	England	Northern Ireland	Scotland	Wales
England	513	-	NS	NS	**S**
Northern Ireland	504	NS	-	NS	NS
Scotland	503	NS	NS	-	NS
Wales	492	**S**	NS	NS	-
OECD average	489	**S**	**S**	**S**	NS

S Indicates a significant difference between mean scores
NS Indicates mean scores are not significantly different

Source: PISA 2018 database

7.1.2 Distribution of performance in reading

The first way in which the spread of performance in each country can be examined is by looking at the distribution of scores. This can be seen by comparing the scores of pupils at the 10th percentile (low achievers) and that of pupils at the 90th percentile (high achievers). The 10th percentile is the score at which 10% of pupils score lower, while the 90th percentile is the score at which 10% score higher.

The scores at the 10th and the 90th percentiles and the differences between them are shown in Figure 7.2 and Table 7.5. The figure shows that the attainment gap between high and low achievers was widest in England, mainly due to higher scores at the top end of the distribution.

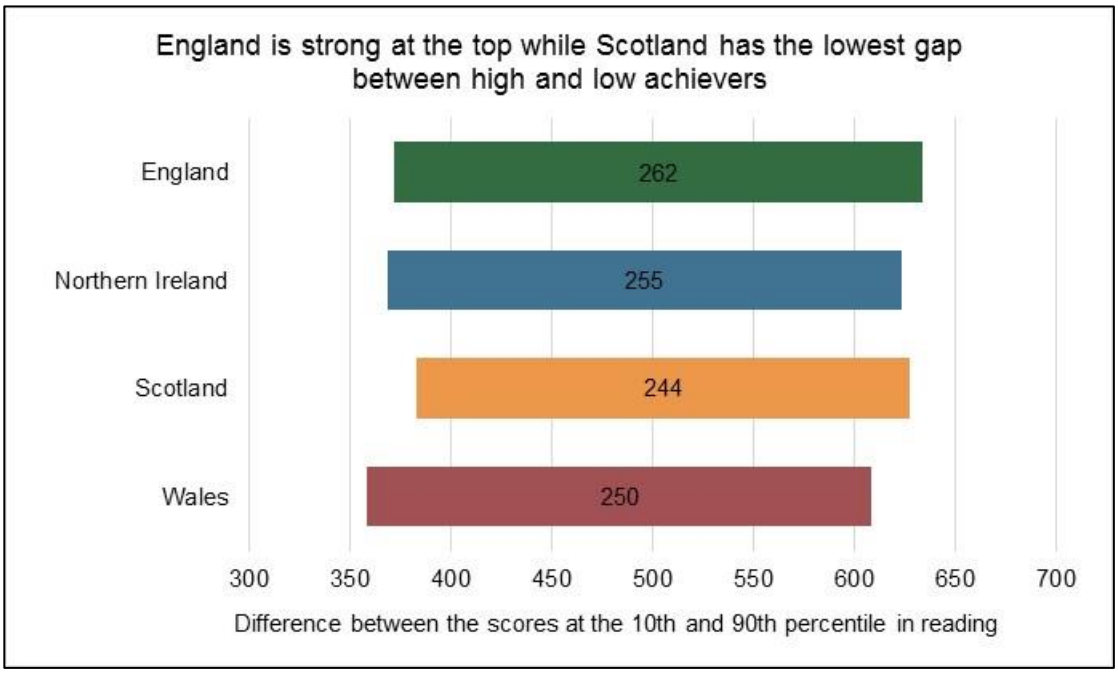
The difference between the average score of OECD countries at the 10th percentile and at the 90th percentile was 260 score points. The range was similar in England at 262 score points and slightly narrower in Northern Ireland (255), and Wales (250). The lowest difference of 244 was found in Scotland.

At the 10th percentile, all 4 countries of the UK performed better than the OECD average, except from in Wales where there was no significant difference. The highest score at this percentile was in Scotland, although this was not significantly different from England's. At the 90th percentile, the OECD average was 614 and the equivalent score in England (634) was 20 points above this. The score at the highest percentile in Scotland (627) was also significantly higher than the OECD average, while in Northern Ireland (623) and Wales (608) the highest performers scored similarly to the OECD average.

Key point

The attainment gap between high and low achievers was largest in England (262 score points) and lowest in Scotland (244 score points). Wales (250) and Northern Ireland (255) lie between the other 2 UK countries.

Figure 7.2 Attainment gap in reading scores across the UK



Source: PISA 2018 database

Table 7.5 Mean scores of highest and lowest performing pupils in reading

Mean reading score at the 10th percentile and the 90th percentile

Country	Reading score (10th)	Standard error	Reading score (90th)	Standard error	Difference 90th-10th
England	372	5.2	634	4.1	262
Northern Ireland	368	5.8	623	5.6	255
Scotland	383	3.6	627	4.7	244
Wales	359	5.8	608	4.5	250[57]
OECD Avg.	354	0.7	614	0.5	260

Source: PISA 2018 database

7.1.3 Performance at each proficiency level in reading

The range of achievement in each country may also be described by the percentages of pupils at each of the PISA proficiency levels. These percentages are summarised in

[57] after taking into account the rounding of figures

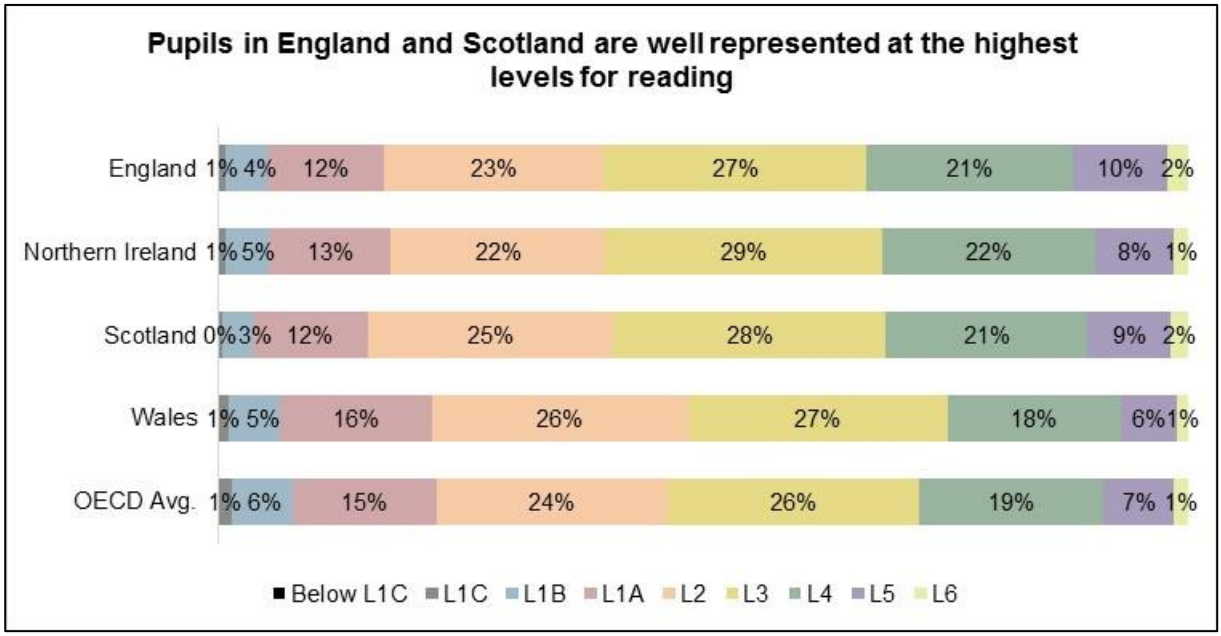
Figure 7.3, which shows that all countries of the UK have some pupils at the top and bottom of the achievement range, but that the percentages vary in each country.

Figure 7.3 also shows that there were very few pupils across the UK at the lowest levels of achievement (Levels 1c and below).

Scotland had the lowest percentage of pupils working below Level 2, the basic proficiency as defined by the OECD, in reading (15%) while Wales had the highest (22%), compared with an OECD average of 23%[58]. In England and Northern Ireland, the proportion of pupils working at the lowest proficiency levels in reading was 17% and 18%[59] respectively.

At the other end of the scale, England had a significantly higher percentage of pupils in the 2 highest levels combined (Level 5 and level 6) than the OECD average (12% in England, compared to 9%[60] across the OECD). The proportions at these levels in Scotland and Northern Ireland were similar to the OECD (10%[61] and 9% respectively) and Wales was significantly smaller (7%).

Figure 7.3 Percentage of pupils reaching each reading level in the UK



Source: PISA 2018 database

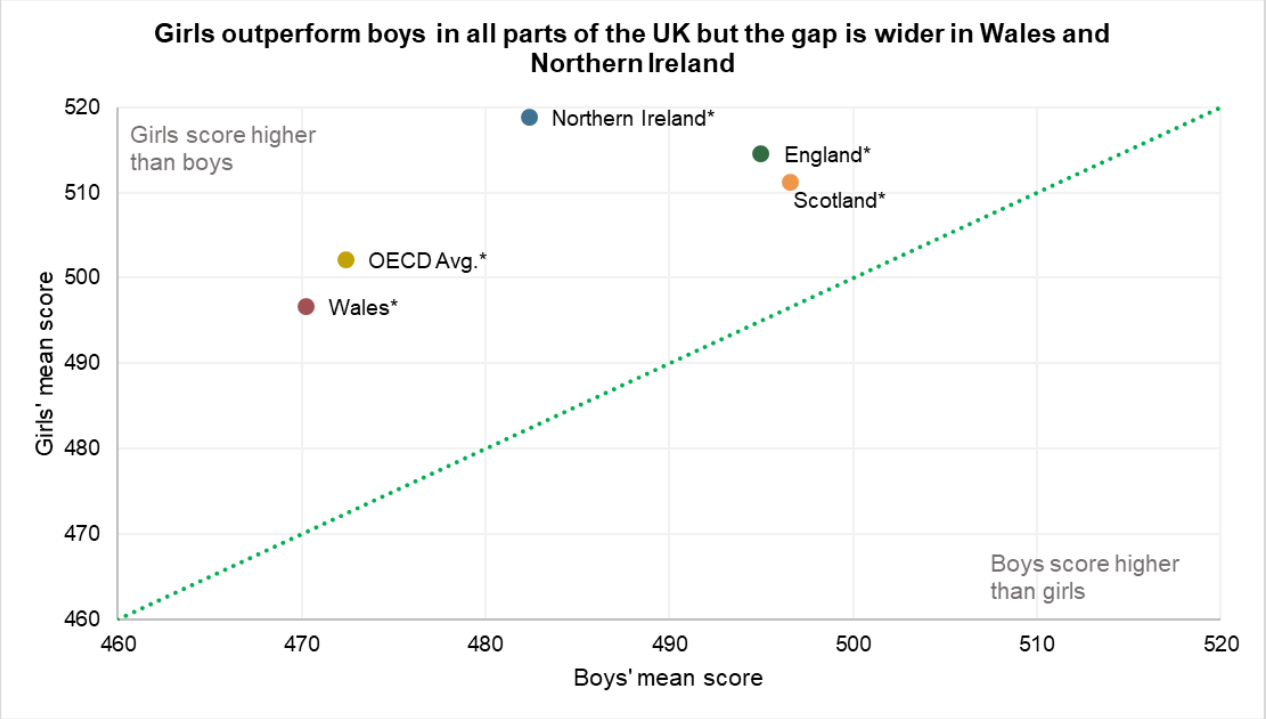
[58] after taking into account the rounding of figures
[59] after taking into account the rounding of figures
[60] after taking into account the rounding of figures
[61] after taking into account the rounding of figures

Full details of the expected skills and performance at each of the PISA reading proficiency levels are provided in Appendix A3. It should be noted that the PISA levels are not the same as levels used in any of the educational systems of the UK.

7.1.4 Gender differences in reading

There were differences in each of the 4 countries of the UK in the achievement of boys and girls. Table 7.6 shows the mean scores for boys and girls and highlights differences that were statistically significant. These differences are further illustrated in Figure 7.4.

Figure 7.4 Gender differences in reading scores across the UK



*The difference between girls and boys score is statistically significant

Source: PISA 2018 database

Table 7.6 Gender differences in reading in the UK

Country	Overall score	Mean score girls	Mean score boys	Difference girls-boys[62]
England	505	515	495	20*
Northern Ireland	501	519	482	36*
Scotland	504	511	497	15*
Wales	483	497	470	26*
OECD Avg.	487	502	472	30*

* The difference is statistically significant

Source: PISA 2018 database

In all cases, girls had a higher mean score than boys and these differences were statistically significant. The size of the difference in Northern Ireland and Wales were not significantly different from the OECD average while in England and Scotland the differences were significantly lower than the OECD average.

Of particular note is that the reading achievement of boys in Wales was especially low compared to the rest of the UK. Compared with England, for example, girls in Wales were 18 score points behind, but boys in Wales were 25 score points behind boys in England.

7.2 Science

This section compares the findings outlined in Chapter 4 with the comparable findings for the other countries of the UK. Full data can be found in Appendix C.

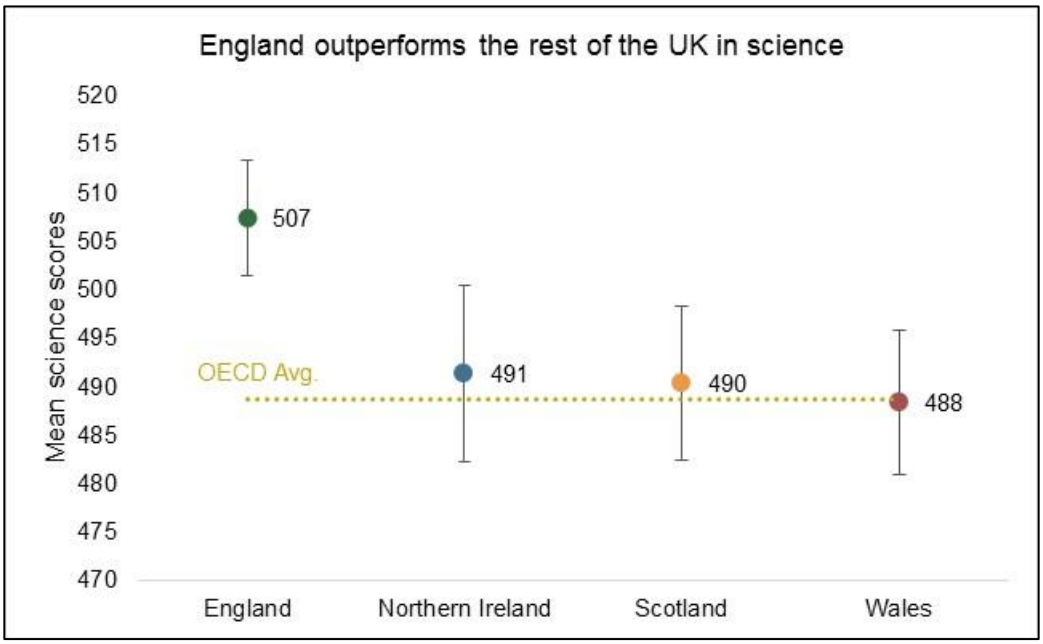
7.2.1 Mean scores in science

Figure 7.5 and Table 7.7 below show the mean scores in England, Wales, Northern Ireland and Scotland for science and indicate any statistically significant differences between countries by (S).

The highest attainment for science was in England, where scores were significantly higher than all other countries of the UK and higher than the OECD average[63]. There was less difference between Scotland, Wales and Northern Ireland, with none being significantly different from each other or the OECD average of 489.

[62] after taking into account the rounding of figures
[63] The 2018 OECD average is based upon the AV37 results published in the OECD International results Table 1.B1.12.

Figure 7.5 Mean science scores across the UK



Source: PISA 2018 database

Table 7.7 Mean scores for science

Country	Mean	England	Northern Ireland	Scotland	Wales
England	507	-	**S**	**S**	**S**
Northern Ireland	491	**S**	-	NS	NS
Scotland	490	**S**	NS	-	NS
Wales	488	**S**	NS	NS	-
OECD average	489	**S**	NS	NS	NS

S Indicates a significant difference between mean science scores
NS Indicates mean science scores are not significantly different

Source: PISA 2018 database

Key point

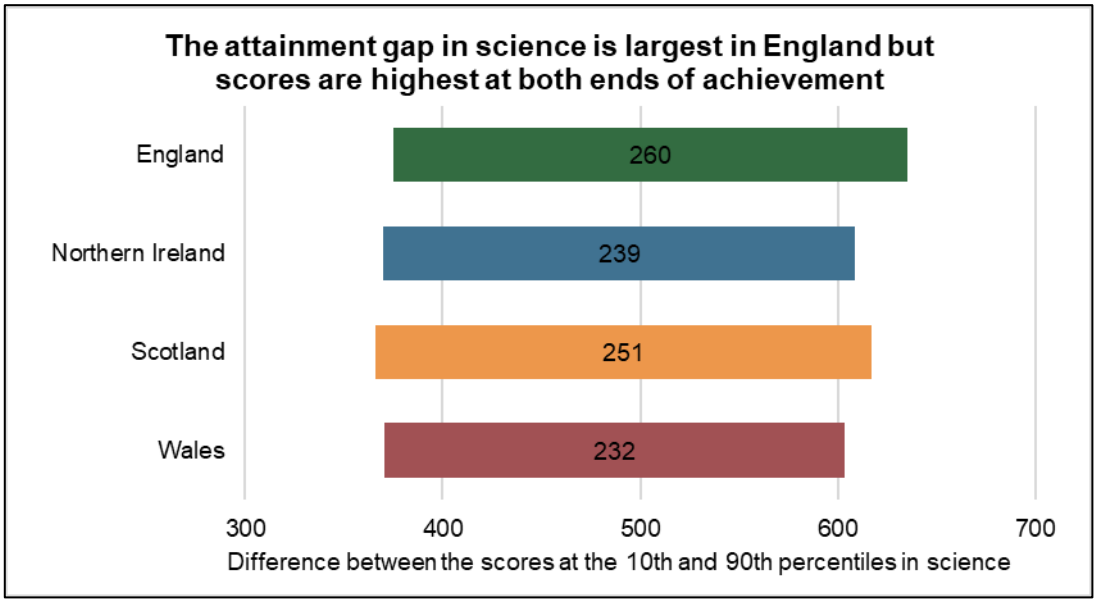
There were no significant differences in science between Scotland, Wales, Northern Ireland and the OECD average. The mean score for science in England was significantly higher than the rest of the UK and the OECD average.

7.2.2 Distribution of performance in science

Table 7.8 and Figure 7.6 show the scores of pupils in each UK country at the 10th and the 90th percentiles, along with the OECD average score at each of these percentiles. The table indicates the range of scores in each country and also shows the difference in score points at the 2 percentiles. Full data can be found in Appendix C.

Scores in England were highest at both ends of the distribution – at both the 10th and the 90th percentiles. At the highest percentile, the score was 26 points above the OECD average. However, England also had the widest spread of attainment, with a score point difference of 260 points between the lowest and highest achieving groups, mainly due to higher scores at the top end of the distribution. This compares with the lowest difference of 232 points in Wales and an OECD average difference of 244.

Figure 7.6 Attainment gap in science scores across the UK



Source: PISA 2018 database

Table 7.8 Mean scores of highest and lowest performing pupils in science

Mean science score at the 10th percentile and the 90th percentile

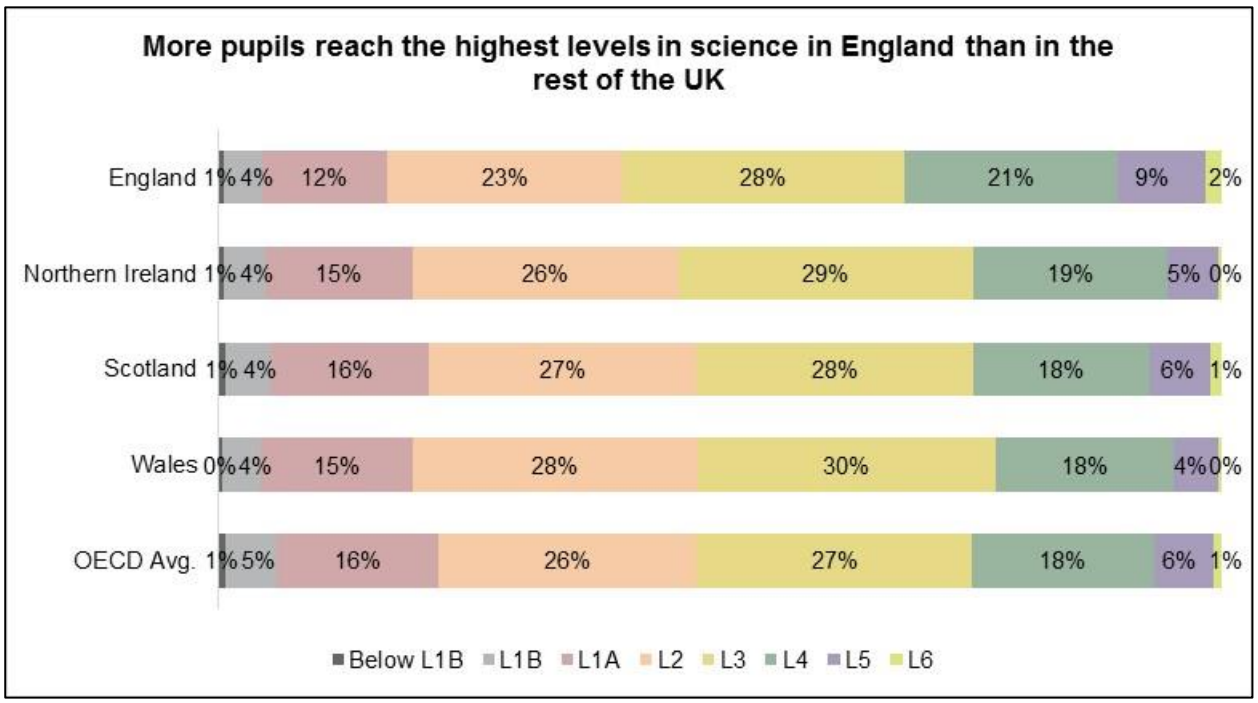
Country	Science score (10th)	Standard error	Science score (90th)	Standard error	Difference 90th-10th
England	375	4.6	635	3.8	260
Northern Ireland	370	5.7	609	6.2	239
Scotland	366	5.7	617	5.9	251
Wales	371	5.3	603	4.6	232
OECD Avg.	365	0.6	609	0.5	244

7.2.3 Performance at each science proficiency level

The distribution of attainment in science can be further illustrated by looking at the percentages of pupils at each PISA proficiency level. Figure 7.7 shows the percentages of pupils at each level of science attainment.

England had the largest percentage of pupils (10%[64]) at the 2 highest levels of attainment (Levels 5 and 6), significantly above the OECD average (7%). Scotland and Northern Ireland had a similar percentage of pupils at these levels compared with the OECD (7% and 5% respectively). Wales had a significantly smaller percentage than the OECD average (5%[65]). At the other end of the scale, all countries of the UK had similar percentages to the OECD average of pupils below Level 2 (Northern Ireland 19%[66], Scotland 21%, Wales 20%[67], OECD 22%), except for England, where the percentage was significantly lower (17%).

Figure 7.7 Percentage of pupils reaching each science level in the UK



Source: PISA 2018 database

[64] after taking into account the rounding of figures
[65] after taking into account the rounding of figures
[66] after taking into account the rounding of figures
[67] after taking into account the rounding of figures

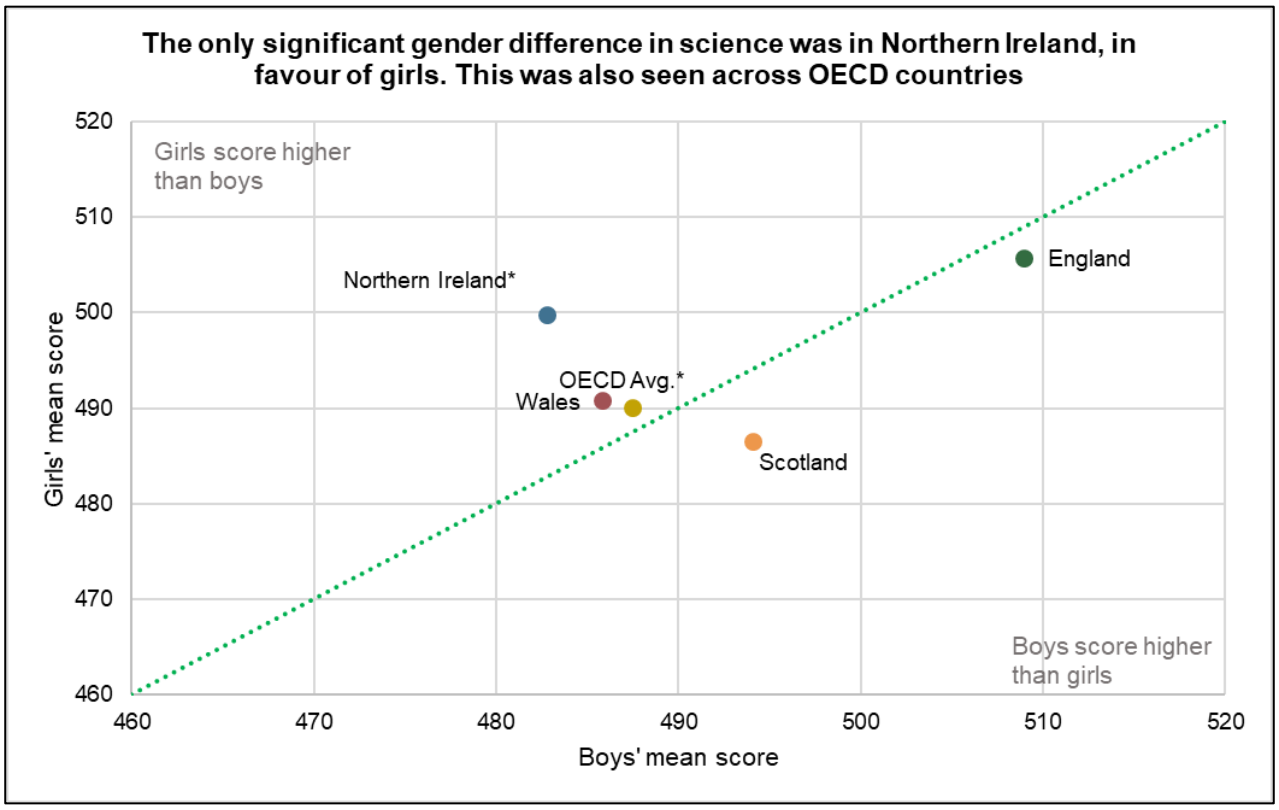
Full details of the expected skills and performance at each of the PISA science proficiency levels are provided in Appendix A3

7.2.4 Gender differences in science

Table 7.9 shows the mean scores of boys and girls, and the differences between them. Figure 7.8 further illustrates these differences. Full data can be found in Appendix C.

In the 4 countries of the UK, the only significant difference was in Northern Ireland, where girls outperformed boys by 17 points. Girls also outperformed boys in the OECD with a 2 point difference in the mean score, which was statistically significant.

Figure 7.8 Gender differences in science scores across the UK



*The difference between girls and boys score is statistically significant

Source: PISA 2018 database

Table 7.9 Gender differences in science in the UK

Country	Overall score	Mean score girls	Mean score boys	Difference girls-boys
England	507	506	509	-3
Northern Ireland	491	500	483	17*
Scotland	490	486	494	-8
Wales	488	491	486	5
OECD Avg.	489	490	488	2*

* The difference is statistically significant

Source: PISA 2018 database

7.3 Mathematics

This section compares the findings outlined in Chapter 5 with the comparable findings for the other countries of the UK. Full data can be found in Appendix D.

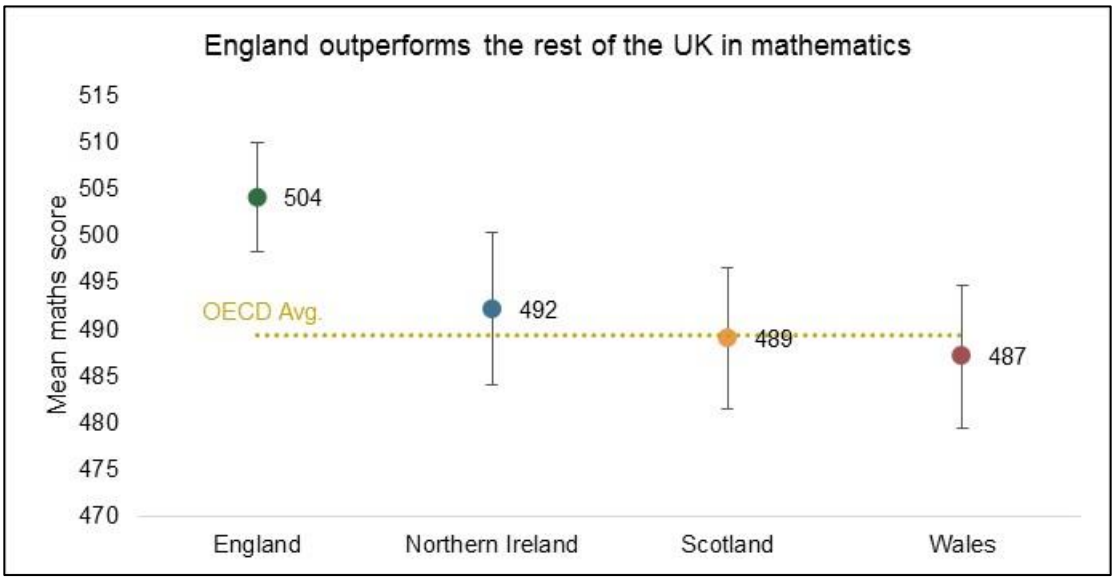
7.3.1 Mean scores in mathematics

Figure 7.9 and Table 7.10 below show the mean scores in England, Wales, Northern Ireland and Scotland for mathematics and indicate any statistically significant differences between countries (S).

The highest attainment for mathematics was in England, where scores were significantly higher than all other countries of the UK and higher than the OECD average[68]. Scotland, Wales and Northern Ireland were not significantly different from each other or from the OECD average of 489.

[68] The 2018 OECD average is based upon the AV37 results published in the OECD International results Table 1.B1.11.

Figure 7.9 Mean mathematics scores across the UK



Source: PISA 2018 database

Table 7.10 Mean scores for mathematics

Country	Mean	England	Northern Ireland	Scotland	Wales
England	504	-	**S**	**S**	**S**
Northern Ireland	492	**S**	-	NS	NS
Scotland	489	**S**	NS	-	NS
Wales	487	**S**	NS	NS	-
OECD average	489	**S**	NS	NS	NS

S Indicates a significant difference between mean mathematics scores
NS Indicates mean mathematics scores are not significantly different

Source: PISA 2018 database

Key point

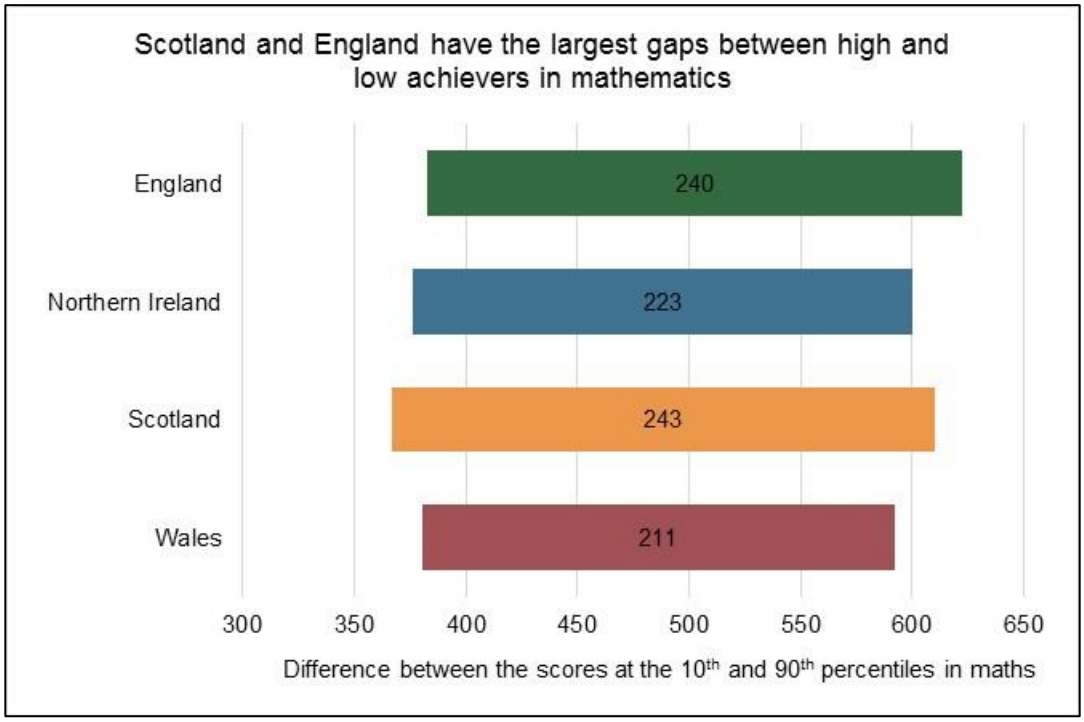
There were no significant differences in mathematics between Scotland, Wales, Northern Ireland and the OECD average. The mean score for mathematics in England was significantly higher than the rest of the UK and the OECD average.

7.3.2 Distribution of performance in mathematics

Table 7.11 and Figure 7.10 show the scores of pupils in each UK country at the 10th and the 90th percentiles, along with the OECD average score at each of these percentiles. The table indicates the range of scores in each country and also shows the difference in score points at the 2 percentiles.

Scores in England were highest at both ends of the distribution – at both the 10th and the 90th percentiles. At the 90th percentile, the score was 18 points above the OECD average. Scotland and England had the widest spread of attainment in mathematics, with score point differences of 243 points between the lowest and highest percentiles in Scotland and 240 in England. This compares with the lowest difference of 211 points in Wales, 223 score points in Northern Ireland and an OECD average of 235.

Figure 7.10 Attainment gap in mathematics scores across the UK



Source: PISA 2018 database

Table 7.11 Mean scores of highest and lowest performing pupils in mathematics

Mean mathematics score at the 10th percentile and the 90th percentile

Country	Maths score (10th)	Standard error	Maths score (90th)	Standard error	Difference 90th-10th
England	383	4.9	623	3.7	240
Northern Ireland	377	6.4	600	5.3	223
Scotland	367	6.0	610	5.7	243
Wales	381	5.4	592	4.4	211
OECD Avg.	370	0.6	605	0.6	235

Source: PISA 2018 database

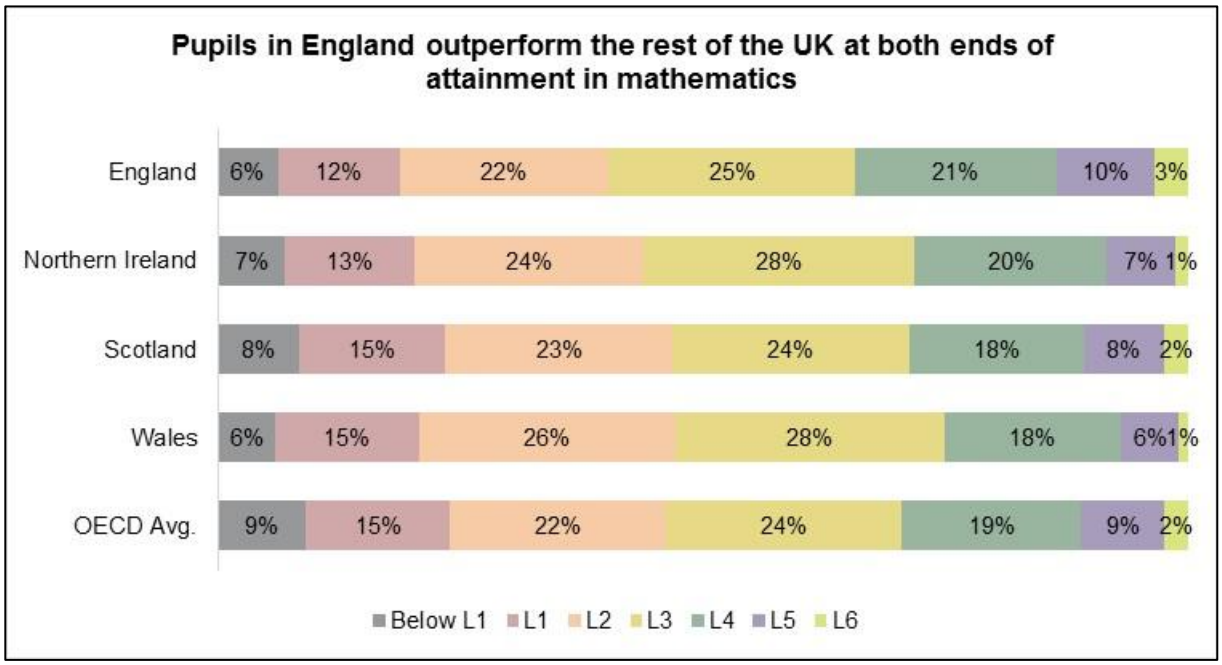
7.3.3 Performance at each mathematics proficiency level

The distribution of attainment in mathematics can be further illustrated by looking at the percentages at each PISA proficiency level. Figure 7.11 shows the percentages of pupils at each level of mathematics attainment.

England had the largest percentage of pupils (14%[69]) at the 2 highest levels of attainment (Levels 5 and 6), significantly higher than the OECD (11%). Scotland followed with 11%[70], which was not significantly different from the OECD. Both Northern Ireland and Wales had significantly lower proportions than the OECD average at these levels (8% and 7% respectively). At the other end of the scale, the proportion of pupils performing below PISA Level 2 was 23% in Scotland, 21% in Wales, 20% in Northern Ireland and 19%[71] in England. The OECD average below Level 2 was 24%, significantly different from Wales, Northern Ireland and England.

[69] after taking into account the rounding of figures
[70] after taking into account the rounding of figures
[71] after taking into account the rounding of figures

Figure 7.11 Percentage of pupils reaching each mathematics level in the UK



Source: PISA 2018 database

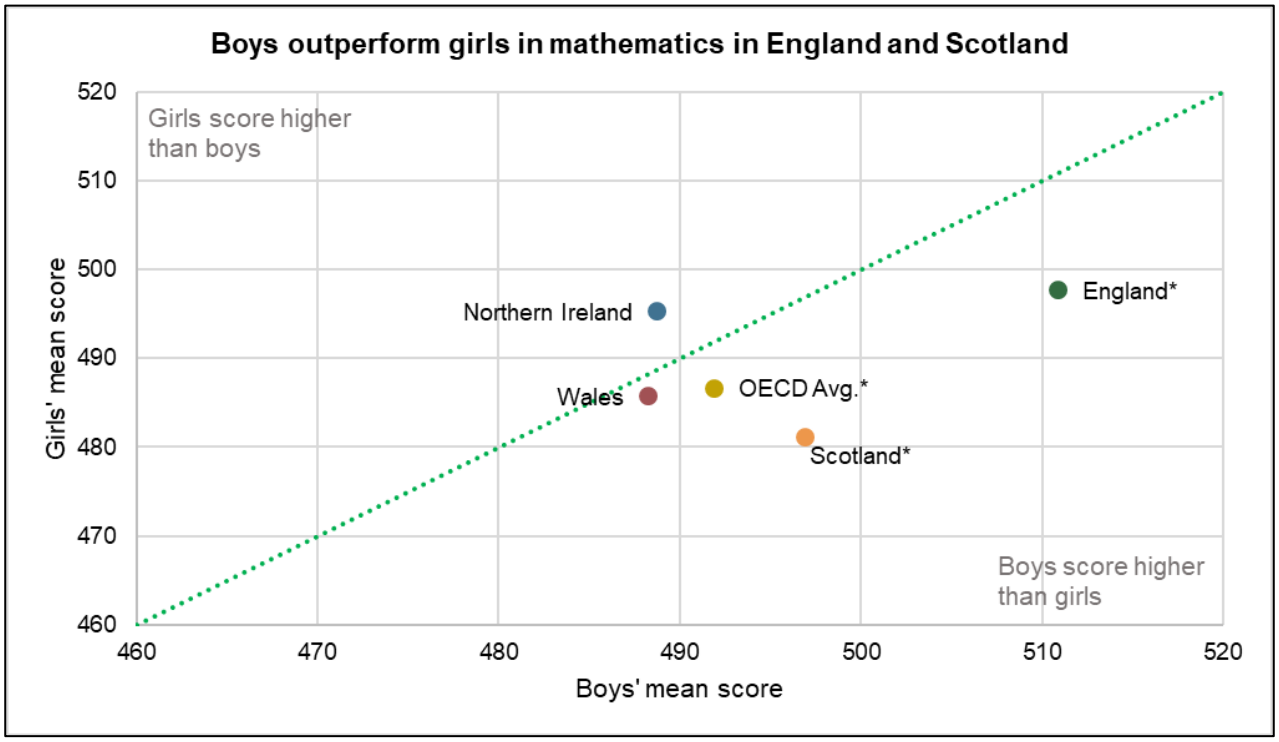
Full details of the expected skills and performance at each of the PISA mathematics proficiency levels are provided in Appendix A3.

7.3.4 Gender differences in mathematics

Table 7.12 shows the mean scores of boys and girls, and the differences between them. Figure 7.12 further illustrates these differences.

In England and Scotland, the mean score for boys was significantly higher than that for girls in mathematics, while in Northern Ireland and Wales there was no significant difference. Boys also outperformed girls in the OECD countries, with a 5 point difference in the mean score; this was statistically significant. In both England and Scotland, boys outperformed girls by more than the OECD average at 13 points and 16 points respectively.

Figure 7.12 Gender differences in mathematics scores across the UK



*The difference between girls and boys score is statistically significant

Source: PISA 2018 database

Table 7.12 Gender differences in mathematics in the UK

Country	Overall score	Mean score girls	Mean score boys	Difference girls-boys
England	504	498	511	-13*
Northern Ireland	492	495	489	7
Scotland	489	481	497	-16*
Wales	487	486	488	-2
OECD Avg.	489	487	492	-5*

* The difference is statistically significant

Source: PISA 2018 database

7.4 Trends in performance

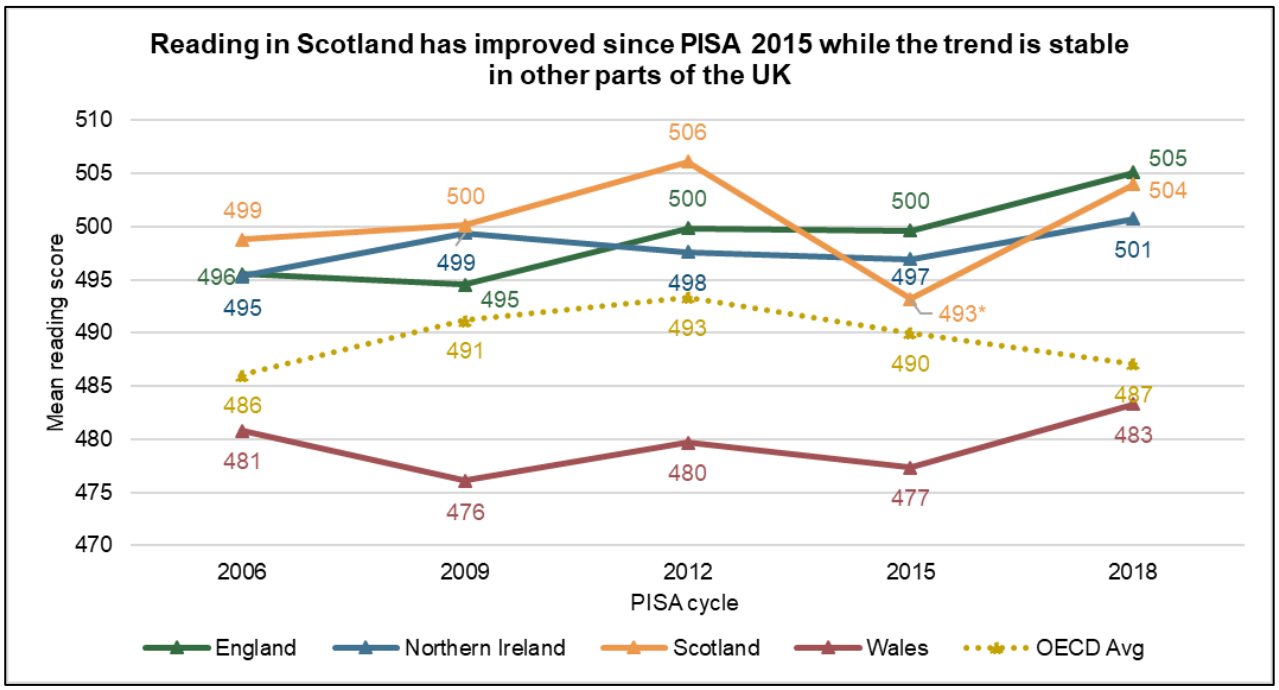
This section describes progress made across successive PISA cycles in the UK. Figures 7.13, 7.14 and 7.15 show scores in the 3 subject domains across all PISA cycles since 2006.

In reading, scores have remained stable across successive PISA cycles, with the only statistically significant change being an increase in the mean reading score in Scotland (compared with PISA 2015), following a similarly sized decrease in 2015.

In science, mean scores in 2018 were significantly lower than those in 2006 in Scotland, Wales and Northern Ireland. This accounts for the large gap between England and the rest of the UK. The downwards trend has been especially pronounced in Scotland, where scores for science in earlier PISA cycles were close to those in England.

In mathematics, the picture is more mixed. Scotland shows a decline that is less pronounced than that for science, but has nevertheless been sustained over successive cycles since PISA 2006, when Scotland outperformed the rest of the UK (Bradshaw *et al*., 2007). Mathematics scores in Wales have improved after a decline in earlier cycles of PISA while scores in Northern Ireland have remained mainly stable. England, however, after successive cycles with stable PISA scores, showed a marked improvement in mathematics in PISA 2018.

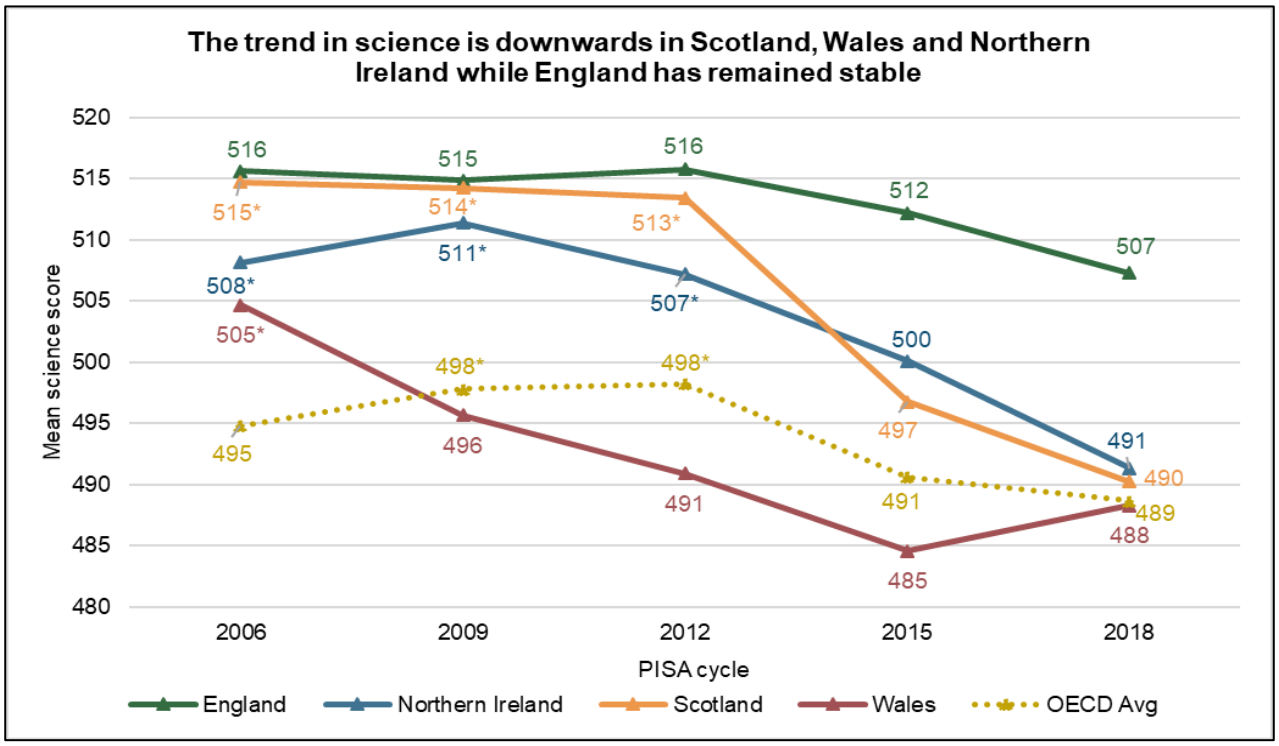
Figure 7.13 Trends in reading scores across the UK



*The mean score of that year is statistically different from the mean score in 2018

Source: PISA 2018 database; Bradshaw *et al*., 2007; Bradshaw *et al*., 2010; Wheater *et al*., 2014; Jerrim *et al*., 2016

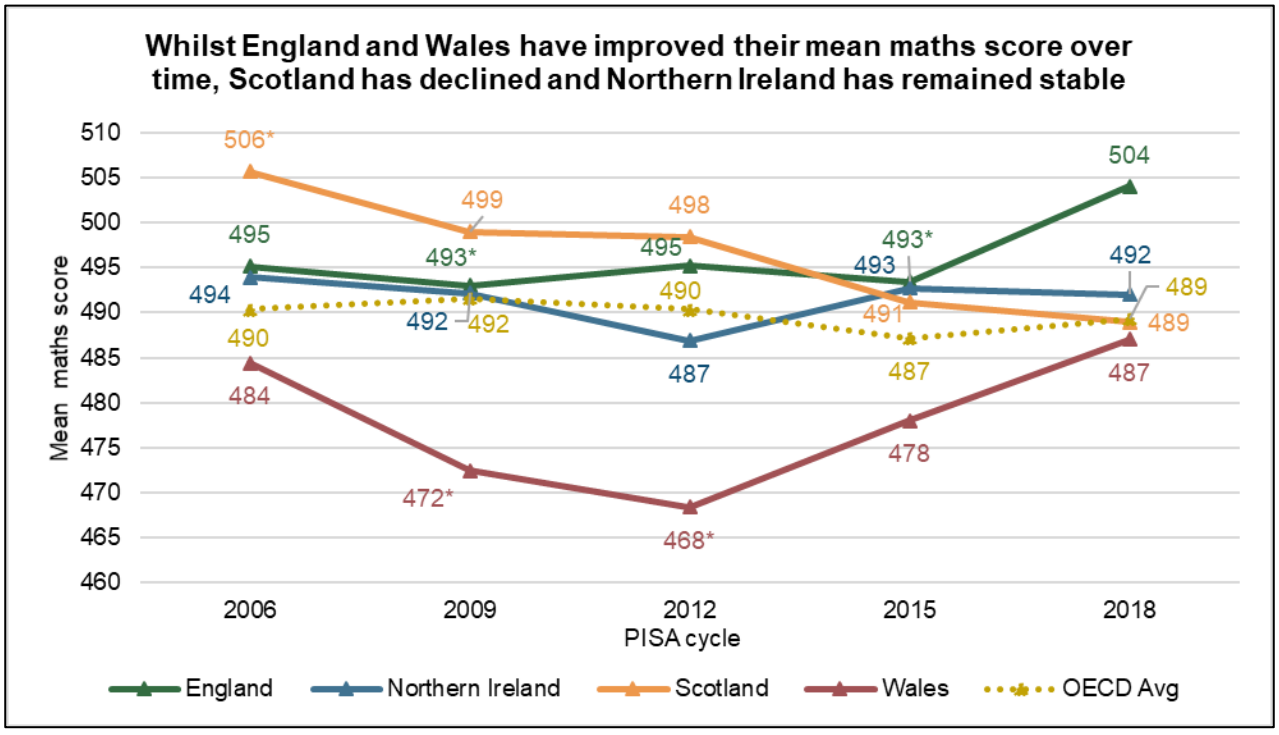
Figure 7.14 Trends in science scores across the UK



*The mean score of that year is statistically different from the mean score in 2018

Source: PISA 2018 database; Bradshaw *et al.*, 2007; Bradshaw *et al.*, 2010; Wheater *et al.*, 2014; Jerrim *et al.*, 2016

Figure 7.15 Trends in mathematics scores across the UK



*The mean score of that year is statistically different from the mean score in 2018

Source: PISA 2018 database; Bradshaw *et al.*, 2007; Bradshaw *et al.*, 2010; Wheater *et al.*, 2014; Jerrim *et al.*, 2016

7.5 Schools and pupils

This section looks at similarities and differences in findings from the school and pupil questionnaires between England, Wales, Northern Ireland and Scotland.

7.5.1 School differences

There were a number of differences among the UK countries in responses to questions about the purposes for which 15-year-old pupils were assessed. The greatest difference was seen for the purpose of making judgements about teachers' effectiveness. Assessments were used by only 42% of schools in Scotland for this purpose, compared with 83% in Wales, 85% in England and 69% in Northern Ireland. All UK countries tended to agree that assessments were used to guide pupils' learning, to adapt teaching to pupils' needs and to inform parents about their child.

Headteachers in England responded more favourably towards their school's capacity to enhance learning and teaching using digital devices than the other UK nations. For example, the number of digital devices connected to the internet was considered sufficient by 72% in England, compared with 59% in Northern Ireland, 58% in Scotland and 50% in Wales. Headteachers and principals in Scotland and Wales were less likely to report that their internet bandwidth or speed was sufficient than teachers in England and Northern Ireland (England 79%, Northern Ireland 69%, Scotland 47%, Wales 49%).

Headteachers and principals differed in their responses to resource shortages, which can be seen in Table 7.13. Headteachers in Wales reported greater shortages or inadequacies of educational materials (for example textbooks, IT equipment etc.) than headteachers and principals in Northern Ireland, England and Scotland. Principals in Northern Ireland reported more inadequacies with the physical infrastructure. Nearly half (49%) of headteachers in Scotland reported teaching was hindered by a lack of teaching staff, compared to England (27%), Wales (28%) and Northern Ireland (24%). In England, very few headteachers (19%) reported lack of support staff as a hindrance, compared with 24% in Northern Ireland, 47% in Scotland and 33% in Wales.

Table 7.13 Resource shortages reported by headteachers and principals

Percentage of headteachers and principals who reported that their school's capacity to provide teaching was hindered to some extent or a lot by each resource shortage

Resource shortage	England	Northern Ireland	Scotland	Wales
A lack of physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems)	34%	45%	21%	38%
Inadequate or poor quality physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems)	33%	43%	26%	39%
A lack of teaching staff	27%	24%	49%	28%
A lack of educational material (e.g. textbooks, IT equipment, library or laboratory material)	26%	32%	19%	46%
Inadequate or poor quality educational material (e.g. textbooks, IT equipment, library or laboratory material)	22%	25%	19%	41%
A lack of support staff	19%	24%	47%	33%
Inadequate or poorly qualified teaching staff	9%	5%	9%	8%
Inadequate or poorly qualified support staff	6%	10%	17%	16%

Source: PISA 2018 database; School Questionnaire

Table 7.14 shows responses of headteachers and principals to questions about hindrances to pupil learning. In Northern Ireland only 8% of principals said that pupil truancy hindered learning to some extent or a lot. Headteachers in Wales, England and Scotland reported that it was a greater problem, with the largest proportion (35%) being reported by headteachers in Scotland. Headteachers in Scotland were also more likely to report problems with pupils not paying attention and pupils lacking respect and disrupting classes than those in the other UK countries. Teacher absenteeism was also reported as more of a problem in Scotland, and more headteachers in Scotland and England reported that learning was hindered by teachers not meeting individual pupils' needs than in Wales and Northern Ireland.

Key point

Truancy was a less frequently reported problem by principals in Northern Ireland than headteachers in the rest of the UK.

Table 7.14 Hindrances to learning reported by headteachers and principals

Percentage of headteachers and principals who reported that the learning of pupils is hindered to some extent or a lot by the each behaviour

Behaviour	England	Northern Ireland	Scotland	Wales
Pupil behaviours	-	-	-	-
Students not paying attention	40%	35%	49%	30%
Student truancy	20%	8%	35%	20%
Students lacking respect for teachers	11%	19%	22%	19%
Students skipping classes	9%	7%	31%	14%
Students intimidating or bullying other students	4%	8%	13%	6%
Student use of alcohol or illegal drugs	3%	3%	5%	7%
Teacher behaviours	-	-	-	-
Teachers not meeting individual students' needs	28%	14%	29%	15%
Teacher absenteeism	20%	19%	30%	14%
Staff resisting change	10%	14%	23%	12%
Teachers not being well prepared for classes	5%	3%	3%	9%
Teachers being too strict with students	3%	0%	6%	7%

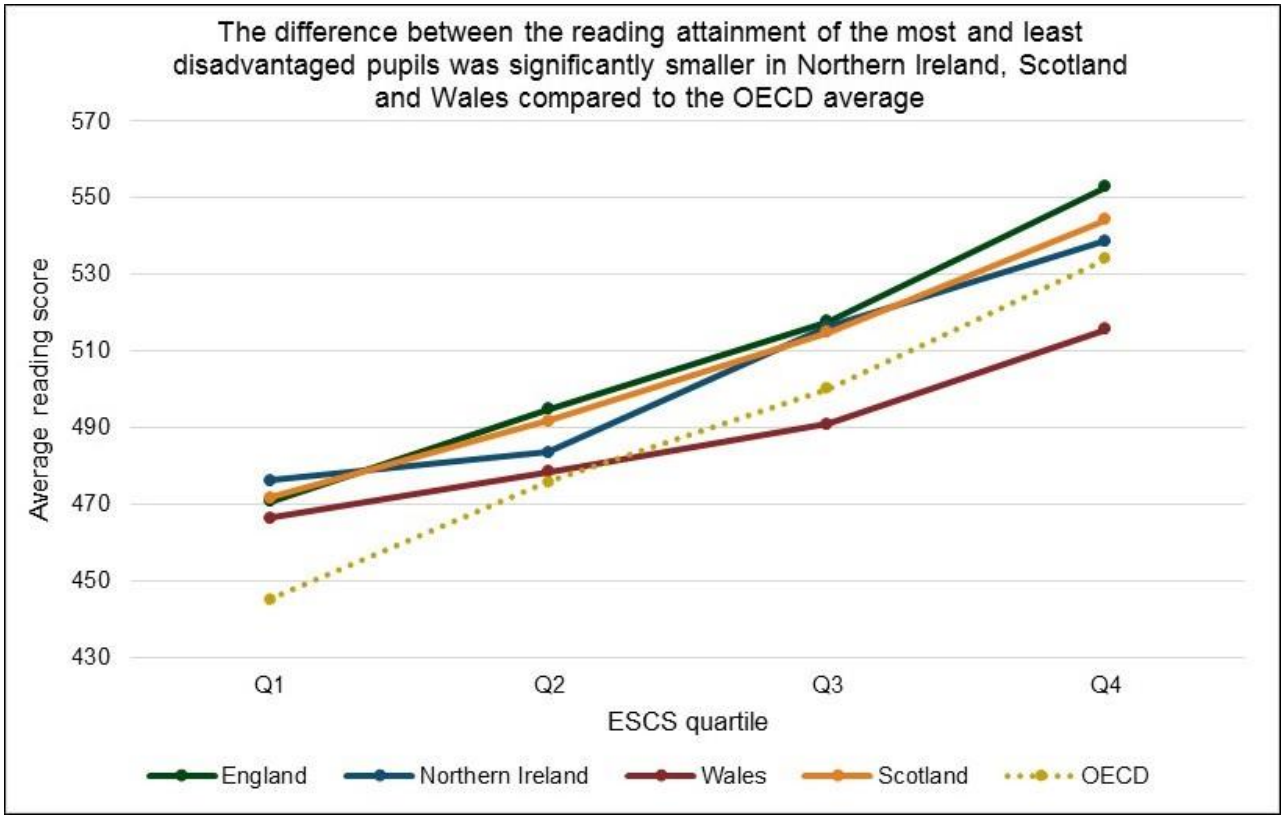
Source: PISA 2018 database; School Questionnaire

7.5.2 Differences in pupils' socio-economic background

On average, pupils in the PISA samples in the UK had a higher socio-economic status than the average across OECD countries, as measured by the economic, social and cultural status (ESCS) Index. The ESCS Index is explained further in Chapter 3

Figure 7.16 compares the reading performance of pupils in each country of the UK and across the OECD when they are divided into 4 equal groups (quartiles) according to their ESCS score. The gap in achievement between pupils highest and lowest on the ESCS Index was smaller in Wales, Northern Ireland and Scotland compared the OECD average. There was no significant difference between England and the OECD average. Wales had the smallest gap (although not significantly different from Northern Ireland) and this is accounted for by the comparatively poor performance of their most advantaged pupils. Pupils in the top quartile of the index in Wales performed at a similar level to those in the third quartile in the rest of the UK.

Figure 7.16 Reading performance of UK countries and OECD by ESCS quartile



Source: PISA 2018 database

The amount of variance in scores which can be explained by socio-economic background provides further insight into the interaction between reading scores and the ESCS Index, or the **strength of the effect**. This shows the extent to which pupils in each country are able to overcome the effects of socio-economic background. Across the OECD, on average, 12% of the variance in scores can be explained by socio-economic background. In all UK countries, the explained variance was less than the OECD average (England 10%, Scotland 8%, Northern Ireland 7%, Wales 4%) but the difference was not significant in England.

The ESCS reading attainment gap was supported by analysis of reading attainment of pupils eligible and not eligible for free school meals. In England, Wales and Northern Ireland, pupils eligible[72] for free school meals scored significantly below pupils not eligible (FSM data were not available for Scotland).

[72] 'entitled to' in Northern Ireland

7.5.3 Differences in pupils' attitudes and aspirations

This section considers some aspects of the pupil attitudes reported in Chapter 3, where there were differences in the 4 countries of the UK, or differences in all countries of the UK compared with the OECD average.

Pupils in England and Wales tended to be more confident in their reading ability than pupils in Scotland and Northern Ireland, and compared with the average in OECD countries. However, pupils in Wales, Scotland and Northern Ireland were less likely to read books than pupils in England and in the OECD. Pupils in England, Wales, Northern Ireland and Scotland had more negative attitudes towards reading than pupils across the OECD.

Table 7.15 Pupils' perception of reading competence and difficulty

Percentage of pupils who agreed or strongly agreed with each statement

Statement	England	Northern Ireland	Scotland	Wales	OECD
I am a good reader.	83	76	78	83	71
I am able to understand difficult texts.	76	71	74	78	67
I read fluently.	78	72	74	78	77
I have always had difficulty with reading	19	22	22	20	19
I have to read a text several times before I completely understand it.	45	48	47	40	44
I find it difficult to answer questions about a text.	29	33	36	26	26

Note: The percentage point difference column may not equal the difference between Wales and the OECD due to rounding.

Source: PISA 2018 database, Student Questionnaire, question ST161

Table 7.16 Pupils' reading mode preference

Percentage of pupils who read books in each mode

Reading mode	England	Northern Ireland	Scotland	Wales	OECD
I rarely or never read books.	37	51	42	44	35
I read paper books more often than books on digital devices.	36	28	32	30	36
I read books on digital devices more often than on paper.	16	12	15	16	15
I read paper books and books on digital devices equally often.	12	10	11	10	13

Note: The percentage point difference column may not equal the difference between Wales and the OECD due to rounding

Source: PISA 2018 database, Student Questionnaire, question ST168

Table 7.17 Pupils' reading engagement

Percentage of pupils who agreed or strongly agreed with each statement

Statement	England	Northern Ireland	Scotland	Wales	OECD
I read only if I have to.	53	62	57	57	49
Reading is one of my favourite hobbies.	28	23	23	24	34
I like talking about books with other people.	31	24	29	28	37
For me, reading is a waste of time.	30	40	32	33	28
I read only to get information that I need.	56	64	57	60	50

Source: PISA 2018 database, Student Questionnaire, question ST160

Pupils in all countries of the UK were less satisfied with their life than pupils in other OECD countries (mean score 7), on average[73]. Pupils in England were least satisfied (mean score 6.1), pupils in Northern Ireland were most satisfied (mean score 6.6), and pupils in Scotland and Wales had mean satisfaction scores of 6.3 and 6.5 respectively. In all countries of the UK, pupils were less likely to strongly agree that their life had meaning and purpose than pupils across the OECD; pupils in Northern Ireland responded most similarly to pupils across the OECD.

Pupils in England, Wales, Northern Ireland and Scotland had lower expectations of their highest level of qualification than pupils across the OECD. Pupils' expectations for a professional career were slightly above the OECD average (44%) in Scotland (47%), Wales (47%), England (51%) and Northern Ireland (50%). As discussed in Chapter 3, a misalignment between expected highest qualification and career is found across the OECD, and this was similar or greater in UK countries.

[73] This is a scale from 0 (not at all satisfied) to 10 (completely satisfied) in response to the question "how satisfied are you with your life as a whole these days?"

References

Bradshaw, J., Ager, R., Burge, B. and Wheater, R. (2010). *PISA 2009: Achievement of 15-year-olds in England* [online]. Available: PISA 2009: Achievement of 15-year-olds in England [31 October, 2019].

Bradshaw, J., Sturman, L., Vappula, H., Ager, R. and Wheater, R. (2007). *Achievement of 15-year-olds in England: PISA 2006 National Report* [online]. Available: Achievement of 15-year-olds in England: PISA 2006 National Report [31 October, 2019].

Jerrim, J. and Shure, N. (2016). *Achievement of 15-Year-Olds in England: PISA 2015 National Report* [online]. Available: Achievement of 15-Year-Olds in England: PISA 2015 National Report [31 October, 2019].

McGrane, J., Stiff, J., Baird, J., Lenkeit, J. and Hopfenbeck T. (2017). *Progress in International Reading Literacy Study (PIRLS): National Report for England* [online]. Available: Progress in International Reading Literacy Study (PIRLS): National Report for England [27 November, 2019].

Sizmur, J., Ager, R., Lynn, L. and Classick, R. (2017). *PIRLS 2016 in Northern Ireland: Reading Achievement* [online]. Available: PIRLS 2016 in Northern Ireland: Reading Achievement [27 November, 2019].

The Organisation for Economic Co-operation and Development (2016). *PISA 2018 Integrated Design* [online]. Available: PISA 2018 Integrated Design [12 November, 2019].

The Organisation for Economic Co-operation and Development (2018a). *PISA for Development Assessment and Analytical Framework: Reading, Mathematics and Science* [online]. DOI 10.1787/9789264305274-en.

The Organisation for Economic Co-operation and Development (2018b). *PISA 2018 Technical Standards* [online]. Available: PISA 2018 Technical Standards [12 November, 2019].

The Organisation for Economic Co-operation and Development (2019a). *PISA 2018 Assessment and Analytical Framework* [online]. DOI 10.1787/b25efab8-en.

The Organisation for Economic Co-operation and Development (2019b). *PISA 2018 Results (Volume I): What Students Know and Can Do* [online]. Available: PISA 2018 Results (Volume I): What Students Know and Can Do [12 November, 2019].

The Organisation for Economic Co-operation and Development (2019c). *PISA 2018 Results (Volume II): Where All Students Can Succeed* [online]. Available: PISA 2018 Results (Volume II): Where All Students Can Succeed [12 November, 2019].

The Organisation for Economic Co-operation and Development (2019d). *PISA 2018 Results (Volume III): What School Life Means for Students'* [online]. Available: PISA 2018 Results (Volume III): What School Life Means for Students' [12 November, 2019].

The Organisation for Economic Co-operation and Development (2019e). *'PISA 2018 Questionnaire Framework.',* In PISA 2018 Assessment and Analytical Framework [online]. DOI 10.1787/850d0ef8-en.

The Organisation for Economic Co-operation and Development (forthcoming), *PISA 2018 International Report and Framework.* Paris: OECD Publishing.

The Organisation for Economic Co-operation and Development (forthcoming), *PISA 2018 Technical Report.* Paris: OECD Publishing.

Wheater, R., Ager, R., Burge, B. and Sizmur, J. (2013). *Achievement of 15-year-olds in England: PISA 2012 National Report:* (OECD Programme for Student Assessment) [online]. Available: Achievement of 15-year-olds in England: PISA 2012 National Report: (OECD Programme for Student Assessment) [31 October, 2019].

Yamamoto, K., Shin H. and Khorramdel L. (2018). 'Multistage Adaptive Testing Design in International Large-Scale Assessments', *Educational Measurement: Issues and Practice*, **37**, 4, 16-27. [online]. Available: Multistage Adaptive Testing Design in International Large-Scale Assessments. [27 November, 2019].

Appendix A Background to the study

The Programme for International Student Assessment (PISA) is an international comparison study run by the Organisation for Economic Cooperation and Development (OECD). Every three years, 15-year-old pupils from all over the world are assessed in reading, mathematics and science. The assessments are designed to gauge how well pupils can apply what they have learned in key subjects in preparation for real-life situations in the adult world.

Over half a million 15-year-olds from 79 countries and economies took the PISA assessment in 2018. The major domain of the study in 2018 was reading and so this was assessed in greater depth than mathematics and science.

A1 The development of the study

An international consortium, led by Educational Testing Service (ETS), designed and implemented the PISA 2018 study on behalf of the OECD. The 2018 study was the 7th cycle of PISA, and built on the experiences of previous triennial cycles since 2000. By using standardised survey procedures and assessments, the study aims to collect data from around the world that can be compared despite differences in language and culture.

The framework and specification for the study, *PISA 2018 Assessment and Analytical Framework* (OECD 2018a), were agreed internationally by the PISA Governing Board, which comprises representatives from each participating country, and both the international consortium and participating countries submitted assessment questions for inclusion in the study. An expert panel (convened by the international PISA consortium) reviewed the questions, and countries were then invited to comment on their difficulty, cultural appropriateness, and curricular and non-curricular relevance.

Every participating country carried out a field trial in 2017, and the outcomes of this were used to finalise the contents and format of the assessments and questionnaires for the main study in 2018.

In all four UK countries, pupils sat the two-hour field trial assessment in March/April 2017 under test conditions, following the standardised procedures implemented by all countries. As the focus in this round was on reading, around two-thirds of the questions were on reading and new reading items were introduced to reflect updates to the PISA Assessment Framework. To provide continuity between cycles, a proportion of 'trend' questions, used in previous cycles, were included for each subject to act as a measure of change. The PISA 2018 design built upon the design and methodology innovations introduced for PISA 2015, which increased the content coverage in the minor domains in order to diminish differences across cycles (compared with the paper-based assessment mode). This design also improves scaling and trend analyses across cycles.

In addition, as part of the design for 2018, some multi-stage adaptive testing (MSAT) for reading was included.[74] This method of adaptive testing, made possible by the electronic delivery of PISA, meant that the selection of questions presented to each pupil was determined by their answers to previous questions, ensuring that pupils received questions that were neither too easy nor too difficult. Another technical advantage of this approach was that more refined information could be gathered for higher and lower achieving pupils, thereby improving the accuracy of the measurement scales. The MSAT is discussed in more detail in Chapter 1, Volume 1 of the PISA 2018 International report.

Further details on the assessment administration are included in A4 below.

Strict international quality standards are applied to all stages of the PISA study to ensure equivalence in translation and adaptation of instruments, sampling procedures and study administration in all participating countries.

Further details of the PISA 2018 Technical standards can be found here: PISA 2018 Technical Standards.

All international OECD publications, as well as the international database, are available on the OECD PISA website.

A2 What PISA measures – sample questions

PISA is designed not only to assess whether pupils can reproduce knowledge, but also whether they can extrapolate from what they have learned and apply their knowledge in new situations. The PISA 2018 study focused on reading, with mathematics and science as minor domains of assessment[75].

All PISA assessments are based on the *PISA 2018 Assessment and Analytical Framework*. This document presents the theory underlying the assessment in the three core subjects of reading, mathematics and science. It outlines the knowledge content, the processes and the contexts in which pupils can apply their learning, and discusses how each domain is assessed. The document also includes detailed frameworks for the various questionnaires distributed to pupils and headteachers that gather information on a number of contextual variables.

The OECD definitions for the three core domains are presented in section A2.1 to A2.3 below, followed by some examples of the types of questions pupils might be presented with in a PISA assessment.

---

[74] Full technical details of the PISA 2018 Integrated Design can be found at PISA 2018 INTEGRATED-DESIGN PDF

[75] Some countries also took part in financial literacy and global competence assessments.

PISA uses proficiency levels to describe the types of skills that pupils are likely to demonstrate and the tasks that they are able to complete. The sample questions that follow include their estimated proficiency level, where available.

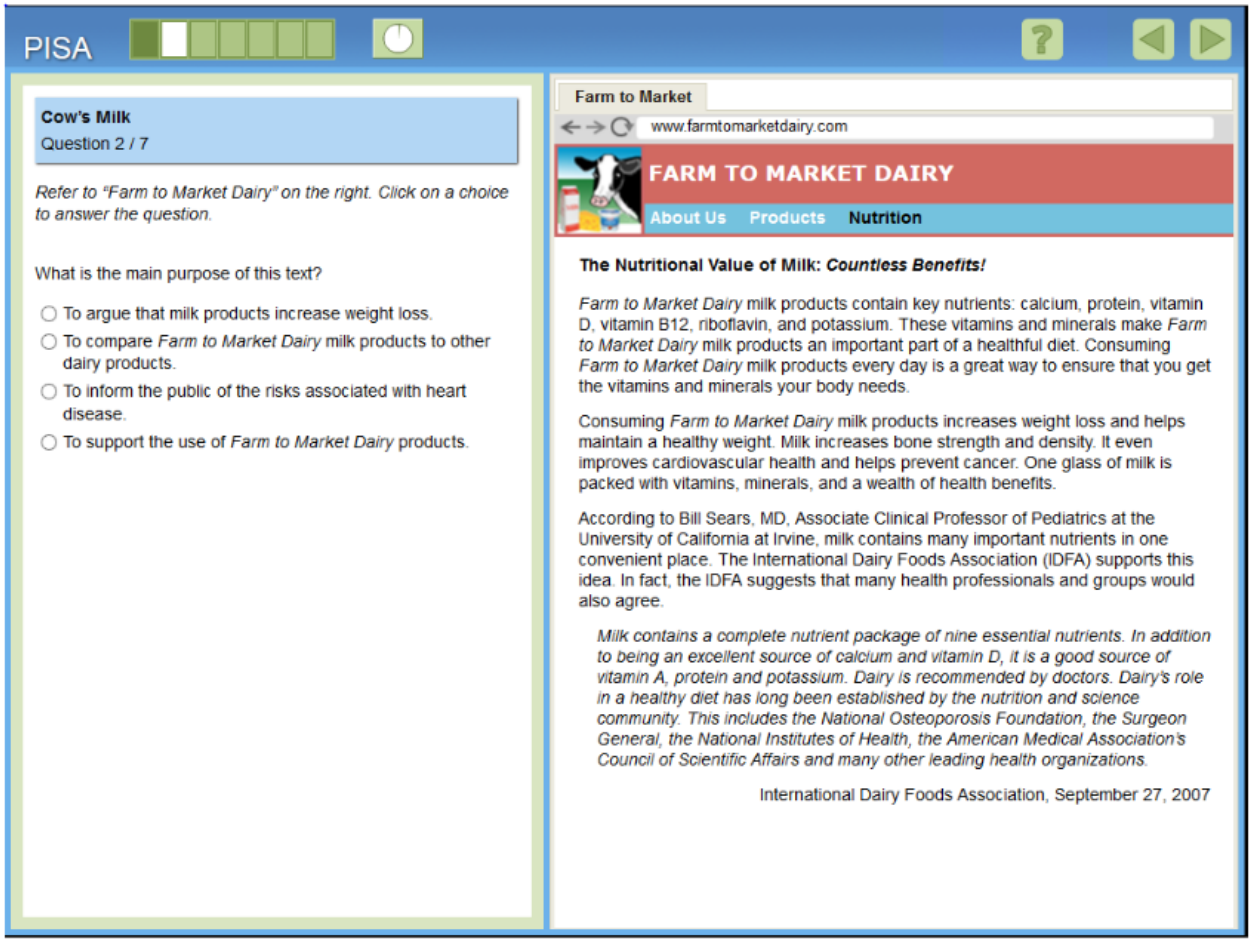
More information on PISA proficiency levels and PISA scale scores can be found in section A3.

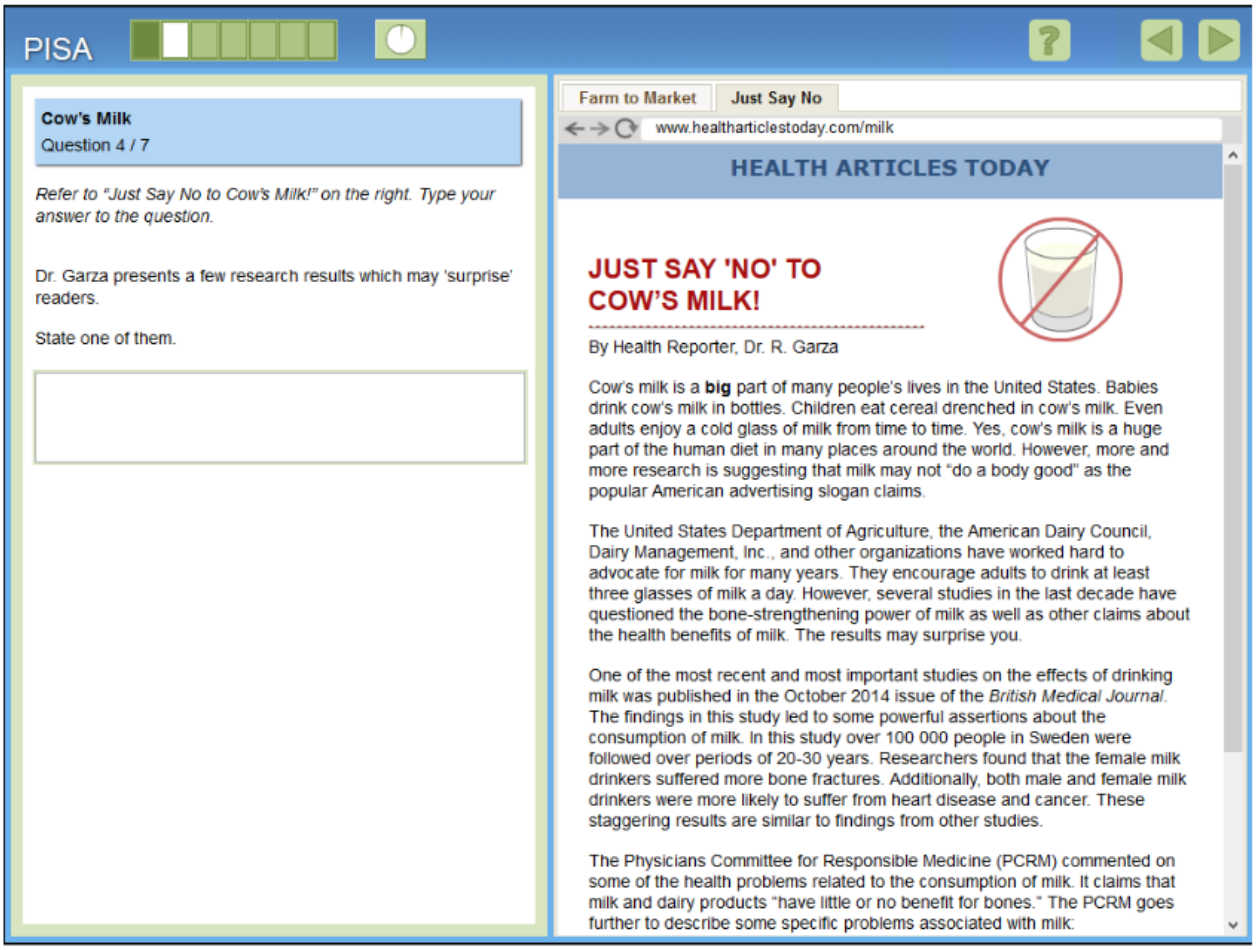
A2.1 Reading

Reading literacy is defined as pupils' capacity to understand, use, evaluate, reflect on and engage with texts in order to achieve one's goals, develop one's knowledge and potential, and participate in society.

OECD 2019

Sample questions: Reading





This item asks the student to identify the research results reported in the article and to state one of them. Here, the student needs to represent the literal meaning of information in the article by identifying one of the findings and providing it. Note that in the coding guide used for the Field Trial, there were only two findings that were allowed for this item because there were only two "surprising" research results described. The coding guide that was used in the Field Trial is provided below. This item was coded with high reliability in the Field Trial.

Item Number	CR557Q10
Cognitive Process	Represent literal meaning
Response Format	Open Response – Human Coded
Estimated Level	3

Full Credit

Code 1: Quotes or paraphrases one of the following research results stated in the text:

1. Female milk drinkers suffered more bone fractures.
2. Both male and female milk drinkers were more likely to suffer from heart disease and cancer.
   - Women who drank milk had more broken bones.
   - People who drink milk had more heart disease and cancer.

Further examples of released reading items can be found at:
http://www.oecd.org/pisa/assessment/PISA-2018-Released-New-REA-Items.pdf

A2.2 Science

Sample questions: Science

PISA 2015

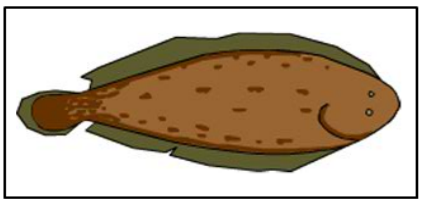
Sustainable Fish Farming
Introduction

Read the introduction. Then click on the NEXT arrow.

SUSTAINABLE FISH FARMING

An increased demand for seafood is placing a greater burden on populations of wild fish. To reduce this burden, researchers are investigating ways to grow fish sustainably in fish farms.

Two challenges to creating a sustainable fish farm include (1) feeding the farmed fish and (2) maintaining water quality. Farmed fish require large amounts of food. A fish farm that is sustainable will grow the food needed to feed the farmed fish. Waste from the fish can build up in the farm to levels that are dangerous to the fish. In a sustainable fish farm, there is a constant flow of ocean water through the farm. Waste and excess nutrients (food that algae and plants need to grow) are removed from the water before it is returned to the ocean.



PISA 2015

Sustainable Fish Farming
Question 1 / 3

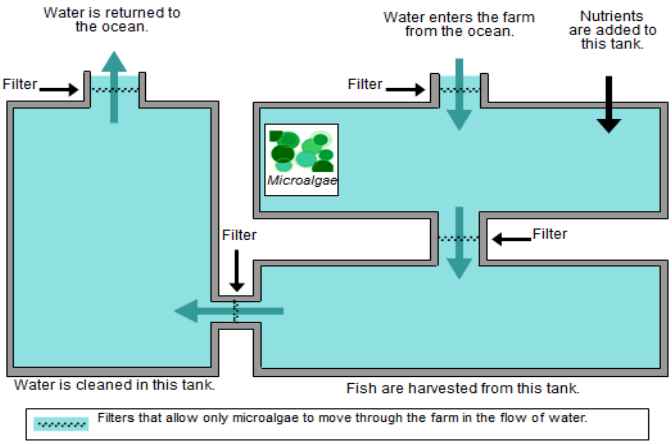
Refer to the information below. Use drag and drop to answer the question.

The diagram shows a design for an experimental fish farm with three large tanks. Filtered salt water is pumped from the ocean before flowing from tank to tank until it is returned to the ocean. The primary goal of the fish farm is to grow common sole to be harvested in a sustainable way.

- Common Sole: The fish being farmed. Their preferred food is ragworms.

The following organisms will also be used in the farm:

- Microalgae: Microscopic organisms that only need light and nutrients to grow.
- Ragworms: Invertebrates that grow very rapidly on a diet of microalgae.
- Shellfish: Organisms that feed on microalgae and other small organisms in the water.
- Marsh Grass: Grasses that absorb nutrients and wastes from the water.



The researchers need to decide in which tank each organism should be placed. Drag and drop each of the organisms below to the appropriate tank above to ensure that the Common Sole is fed and that salt water is returned to the ocean unchanged. The microalgae are already in the correct tank.

PISA 2015

Sustainable Fish Farming
Question 2 / 3

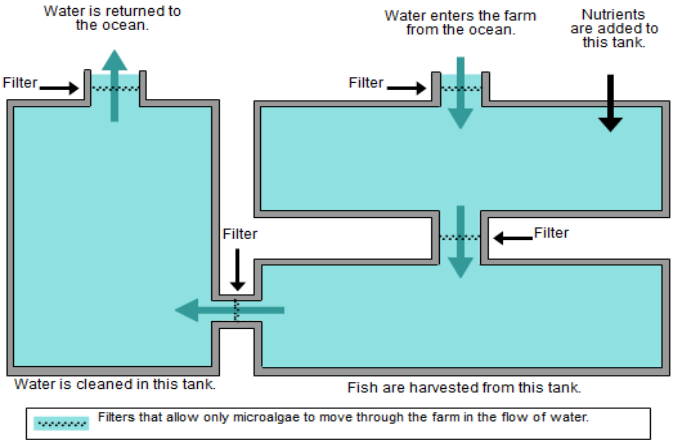
Refer to the information below. Click on a choice to answer the question.

The diagram shows a design for an experimental fish farm with three large tanks. Filtered salt water is pumped from the ocean before flowing from tank to tank until it is returned to the ocean. The primary goal of the fish farm is to grow common sole to be harvested in a sustainable way.

- Common Sole: The fish being farmed. Their preferred food is ragworms.

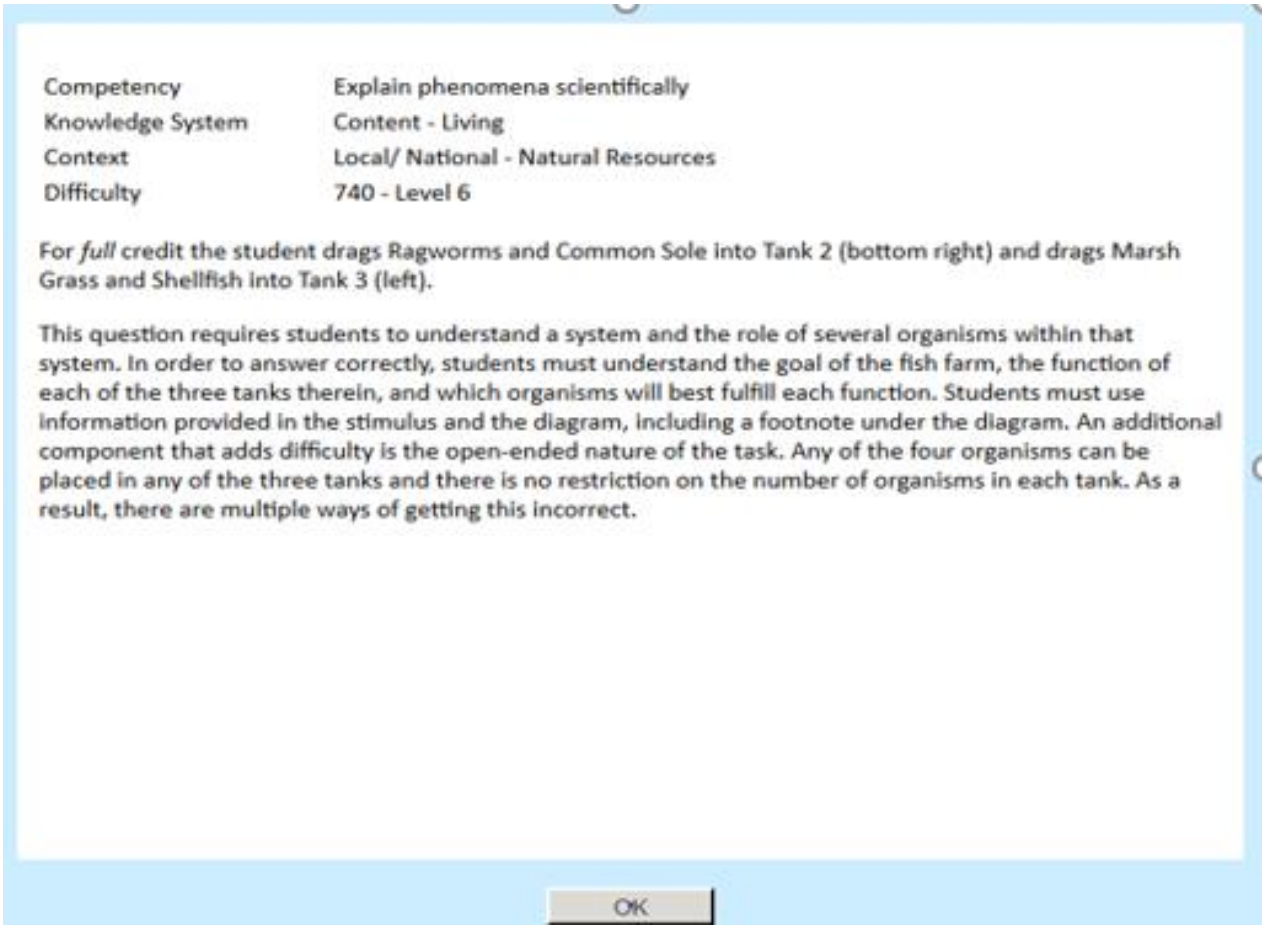
The following organisms will also be used in the farm:

- Microalgae: Microscopic organisms that only need light and nutrients to grow.
- Ragworms: Invertebrates that grow very rapidly on a diet of microalgae.
- Shellfish: Organisms that feed on microalgae and other small organisms in the water.
- Marsh Grass: Grasses that absorb nutrients and wastes from the water.



Researchers have noticed that the water that is being returned to the ocean contains a large quantity of nutrients. Adding which of the following to the farm will reduce this problem?

- ○ More nutrients
- ○ More ragworms
- ○ More shellfish
- ○ More marsh grass



Further examples of released science items can be found at:
http://www.oecd.org/pisa/pisa-2015-science-assessment-questions.htm

A2.3 Mathematics

> Mathematics literacy is defined as pupils' capacity to formulate, employ and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena.
>
> OECD 2019

Sample questions: Mathematics[76]

HOLIDAY APARTMENT

Christina finds this holiday apartment for sale on the internet. She is thinking about buying the holiday apartment so that she can rent it out to holiday guests.

Number of rooms:	1 x living and dining room 1 x bedroom 1 x bathroom
Size:	60 square metres (m^2)
Parking spot:	yes
Travel time to town centre:	10 minutes
Distance to the beach:	350 metres (m) in a direct line
Average usage by holiday guests in the last 10 years:	315 days per year

Price: 200 000 zeds

[76] Please note: No mathematics questions in computerised format have yet been publicly released. These will become available during PISA 2021, when mathematics is the major domain. The examples shown represent similar content to some computer-based questions but the format is different. These are questions from 2012 and do not have proficiency levels identified.

Question 1: HOLIDAY APARTMENT

PM962Q01 – 0 1 9

To assess the price of the holiday apartment, Christina has asked for an expert's evaluation. To estimate the value of a holiday apartment, the expert uses the following criteria:

Price per m²	**Base price:**	2500 zeds per m²			
Additional value criteria	**Travel time to town centre:**	More than 15 minutes: +0 zeds	From 5 to 15 minutes: +10 000 zeds	Less than 5 minutes: +20 000 zeds	
	Distance to beach (in a direct line):	More than 2 km: +0 zeds	From 1 to 2 km: +5000 zeds	From 0.5 to 1 km: +10 000 zeds	Less than 0.5 km: +15 000 zeds
	Parking spot:	No: +0 zeds	Yes: +35 000 zeds		

If the value estimated by the expert is greater than the advertised selling price, the price is considered to be "very good" for Christina as the potential buyer.

Show that based on the expert's criteria, the selling price on offer is "very good" for Christina.

.....

.....

.....

.....

.....

HOLIDAY APARTMENT SCORING 1

QUESTION INTENT:

Description: Evaluate a number of criteria against the advertised selling price of a holiday apartment

Mathematical content area: Quantity

Context: Societal

Process: Employ

Full Credit

Code 1: A response that shows that the estimated value according to the expert's criteria is 210 000 zeds which is more than 200 000 zeds hence making it a "very good" price. *[The expert's value of 210 000 zeds must be explicitly stated, but the advertised price can be referred to implicitly or explicitly].*

- The expert's total is 210 000 zeds which is greater than the advertised price of 200 000 which means it is a very good price.
- The total of 210 000 zeds is greater than the advertised price.

No Credit

Code 0: Other responses.

Code 9: Missing.

Question 2: HOLIDAY APARTMENT

PM962Q02

315 days per year is the average usage of the apartment by holiday guests over the last 10 years.

Decide whether the following statements can be deduced from this information.
Circle "Yes" or "No" for each statement.

Statement	Can the statement be deduced from the given data?
It can be said with certainty that the holiday apartment was used on exactly 315 days by holiday guests in at least one of the last 10 years.	Yes / No
Theoretically it is possible that in the last 10 years the apartment was used on more than 315 days every year by holiday guests.	Yes / No
Theoretically it is possible that in one of the last 10 years the apartment was not used at all by holiday guests.	Yes / No

Note: Assume a year has 365 days.

HOLIDAY APARTMENT SCORING 2

QUESTION INTENT:

Description: Interpret the meaning of a given average value
Mathematical content area: Uncertainty and data
Context: Societal
Process: Interpret

Full Credit

Code 1: Three correct responses: No, No, Yes, in that order.

No Credit

Code 0: Other responses.

Further examples of released mathematics items can be found at: https://www.oecd.org/pisa/assessment/PISA%202012%20items%20for%20release_ENGLISH.pdf

A3 What the proficiency levels and PISA scale scores mean

PISA uses proficiency levels to describe the types of skills that pupils are likely to demonstrate and the tasks that they are able to complete. Assessment questions that focus on simple tasks are categorised at lower levels whereas those that are more demanding are categorised at higher levels. The question categorisations are based on both quantitative and qualitative analysis, taking into account question difficulty as well as expert views on the specific cognitive demands of each individual question. All PISA questions have been categorised in this manner.

Pupils described as being at a particular level not only demonstrate the knowledge and skills associated with that level but also the proficiencies required at lower levels. For example, all pupils proficient at Level 3 are also considered to be proficient at Levels 1 and 2. The proficiency level of a pupil is the highest level at which they answer more than half of the questions correctly. Table A1.1 shows the range of score points for each level in each subject.

Table A1.1 PISA proficiency level scale scores

Proficiency level	Reading	Science	Mathematics
Below Level 1c	Below 189	-	-
Level 1c	189-262	Below 260	-
Level 1b	262-335	260-335	Below 358
Level 1a	335-407	335-410	358-422
Level 2	407-480	410-484	422-482
Level 3	480-553	484-559	482-545
Level 4	553-626	559-633	545-607
Level 5	626-698	633-708	607-669
Level 6	Above 698	Above 708	Above 669

Source: PISA 2018 database

The mean score for OECD countries for each subject scale was set to 500 in the PISA cycle when the subject was the major domain for the first time. Thus, the reading scale was set to a mean of 500 in its first year in 2000. Similarly, the mathematics scale was set to a mean of 500 in 2003 and the science scale was set to a mean of 500 in 2006. The method by which these scales are derived is explained further in Appendix E and in the PISA Technical Report (OECD, forthcoming).

As with any repeated measurement that uses samples, the mean may vary slightly from cycle to cycle without necessarily indicating any real change in the global level of skills.

Tables A1.2 to A1.4 below describe what pupils can typically do at each proficiency level for the three core subjects: reading, science and mathematics.

Table A1.2 Reading proficiency levels

Level	Percentage of pupils at this level	What pupils can typically do at each level
6	**OECD**: 1% perform tasks at Level 6 **England**: 2%	Readers at Level 6 can comprehend lengthy and abstract texts in which the information of interest is deeply embedded and only indirectly related to the task. They can compare, contrast and integrate information representing multiple and potentially conflicting perspectives, using multiple criteria and generating inferences across distant pieces of information to determine how the information may be used. Readers at Level 6 can reflect deeply on the text's source in relation to its content, using criteria external to the text. They can compare and contrast information across texts, identifying and resolving inter-textual discrepancies and conflicts through inferences about the sources of information, their explicit or vested interests, and other cues as to the validity of the information. Tasks at Level 6 typically require the reader to set up elaborate plans, combining multiple criteria and generating inferences to relate the task and the text(s). Materials at this level include one or several complex and abstract text(s), involving multiple and possibly discrepant perspectives. Target information may take the form of details that are deeply embedded within or across texts and potentially obscured by competing information.
5	**OECD**: 9% perform tasks at least at Level 5 **England**: 12%	Readers at Level 5 can comprehend lengthy texts, inferring which information in the text is relevant even though the information of interest may be easily overlooked. They can perform causal or other forms of reasoning based on a deep understanding of extended pieces of text. They can also answer indirect questions by inferring the relationship between the question and one or several pieces of information distributed within or across multiple texts and sources. Reflective tasks require the production or critical evaluation of hypotheses, drawing on specific information. Readers can establish distinctions between content and purpose, and between fact and opinion as applied to complex or abstract statements. They can assess neutrality and bias based on explicit or implicit cues pertaining to both the content and/or

Level	Percentage of pupils at this level	What pupils can typically do at each level
		source of the information. They can also draw conclusions regarding the reliability of the claims or conclusions offered in a piece of text. For all aspects of reading, tasks at Level 5 typically involve dealing with concepts that are abstract or counterintuitive, and going through several steps until the goal is reached. In addition, tasks at this level may require the reader to handle several long texts, switching back and forth across texts in order to compare and contrast information.
4	**OECD**: 28% perform tasks at least at Level 4 **England**: 33%	At Level 4, readers can comprehend extended passages in single or multiple-text settings. They interpret the meaning of nuances of language in a section of text by taking into account the text as a whole. In other interpretative tasks, pupils demonstrate understanding and application of ad hoc categories. They can compare perspectives and draw inferences based on multiple sources. Readers can search, locate and integrate several pieces of embedded information in the presence of plausible distractors. They can generate inferences based on the task statement in order to assess the relevance of target information. They can handle tasks that require them to memorise prior task content. In addition, pupils at this level can evaluate the relationship between specific statements and a person's overall stance or conclusion about a topic. They can reflect on the strategies that authors use to convey their points, based on salient features of texts (e.g. titles and illustrations). They can compare and contrast claims explicitly made in several texts and assess the reliability of a source based on salient criteria. Texts at Level 4 are often long or complex, and their content or form may not be standard. Many of the tasks are situated in multiple-text settings. The texts and the tasks contain indirect or implicit cues.
3	**OECD**: 54% perform tasks at least at Level 3 **England**: 60%	Readers at Level 3 can represent the literal meaning of single or multiple texts in the absence of explicit content or organisational clues. Readers can integrate content and generate both basic and more advanced inferences. They can also integrate several parts of a piece of text in order to identify the main idea, understand a relationship or construe the meaning of a word or

Level	Percentage of pupils at this level	What pupils can typically do at each level
		phrase when the required information is featured on a single page. They can search for information based on indirect prompts, and locate target information that is not in a prominent position and/or is in the presence of distractors. In some cases, readers at this level recognise the relationship between several pieces of information based on multiple criteria. Level 3 readers can reflect on a piece of text or a small set of texts, and compare and contrast several authors' viewpoints based on explicit information. Reflective tasks at this level may require the reader to perform comparisons, generate explanations or evaluate a feature of the text. Some reflective tasks require readers to demonstrate a detailed understanding of a piece of text dealing with a familiar topic, whereas others require a basic understanding of less familiar content. Tasks at Level 3 require the reader to take many features into account when comparing, contrasting or categorising information. The required information is often not prominent or there may be a considerable amount of competing information. Texts typical of this level may include other obstacles, such as ideas that are contrary to expectation or negatively worded.
2	**OECD**: 77% perform tasks at least at Level 2 **England**: 83%	Readers at Level 2 can identify the main idea in a piece of text of moderate length. They can understand relationships or construe meaning within a limited part of the text when the information is not prominent by producing basic inferences, and/or when the text(s) include some distracting information. They can select and access a page in a set based on explicit though sometimes complex prompts, and locate one or more pieces of information based on multiple, partly implicit criteria. Readers at Level 2 can, when explicitly cued, reflect on the overall purpose, or on the purpose of specific details, in texts of moderate length. They can reflect on simple visual or typographical features. They can compare claims and evaluate the reasons supporting them based on short, explicit statements. Tasks at Level 2 may involve comparisons or contrasts based on a single feature in the text. Typical reflective tasks at this level require readers to make a comparison or several connections between the text and outside knowledge by drawing on personal experience and attitudes.

Level	Percentage of pupils at this level	What pupils can typically do at each level
1a	**OECD**: 92% perform tasks at least at Level 1a **England**: 95%	Readers at Level 1a can understand the literal meaning of sentences or short passages. Readers at this level can also recognise the main theme or the author's purpose in a piece of text about a familiar topic, and make a simple connection between several adjacent pieces of information, or between the given information and their own prior knowledge. They can select a relevant page from a small set based on simple prompts, and locate one or more independent pieces of information within short texts. Level 1a readers can reflect on the overall purpose and on the relative importance of information (e.g. the main idea vs. non-essential detail) in simple texts containing explicit cues. Most tasks at this level contain explicit cues regarding what needs to be done, how to do it, and where in the text(s) readers should focus their attention.
1b	**OECD**: 99% perform tasks at least at Level 1b **England**: 99%	Readers at Level 1b can evaluate the literal meaning of simple sentences. They can also interpret the literal meaning of texts by making simple connections between adjacent pieces of information in the question and/or the text. Readers at this level can scan for and locate a single piece of prominently placed, explicitly stated information in a single sentence, a short text or a simple list. They can access a relevant page from a small set based on simple prompts when explicit cues are present. Tasks at Level 1b explicitly direct readers to consider relevant factors in the task and in the text. Texts at this level are short and typically provide support to the reader, such as through repetition of information, pictures or familiar symbols. There is minimal competing information.
1c	**OECD**: 100% perform tasks at least at Level 1c **England**: 100%	Readers at Level 1c can understand and affirm the meaning of short, syntactically simple sentences on a literal level, and read for a clear and simple purpose within a limited amount of time. Tasks at this level involve simple vocabulary and syntactic structures.

Table A1.3 Science proficiency levels

Level	Percentage of pupils at this level	What pupils can typically do at each level
6	**OECD**: 1% perform tasks at Level 6 **England**: 2%	At Level 6, pupils can draw on a range of interrelated scientific ideas and concepts from the physical, life, and earth and space sciences and use content, procedural and epistemic knowledge in order to offer explanatory hypotheses of novel scientific phenomena, events and processes or to make predictions. In interpreting data and evidence, they are able to discriminate between relevant and irrelevant information and can draw on knowledge external to the normal school curriculum. They can distinguish between arguments that are based on scientific evidence and theory and those based on other considerations. Level 6 pupils can evaluate competing designs of complex experiments, field studies or simulations and justify their choices.
5	**OECD**: 7% perform tasks at least at Level 5 **England**: 10%	At Level 5, pupils can use abstract scientific ideas or concepts to explain unfamiliar and more complex phenomena, events and processes involving multiple causal links. They are able to apply more sophisticated epistemic knowledge to evaluate alternative experimental designs and justify their choices and use theoretical knowledge to interpret information or make predictions. Level 5 pupils can evaluate ways of exploring a given question scientifically and identify limitations in interpretations of data sets including sources and the effects of uncertainty in scientific data.
4	**OECD**: 25% perform tasks at least at Level 4 **England**: 32%	At Level 4, pupils can use more complex or more abstract content knowledge, which is either provided or recalled, to construct explanations of more complex or less familiar events and processes. They can conduct experiments involving two or more independent variables in a constrained context. They are able to justify an experimental design, drawing on elements of procedural and epistemic knowledge. Level 4 pupils can interpret data drawn from a moderately complex data set or less familiar context, draw appropriate conclusions that go beyond the data and provide justifications for their choices.

Level	% at this level	What pupils can typically do at each level
3	**OECD**: 52% perform tasks at least at Level 3 **England**: 60%	At Level 3, pupils can draw upon moderately complex content knowledge to identify or construct explanations of familiar phenomena. In less familiar or more complex situations, they can construct explanations with relevant cueing or support. They can draw on elements of procedural or epistemic knowledge to carry out a simple experiment in a constrained context. Level 3 pupils are able to distinguish between scientific and non-scientific issues and identify the evidence supporting a scientific claim.
2	**OECD**: 78% perform tasks at least at Level 2 **England**: 83%	At Level 2, pupils are able to draw on everyday content knowledge and basic procedural knowledge to identify an appropriate scientific explanation, interpret data, and identify the question being addressed in a simple experimental design. They can use basic or everyday scientific knowledge to identify a valid conclusion from a simple data set. Level 2 pupils demonstrate basic epistemic knowledge by being able to identify questions that can be investigated scientifically.
1a	**OECD**: 94% perform tasks at least at Level 1a **England**: 96%	At Level 1a, pupils are able to use basic or everyday content and procedural knowledge to recognise or identify explanations of simple scientific phenomena. With support, they can undertake structured scientific enquiries with no more than two variables. They are able to identify simple causal or correlational relationships and interpret graphical and visual data that require a low level of cognitive demand. Level 1a pupils can select the best scientific explanation for given data in familiar personal, local and global contexts.
1b	**OECD**: 99% perform tasks at least at Level 1b **England**: 99%	At Level 1b, pupils can use basic or everyday scientific knowledge to recognise aspects of familiar or simple phenomena. They are able to identify simple patterns in data, recognise basic scientific terms and follow explicit instructions to carry out a scientific procedure.

Table A1.4 Mathematics proficiency levels

Level	Percentage at this level	What pupils can typically do at each level
6	**OECD**: 2% perform tasks at Level 6 **England**: 3%	At Level 6, pupils can conceptualise, generalise and utilise information based on their investigations and modelling of complex problem situations, and can use their knowledge in relatively non-standard contexts. They can link different information sources and representations together and flexibly translate amongst them. Pupils at this level are capable of advanced mathematical thinking and reasoning. These pupils can apply this insight and understanding, along with a mastery of symbolic and formal mathematical operations and relationships, to develop new approaches and strategies for attacking novel situations. Pupils at this level can reflect on their actions, and can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments, and the appropriateness of these to the original situation.
5	**OECD**: 11% perform tasks at least at Level 5 **England**: 14%	At Level 5, pupils can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare and evaluate appropriate problem-solving strategies for dealing with complex problems related to these models. Pupils at this level can work strategically using broad, well-developed thinking and reasoning skills, appropriate linked representations, symbolic and formal characterisations, and insight pertaining to these situations. Pupils at this level have begun to develop the ability to reflect on their work and to communicate conclusions and interpretations in written form.
4	**OECD**: 29% perform tasks at least at Level 4 **England**: 34%	At Level 4, pupils can work effectively with explicit models for complex, concrete situations that may involve constraints or call for making assumptions. They can select and integrate different representations, including symbolic representations, linking them directly to aspects of real-world situations. Pupils at this level can utilise their limited range of skills and can reason with some insight, in straightforward contexts. They can

Level	Percentage at this level	What pupils can typically do at each level
		construct and communicate explanations and arguments based on their interpretations, arguments and actions.
3	**OECD**: 54% perform tasks at least at Level 3 **England**: 60%	At Level 3, pupils can execute clearly described procedures, including those that require sequential decisions. Their interpretations are sufficiently sound to be a base for building a simple model or for selecting and applying simple problem-solving strategies. Pupils at this level can interpret and use representations based on different information sources and reason directly from them. They typically show some ability to handle percentages, fractions and decimal numbers, and to work with proportional relationships. Their solutions reflect that they have engaged in basic interpretation and reasoning.
2	**OECD**: 76% perform tasks at least at Level 2 **England**: 81%	At Level 2, pupils can interpret and recognise situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Pupils at this level can employ basic algorithms, formulae, procedures or conventions to solve problems involving whole numbers. They are capable of making literal interpretations of results.
1	**OECD**: 91% perform tasks at least at Level 1 **England**: 94%	At Level 1, pupils can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are almost always obvious and follow immediately from the given stimuli.

A4 Study administration

The overall administration of PISA 2018 was carried out on behalf of the OECD by an international consortium led by Educational Testing Service (ETS).

National Centre

The international consortium worked with PISA National Centres within each country, through the National Project Manager (NPM). For England, Wales, Northern Ireland and Scotland, the National Foundation for Educational Research (NFER) was the PISA National Centre.

National Centres were responsible for making local adaptations to instruments and manuals, and for translation where necessary. NFER made appropriate adaptations to all PISA instruments and accompanying documentation, ensuring the language and terminology used in the cognitive instruments was appropriate for UK pupils (for example, use of metric measures not imperial, use of British words, spellings or colloquialisms, references to UK school year groups or study programmes). They also conducted a series of checks and assessments on the electronic Student Delivery System (SDS) to ensure that it functioned as intended.

Sampling

School samples were selected by the PISA international consortium, and National Centres were responsible for supplying the information to allow them to select the sample of schools. Samples of pupils within participating schools were selected by NFER using software supplied by the consortium.

Administration in schools

PISA was conducted in schools by study administrators employed and trained by NFER.

During the administration of the study in schools, pupils accessed the computer-based assessments using a unique ID and password. When logging into the electronic student delivery system (SDS), the ID automatically allocated specific clusters of questions to each pupil. As a result, different pupils did not all see the same set of questions. All pupils received reading questions[77], and may also have been presented with science and/or mathematics questions so that overall, across the country, full coverage of the assessment framework in each subject was achieved.

[77] allocated according to the 2018 multi-stage adaptive design described in section A1

In addition to the assessments in the core subjects, there were also school and pupil questionnaires. The pupil questionnaire consisted of a core set of questions asked in all participating countries. In addition, pupils in England completed PISA questionnaires on ICT Familiarity and Educational Careers.

Assessments and questionnaires were generally administered to pupils in a single session, with a two hour period for the assessments and approximately 45 minutes for completion of the pupil questionnaire. The total length of an administration session in school, including set up and close down, was around three and a half hours to 4 hours.

The pupils included in the PISA study are generally described as '15-year-olds'. Specifically, the sample consisted of pupils aged from 15 years and 3 months to 16 years and 2 months at the beginning of the PISA assessment period.

Countries were generally required to carry out the study during an eight-week period between March and August 2018. However, as in previous cycles, England, Wales and Northern Ireland were permitted to test outside this period because of the problems for schools caused by the overlap with GCSE preparation and other examinations. In England, Wales and Northern Ireland the study took place in October 2018 to January 2019[78]. Scotland also tested in November/December, for the first time, in 2018.

A5 The PISA sample in England

Countries must follow strict international sampling procedures to ensure comparability of national samples.

In each country participating in PISA, the minimum number of participating schools was 150, and the minimum number of pupils 4,500; in some countries, the numbers exceeded these. In some cases this was due to the need to over-sample some parts of the country. In the case of the UK, for example, larger samples were drawn for Wales, Scotland and Northern Ireland than would be required for a representative UK sample. This was to make it possible to provide separate PISA results for the 4 constituent countries of the UK. In some countries, additional samples were drawn for other purposes, for example, to enable reporting of results for a sub-group such as a separate language group. In very small countries with fewer than 150 schools, the study was completed as a school census with all appropriate schools included.

[78] A short time extension to the testing window was granted due to technical issues experienced by many schools. This was partly due to anomalies with the diagnostic assessment failing to detect issues with launching the SDS.

Selecting schools for the sample

To ensure the sample is properly representative of the country as a whole, key characteristics of the total population of schools, such as school type, and region, must be taken into account. The first stage of sampling, therefore, was agreement of the school stratification variables to be used for each country. Table A1.5 shows the variables which were used for sampling of schools in England for PISA 2018.

Table A1.5 Stratification variables

Stratification Variable	Explicit or Implicit	Level Names
Country	Explicit	England
School type	Explicit	• maintained selective • maintained non-selective • independent • academy
Region	Explicit	• North • Midlands • South • Greater London
Gender	Implicit	• male • mixed • female
School performance	Implicit	Six bands: Based on average attainment 8 score per pupil at school level, as taken from the 2016 performance tables • Lowest band • 2nd lowest band • Middle band • 2nd highest band • Highest band • Missing data/not applicable
Local authority	Implicit	152 LAs for England

Note: Due to some small strata (with 3 or fewer schools), the consortium advised that some strata should be collapsed to avoid strata with no replacement schools and schools which will have almost certainly been selected in previous surveys and would be selected in future surveys if the same strata were maintained.

Countries are allowed to exempt schools from the sampling frame if it is expected that the majority of pupils would not be eligible to participate in PISA. Special schools, hospital schools, secure units and international immersion schools were excluded on this basis. Pupil referral units were also excluded as those pupils remain registered with their original school and would therefore be double-counted.

Following agreement of the sampling plan and the establishment of population estimates in the age group, the list of all eligible schools and their populations was sent to the PISA consortium. The consortium examined and approved the sampling frame then carried out the school sampling.

The PISA study has strict sampling requirements regarding both the acceptable participation rate and the methodology for the replacement of any schools which decline to participate. Within each country, three separate samples are selected, the first being the main sample and the other two back-up samples. In the back-up samples each school is a replacement for a specific school in the main sample. So, if a main sample school declines to participate, there are two other schools which can be used as replacements for that school.

The schools which had been selected in the main sample were invited to participate, and replacement schools were invited as necessary for any schools in the main sample which declined to participate. Information on all eligible pupils (those who would be within the PISA age range at the time of the PISA assessment period in November/December 2018) was then collected either centrally from the National Pupil Database or, in some cases, directly from schools.

The Keyquest software supplied by the PISA consortium was used to randomly select 40 pupils within each school from those who met the PISA age definition.

School and pupil response rates

According to the PISA sampling rules, 85% of main sample schools are required to participate. If this percentage is achieved, it is not necessary to replace non-participating schools. If the response from the main sample is below 85% but above 65%, it is still possible to achieve an acceptable response rate by using replacement schools from the back-up samples. However, the target then moves upwards – for example, with a main sample response of 70%, the after-replacement target is 93% (rather than 85%).

There is also a response rate requirement for pupils within each school. It is possible for pupils to be excluded from participation and not counted within the total because they have special needs such that they could not participate, because they have limited language skills, or because they are no longer at the school. The remaining pupils are deemed eligible for PISA participation, and at least 50% of these must participate for the school to be counted as a participating school.

The international response rate for the United Kingdom is calculated based on the results for England, Wales, Northern Ireland and Scotland, with weighting according to the population in each country as well as school size.

The weighted school response rate for the UK as a whole[79] was 72.9% of main sample schools, and 86.6% after replacement. Table A1.6 shows the response rates for each country. Table A1.7 gives the numbers of participating schools and pupils across the UK and Table A1.8 shows the response rates by country for the school questionnaire.

Table A1.6 School and pupil response rates by country

Country	School response rate before replacement	School response rate after replacement	Pupil response rate
England	71.7%	86.3%	83.2%
Northern Ireland	65.7%	77.1%	83.7%
Wales	78.1%	89.3%	85.5%
Scotland	86.5%	92.2%	80.5%
UK overall	**72.9%**	**86.6%**	**83.1%**

As the figures did not fully meet the PISA 2018 participation requirements, a non-response bias analysis was required to examine whether the final set of participating schools were representative of the overall sample of schools and ensure that no significant differences were found between the balance of stratification variables in the achieved sample and the original, planned sample. The OECD's Technical Advisory Group was satisfied that this analysis demonstrated that no notable bias would result from the non-response. The OECD therefore agreed that the UK data should be included as fully comparable to other countries' data in the international reports.

There was also a requirement for 80% of selected pupils to participate in PISA. Across England, Wales, Northern Ireland and Scotland, the pupil response rate target was met with a final weighted response rate of 83.1%.

[79] Scotland participated in PISA as a separate adjudicated entity and met the sampling requirements.

Table A1.7 Numbers of participating schools and pupils by country

Country	Number of participating schools	Number of participating pupils
England	170	5,174
Northern Ireland	75	2,360
Wales	107	3,165
Scotland	107	2,969
UK overall	459	13,688

Table A1.8 School questionnaire response rates by country

Country	Unweighted response rates for the school questionnaire
England	75%
Northern Ireland	83%
Wales	92%
Scotland	81%

Appendix B Reading Tables

You can find accessible versions of these tables in the appendix data tables file on the **PISA 2018: national report for England** page.

Table B1.1 Mean score and variation in reading performance

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
B-S-J-Z (China)	555	(2.7)	87	(1.7)	441	(4.2)	559	(2.9)	666	(3.5)
Singapore	549	(1.6)	109	(1.0)	398	(3.9)	559	(2.1)	684	(2.5)
Macao (China)	525	(1.2)	92	(1.1)	403	(3.2)	530	(1.7)	641	(3.0)
Hong Kong (China)	524	(2.7)	99	(1.5)	390	(5.5)	533	(2.9)	645	(2.5)
Estonia	523	(1.8)	93	(1.2)	402	(3.5)	524	(2.3)	643	(3.1)
Canada	520	(1.8)	100	(0.8)	388	(2.4)	524	(2.2)	646	(2.3)
Finland	520	(2.3)	100	(1.3)	387	(4.2)	527	(2.8)	643	(3.0)
Republic of Ireland	518	(2.2)	91	(1.0)	398	(3.5)	520	(2.4)	635	(2.8)
Korea	514	(2.9)	102	(1.7)	377	(4.9)	522	(3.1)	640	(3.9)
Poland	512	(2.7)	97	(1.4)	384	(3.6)	515	(3.3)	636	(4.0)
Sweden	506	(3.0)	108	(1.5)	360	(5.7)	512	(3.4)	640	(3.5)
New Zealand	506	(2.0)	106	(1.3)	362	(3.7)	511	(2.9)	640	(2.9)
United States	505	(3.6)	108	(1.6)	361	(5.3)	510	(4.1)	643	(3.9)
England	505	(3.0)	101	(1.5)	372	(5.2)	508	(3.2)	634	(4.1)
Scotland	504	(3.0)	95	(1.9)	383	(3.6)	503	(3.7)	627	(4.7)
United Kingdom	504	(2.6)	100	(1.3)	372	(4.3)	506	(2.7)	632	(3.5)
Japan	504	(2.7)	97	(1.7)	374	(4.5)	508	(3.0)	627	(3.7)
Australia	503	(1.6)	109	(0.9)	357	(2.8)	507	(1.9)	640	(2.2)
Chinese Taipei	503	(2.8)	102	(1.5)	367	(3.8)	508	(3.1)	630	(3.8)
Denmark	501	(1.8)	92	(1.2)	380	(3.0)	504	(2.2)	618	(2.6)

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Northern Ireland	501	(4.0)	98	(2.2)	368	(5.8)	506	(5.0)	623	(5.6)
Norway	499	(2.2)	106	(1.3)	356	(4.3)	506	(2.7)	632	(2.9)
Germany	498	(3.0)	106	(1.5)	354	(4.5)	504	(4.1)	632	(3.5)
Slovenia	495	(1.2)	94	(1.2)	372	(3.0)	499	(1.9)	614	(2.8)
Belgium	493	(2.3)	103	(1.3)	352	(3.8)	498	(2.7)	623	(2.6)
France	493	(2.3)	101	(1.5)	355	(3.5)	497	(3.0)	622	(3.6)
Portugal	492	(2.4)	96	(1.2)	362	(4.0)	497	(2.9)	613	(2.7)
Czech Republic	490	(2.5)	97	(1.6)	362	(4.3)	492	(3.0)	616	(2.8)
OECD Average	487	(0.4)	99	(0.2)	354	(0.7)	490	(0.5)	614	(0.5)
Netherlands	485	(2.7)	105	(1.7)	344	(4.4)	486	(3.7)	621	(3.3)
Austria	484	(2.7)	99	(1.2)	350	(3.7)	488	(3.8)	612	(2.9)
Switzerland	484	(3.1)	103	(1.5)	345	(4.6)	488	(3.6)	615	(4.0)
Wales	483	(4.0)	97	(1.6)	359	(5.8)	484	(4.3)	608	(4.5)
Croatia	479	(2.7)	89	(1.7)	362	(4.6)	480	(3.2)	594	(3.2)
Latvia	479	(1.6)	90	(1.1)	360	(3.2)	480	(2.2)	595	(2.7)
Russian Federation	479	(3.1)	93	(1.8)	357	(4.8)	480	(3.4)	597	(3.6)
Italy	476	(2.4)	97	(1.7)	345	(4.6)	481	(2.9)	598	(3.4)
Hungary	476	(2.3)	98	(1.3)	346	(4.0)	479	(3.1)	602	(3.7)
Lithuania	476	(1.5)	94	(1.0)	351	(2.7)	479	(2.3)	597	(1.8)
Iceland	474	(1.7)	105	(1.3)	332	(4.0)	477	(2.7)	609	(3.3)
Belarus	474	(2.4)	89	(1.3)	355	(3.4)	475	(3.0)	589	(3.1)
Israel	470	(3.7)	124	(1.9)	296	(5.9)	479	(4.9)	628	(3.7)
Luxembourg	470	(1.1)	108	(1.0)	325	(2.1)	472	(1.8)	612	(2.8)
Ukraine	466	(3.5)	93	(1.7)	340	(5.2)	472	(3.5)	582	(3.8)
Turkey	466	(2.2)	88	(1.6)	351	(4.1)	466	(2.6)	581	(3.1)
Slovak Republic	458	(2.2)	100	(1.4)	326	(4.0)	458	(2.9)	590	(3.3)
Greece	457	(3.6)	97	(1.6)	326	(4.9)	460	(4.1)	583	(3.9)

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Chile	452	(2.6)	92	(1.2)	331	(3.6)	453	(3.2)	572	(3.3)
Mexico	420	(2.7)	84	(1.6)	314	(3.5)	419	(2.9)	530	(4.2)
Colombia	412	(3.3)	89	(1.5)	300	(3.7)	408	(3.8)	532	(4.7)

Source: PISA 2018 database

Table B1.2 Mean score and variation in the cognitive process subscale of reading: 'locate information'

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Australia	499	(2.2)	107	(1.3)	355	(3.4)	505	(2.5)	634	(3.0)
Austria	480	(2.9)	103	(1.6)	341	(4.9)	485	(3.3)	611	(2.8)
Belarus	480	(2.7)	95	(1.6)	354	(3.9)	483	(3.2)	600	(3.6)
Belgium	498	(2.6)	104	(1.8)	357	(4.1)	504	(3.1)	629	(2.9)
B-S-J-Z (China)	553	(3.1)	93	(2.0)	432	(4.7)	555	(3.4)	670	(4.0)
Canada	517	(2.3)	100	(1.4)	387	(3.0)	521	(2.6)	642	(3.4)
Chinese Taipei	499	(3.2)	106	(1.7)	358	(4.3)	506	(3.6)	631	(4.3)
Colombia	404	(3.6)	95	(1.9)	284	(4.6)	400	(4.1)	530	(4.8)
Croatia	478	(3.0)	98	(2.0)	348	(5.2)	481	(3.5)	603	(3.8)
Czech Republic	492	(2.9)	104	(2.4)	356	(5.6)	495	(3.5)	625	(4.3)
Denmark	501	(2.3)	94	(1.4)	377	(4.1)	505	(2.8)	619	(3.5)
England	507	(3.4)	106	(1.8)	370	(5.6)	511	(3.5)	639	(4.1)
Estonia	529	(2.2)	92	(1.3)	409	(4.1)	530	(2.7)	645	(2.8)
Finland	526	(2.5)	102	(1.9)	389	(5.0)	533	(2.8)	651	(2.9)
France	496	(2.9)	110	(2.0)	348	(4.2)	502	(3.7)	633	(4.6)
Germany	498	(3.4)	113	(1.8)	346	(5.1)	503	(4.0)	642	(4.0)
Greece	458	(3.8)	103	(2.0)	319	(6.5)	464	(4.3)	587	(3.7)
Hong Kong (China)	528	(3.1)	101	(1.6)	391	(6.2)	537	(3.3)	650	(3.5)
Hungary	471	(2.4)	98	(1.4)	338	(3.7)	476	(3.1)	594	(3.3)
Iceland	482	(1.9)	106	(1.5)	338	(4.0)	486	(2.6)	616	(4.0)
Israel	461	(4.1)	130	(2.4)	279	(6.9)	471	(5.2)	624	(4.0)
Italy	470	(2.9)	106	(2.1)	329	(5.3)	476	(3.1)	600	(3.9)
Japan	499	(2.8)	98	(1.9)	370	(4.9)	504	(3.3)	621	(3.5)
Korea	521	(3.1)	106	(2.1)	378	(5.5)	529	(3.0)	650	(3.9)
Latvia	483	(2.4)	95	(1.3)	358	(3.1)	484	(2.8)	607	(2.9)
Lithuania	474	(2.0)	98	(1.3)	343	(4.2)	478	(2.4)	598	(3.0)
Luxembourg	470	(1.5)	109	(1.4)	324	(3.3)	474	(2.8)	608	(2.6)

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Macao (China)	529	(1.6)	88	(1.2)	413	(3.0)	533	(1.9)	639	(3.4)
Malta	453	(2.2)	116	(1.6)	293	(4.6)	461	(3.0)	597	(3.8)
Mexico	416	(3.1)	88	(1.8)	302	(4.0)	415	(3.4)	530	(4.5)
Netherlands	500	(3.0)	102	(2.1)	363	(5.3)	504	(4.1)	631	(4.3)
New Zealand	506	(2.5)	106	(1.7)	363	(4.6)	512	(3.0)	638	(3.7)
Northern Ireland	505	(5.4)	99	(2.3)	372	(7.6)	510	(5.8)	631	(5.7)
Norway	503	(2.6)	108	(1.6)	356	(4.5)	509	(3.0)	638	(3.7)
Poland	514	(2.8)	101	(1.7)	383	(3.6)	517	(3.1)	641	(4.0)
Portugal	489	(2.9)	102	(1.6)	352	(4.7)	495	(3.5)	616	(3.6)
Republic of Ireland	521	(2.3)	92	(1.4)	398	(3.9)	525	(2.6)	636	(3.3)
Russian Federation	479	(3.6)	101	(2.3)	348	(6.3)	482	(4.0)	608	(4.3)
Scotland	507	(5.3)	104	(4.2)	372	(8.7)	510	(4.9)	639	(9.4)
Singapore	553	(1.7)	105	(1.3)	409	(4.1)	563	(1.9)	680	(2.1)
Slovak Republic	461	(2.6)	105	(1.7)	322	(5.2)	465	(3.0)	593	(4.6)
Slovenia	498	(1.6)	101	(1.3)	365	(3.0)	502	(2.8)	624	(2.8)
Sweden	511	(3.1)	108	(1.9)	365	(5.5)	518	(3.6)	645	(3.6)
Switzerland	483	(3.4)	106	(2.0)	340	(5.3)	488	(4.0)	616	(4.4)
Turkey	463	(2.4)	89	(1.9)	346	(4.6)	464	(2.5)	576	(4.2)
United Kingdom	507	(3.0)	105	(1.5)	370	(4.8)	510	(3.0)	638	(3.6)
United States	501	(3.5)	107	(1.9)	357	(5.8)	507	(4.1)	636	(4.6)
Wales	494	(4.4)	96	(1.5)	370	(5.9)	495	(5.1)	617	(5.6)
OECD Average	487	(0.5)	103	(0.3)	350	(0.8)	492	(0.6)	616	(0.6)

Source: PISA 2018 database

Table B1.3 Mean score and variation in the cognitive process subscale of reading: 'understand'

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Australia	502	(1.7)	112	(0.9)	352	(2.6)	507	(2.1)	643	(2.4)
Austria	481	(2.7)	101	(1.4)	343	(3.7)	485	(3.8)	610	(2.8)
Belarus	477	(2.5)	92	(1.5)	354	(4.2)	480	(3.0)	595	(3.3)
Belgium	492	(2.3)	105	(1.4)	348	(4.0)	497	(2.8)	625	(2.8)
B-S-J-Z (China)	562	(2.8)	87	(1.8)	449	(4.5)	565	(3.2)	670	(3.6)
Canada	520	(1.9)	103	(1.0)	383	(2.8)	523	(2.1)	650	(2.4)
Chile	450	(2.8)	93	(1.4)	327	(3.7)	452	(3.3)	571	(3.2)
Chinese Taipei	506	(3.0)	104	(1.7)	366	(4.2)	512	(3.4)	636	(4.0)
Colombia	413	(3.3)	89	(1.6)	301	(3.7)	408	(4.0)	532	(4.1)
Croatia	478	(2.7)	90	(1.7)	360	(4.3)	480	(3.0)	594	(3.3)
Czech Republic	488	(2.8)	101	(1.7)	354	(4.9)	490	(3.1)	618	(3.4)
Denmark	497	(2.0)	96	(1.2)	371	(3.4)	500	(2.4)	619	(2.9)
England	499	(3.2)	104	(1.7)	363	(4.9)	503	(3.5)	631	(3.6)
Estonia	526	(1.9)	94	(1.4)	403	(3.2)	526	(2.8)	648	(3.3)
Finland	518	(2.4)	103	(1.4)	378	(4.1)	526	(2.9)	645	(2.9)
France	490	(2.5)	105	(1.6)	347	(3.5)	496	(3.3)	623	(3.7)
Germany	494	(3.0)	108	(1.6)	346	(4.5)	500	(3.9)	632	(3.8)
Greece	457	(3.7)	100	(1.7)	322	(5.8)	461	(4.1)	586	(4.0)
Hong Kong (China)	529	(2.9)	102	(1.8)	392	(5.7)	538	(3.0)	653	(2.6)
Hungary	479	(2.4)	99	(1.5)	344	(3.5)	483	(3.4)	606	(3.4)
Iceland	480	(1.8)	104	(1.5)	342	(3.4)	482	(2.8)	615	(3.5)
Israel	469	(3.8)	125	(2.1)	293	(6.7)	476	(5.2)	627	(3.7)
Italy	478	(2.6)	98	(1.9)	345	(5.5)	483	(3.0)	601	(3.3)
Japan	505	(2.8)	101	(1.8)	369	(5.2)	510	(3.4)	632	(3.6)
Korea	522	(3.0)	103	(1.8)	382	(6.3)	530	(3.1)	648	(3.7)
Latvia	482	(1.7)	90	(1.0)	364	(3.1)	484	(2.4)	598	(2.8)
Lithuania	475	(1.7)	98	(1.0)	343	(3.2)	479	(2.0)	600	(2.3)

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Luxembourg	470	(1.2)	111	(1.1)	321	(2.5)	472	(2.1)	615	(2.9)
Macao (China)	529	(1.6)	92	(1.1)	408	(2.8)	533	(2.0)	644	(2.7)
Mexico	417	(2.8)	84	(1.6)	311	(3.3)	416	(2.9)	527	(4.4)
New Zealand	506	(2.1)	108	(1.6)	359	(3.9)	512	(2.7)	641	(2.7)
Northern Ireland	495	(4.2)	99	(2.2)	361	(6.2)	500	(5.0)	619	(5.5)
Norway	498	(2.3)	108	(1.4)	351	(4.2)	505	(2.9)	635	(2.9)
Poland	514	(2.8)	99	(1.7)	383	(3.6)	517	(3.3)	640	(4.0)
Portugal	489	(2.6)	99	(1.4)	353	(4.4)	496	(3.1)	612	(2.8)
Republic of Ireland	510	(2.4)	93	(1.1)	387	(3.6)	513	(2.6)	628	(3.2)
Russian Federation	480	(3.2)	95	(1.8)	354	(5.3)	483	(3.4)	601	(3.6)
Scotland	499	(3.2)	100	(2.6)	369	(5.4)	499	(3.6)	626	(5.6)
Singapore	548	(1.5)	109	(1.1)	396	(3.7)	558	(1.9)	682	(2.2)
Slovak Republic	458	(2.5)	104	(1.6)	321	(4.1)	458	(2.9)	593	(3.4)
Slovenia	496	(1.2)	95	(1.2)	370	(3.2)	500	(1.8)	615	(2.5)
Sweden	504	(3.1)	107	(1.5)	359	(5.1)	510	(3.5)	639	(3.4)
Switzerland	483	(3.2)	105	(1.5)	342	(4.4)	487	(4.0)	618	(3.7)
Turkey	474	(2.2)	88	(1.6)	358	(3.5)	474	(2.4)	588	(3.6)
United Kingdom	498	(2.7)	103	(1.4)	363	(4.0)	501	(3.0)	629	(3.2)
United States	501	(3.7)	110	(1.5)	353	(5.3)	505	(4.6)	641	(4.4)
Wales	479	(4.2)	97	(1.5)	352	(6.0)	479	(4.6)	603	(5.1)
OECD Average	487	(0.4)	101	(0.2)	351	(0.7)	490	(0.5)	616	(0.6)

Source: PISA 2018 database

Table B1.4 Mean score and variation in the cognitive process subscale of reading: 'evaluate and reflect'

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Australia	513	(2.1)	117	(1.2)	357	(3.3)	517	(2.6)	660	(2.6)
Belarus	473	(2.7)	93	(1.5)	349	(4.0)	475	(3.0)	592	(4.1)
Belgium	497	(2.8)	110	(1.6)	347	(5.0)	504	(3.4)	634	(3.2)
B-S-J-Z (China)	565	(3.1)	93	(2.1)	443	(5.1)	570	(3.5)	681	(3.9)
Canada	527	(2.2)	108	(1.4)	384	(3.6)	533	(2.6)	662	(3.2)
Chile	456	(3.4)	100	(1.5)	324	(4.0)	456	(3.9)	586	(3.9)
Chinese Taipei	504	(3.1)	104	(1.8)	365	(4.8)	509	(3.6)	636	(4.2)
Colombia	417	(3.7)	98	(1.8)	294	(4.1)	411	(4.5)	550	(5.1)
Croatia	474	(2.9)	95	(1.8)	349	(4.6)	474	(3.4)	597	(3.6)
Czech Republic	489	(2.8)	100	(1.9)	358	(4.9)	490	(3.2)	620	(3.5)
Denmark	505	(2.1)	93	(1.3)	381	(4.0)	508	(2.5)	622	(3.0)
England	513	(3.4)	108	(1.9)	370	(5.1)	516	(3.8)	651	(4.8)
Estonia	521	(2.4)	96	(1.4)	396	(3.4)	523	(2.9)	644	(3.4)
Finland	517	(2.5)	102	(1.6)	381	(3.8)	522	(3.0)	645	(3.3)
France	491	(2.9)	106	(1.8)	348	(4.1)	496	(3.5)	625	(4.2)
Germany	497	(3.3)	110	(2.0)	346	(5.0)	502	(4.4)	635	(3.6)
Greece	462	(4.0)	104	(2.0)	322	(6.1)	465	(4.4)	594	(4.2)
Hong Kong (China)	532	(3.3)	101	(1.7)	393	(5.4)	541	(3.2)	654	(4.0)
Hungary	477	(2.6)	101	(1.5)	343	(3.6)	479	(4.0)	609	(4.3)
Iceland	475	(2.0)	101	(1.3)	337	(3.3)	478	(2.9)	607	(3.0)
Israel	481	(4.2)	128	(2.1)	302	(6.5)	491	(5.3)	642	(4.1)
Italy	482	(2.7)	103	(2.0)	344	(5.0)	487	(3.3)	612	(3.8)
Japan	502	(3.0)	108	(1.9)	357	(5.1)	506	(3.6)	640	(4.0)
Korea	522	(3.5)	109	(2.1)	373	(6.4)	530	(3.6)	655	(4.7)
Latvia	477	(1.7)	91	(1.5)	357	(3.2)	478	(2.2)	595	(3.3)
Lithuania	474	(2.0)	99	(1.3)	344	(3.1)	475	(2.8)	603	(3.2)
Luxembourg	468	(1.4)	115	(1.5)	315	(3.2)	469	(2.1)	620	(3.4)

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Macao (China)	534	(1.6)	95	(1.4)	407	(3.5)	539	(2.0)	652	(2.8)
Mexico	426	(3.1)	89	(2.0)	314	(3.6)	423	(3.4)	542	(5.2)
Netherlands	476	(3.7)	123	(3.1)	308	(7.8)	486	(4.2)	628	(4.2)
New Zealand	509	(2.6)	113	(1.4)	355	(4.5)	514	(3.1)	651	(3.0)
Northern Ireland	504	(5.8)	102	(2.4)	367	(7.7)	509	(6.8)	633	(7.2)
Norway	502	(2.6)	106	(1.5)	359	(5.0)	507	(3.0)	637	(3.0)
Poland	514	(2.9)	99	(1.9)	384	(4.1)	517	(3.6)	640	(4.5)
Portugal	494	(2.6)	102	(2.0)	356	(4.8)	499	(3.1)	623	(4.3)
Republic of Ireland	519	(2.5)	97	(1.2)	391	(3.5)	520	(3.0)	645	(3.1)
Russian Federation	479	(3.3)	95	(1.8)	356	(4.9)	480	(3.5)	602	(4.4)
Scotland	503	(4.7)	107	(3.9)	364	(7.4)	504	(4.9)	639	(7.9)
Singapore	561	(2.1)	117	(1.4)	400	(4.1)	570	(2.4)	705	(2.7)
Slovak Republic	457	(2.6)	103	(2.0)	322	(4.8)	459	(3.0)	591	(3.9)
Slovenia	494	(1.5)	96	(1.6)	367	(3.5)	497	(2.0)	618	(3.6)
Sweden	512	(3.4)	111	(1.8)	362	(5.3)	516	(4.0)	653	(3.6)
Switzerland	482	(3.4)	106	(1.7)	340	(4.5)	485	(4.3)	621	(4.5)
Turkey	475	(2.5)	96	(1.9)	348	(4.2)	475	(2.9)	600	(4.5)
United Kingdom	511	(2.9)	108	(1.8)	369	(4.4)	513	(3.2)	648	(4.2)
United States	511	(4.2)	114	(2.0)	355	(5.9)	516	(4.6)	656	(4.9)
Wales	492	(4.5)	100	(2.1)	361	(5.6)	493	(4.8)	620	(5.5)
OECD Average	489	(0.5)	105	(0.3)	349	(0.8)	493	(0.6)	623	(0.6)

Source: PISA 2018 database

Table B1.5 Mean score and variation in the text structure subscale of reading: 'single'

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Australia	502	(1.8)	113	(1.1)	350	(2.8)	507	(2.1)	644	(2.3)
Austria	478	(2.7)	104	(1.4)	338	(3.5)	483	(3.5)	611	(3.4)
Belarus	474	(2.5)	93	(1.4)	349	(3.6)	478	(3.3)	591	(3.4)
Belgium	491	(2.4)	105	(1.4)	348	(3.9)	497	(2.9)	624	(2.6)
B-S-J-Z (China)	556	(3.0)	90	(1.8)	440	(4.9)	560	(3.2)	669	(3.6)
Canada	521	(1.9)	103	(1.1)	385	(2.9)	524	(2.1)	650	(2.8)
Chinese Taipei	501	(2.9)	105	(1.7)	360	(4.0)	507	(3.4)	632	(4.2)
Colombia	411	(3.4)	92	(1.5)	296	(3.6)	408	(4.0)	534	(4.5)
Croatia	475	(2.7)	90	(1.8)	356	(4.6)	477	(3.0)	591	(3.3)
Czech Republic	484	(2.8)	101	(1.9)	348	(5.2)	487	(3.0)	613	(3.0)
Denmark	496	(2.0)	96	(1.2)	370	(3.6)	500	(2.6)	618	(3.3)
England	500	(3.2)	105	(1.9)	361	(5.2)	503	(3.4)	632	(4.3)
Estonia	522	(1.9)	92	(1.3)	402	(3.6)	523	(2.3)	640	(3.3)
Finland	518	(2.5)	103	(1.4)	378	(4.1)	525	(2.9)	646	(3.3)
France	486	(2.6)	109	(1.6)	338	(4.0)	493	(3.1)	623	(3.6)
Germany	494	(3.2)	111	(1.7)	343	(5.0)	501	(4.0)	633	(3.6)
Greece	459	(3.8)	103	(1.9)	320	(6.5)	464	(4.1)	589	(3.9)
Hong Kong (China)	529	(3.0)	99	(1.8)	394	(5.9)	539	(3.4)	649	(3.2)
Hungary	474	(2.3)	97	(1.5)	341	(3.4)	479	(3.1)	596	(3.5)
Iceland	479	(1.8)	106	(1.3)	337	(4.1)	482	(2.7)	616	(3.1)
Israel	469	(3.9)	128	(2.1)	290	(6.9)	480	(5.1)	630	(3.4)
Italy	474	(2.6)	99	(1.8)	341	(5.0)	480	(2.8)	598	(3.3)
Japan	499	(2.8)	101	(1.9)	363	(5.0)	504	(3.1)	626	(3.5)
Korea	518	(3.1)	106	(1.8)	374	(6.1)	527	(3.3)	646	(3.9)
Latvia	479	(1.6)	89	(1.1)	361	(2.8)	481	(2.3)	592	(2.5)
Lithuania	474	(1.7)	99	(1.1)	340	(3.2)	479	(2.2)	599	(2.3)
Luxembourg	464	(1.2)	113	(1.2)	312	(2.5)	467	(2.0)	612	(3.6)

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Macao (China)	529	(1.3)	92	(1.1)	408	(3.1)	534	(2.0)	644	(3.0)
Mexico	419	(2.9)	86	(1.8)	311	(3.5)	417	(3.1)	531	(4.5)
Netherlands	488	(2.8)	106	(1.9)	346	(5.4)	491	(3.6)	624	(3.2)
New Zealand	504	(2.2)	110	(1.3)	353	(4.3)	510	(2.6)	641	(3.0)
Northern Ireland	495	(4.7)	98	(2.3)	361	(5.9)	500	(5.7)	619	(6.9)
Norway	498	(2.4)	109	(1.3)	350	(5.1)	505	(2.7)	633	(3.0)
Poland	512	(2.8)	100	(1.7)	380	(3.8)	516	(3.3)	638	(4.4)
Portugal	487	(2.6)	101	(1.5)	349	(4.3)	495	(3.1)	613	(3.2)
Republic of Ireland	513	(2.5)	95	(1.1)	387	(4.0)	516	(2.6)	633	(3.5)
Russian Federation	477	(3.4)	97	(2.1)	348	(5.8)	479	(3.8)	600	(4.0)
Scotland	497	(3.9)	101	(2.6)	366	(5.2)	497	(4.2)	626	(6.1)
Singapore	554	(1.5)	111	(1.1)	398	(3.5)	564	(2.1)	689	(2.1)
Slovak Republic	453	(2.3)	104	(1.5)	316	(3.9)	454	(2.9)	587	(3.1)
Slovenia	495	(1.2)	94	(1.3)	369	(2.9)	500	(1.8)	612	(2.9)
Sweden	503	(3.1)	107	(1.5)	358	(5.3)	509	(3.4)	636	(3.4)
Switzerland	477	(3.2)	107	(1.7)	331	(5.0)	481	(3.9)	613	(4.1)
Turkey	473	(2.3)	88	(1.5)	357	(4.1)	474	(2.5)	587	(3.4)
United Kingdom	498	(2.7)	104	(1.6)	361	(4.4)	502	(2.9)	630	(3.7)
United States	502	(3.7)	112	(1.6)	351	(5.7)	507	(4.6)	644	(4.2)
Wales	480	(4.2)	97	(1.6)	353	(6.1)	481	(4.6)	605	(4.9)
OECD Average	485	(0.4)	102	(0.3)	348	(0.7)	489	(0.5)	615	(0.6)

Source: PISA 2018 database

Table B1.6 Mean score and variation in the text structure subscale of reading: 'multiple'

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Australia	507	(1.8)	110	(1.0)	360	(2.8)	512	(2.1)	647	(3.0)
Austria	484	(2.7)	100	(1.3)	350	(3.9)	486	(3.7)	614	(3.2)
Belarus	478	(2.4)	92	(1.4)	355	(3.7)	480	(2.9)	597	(3.0)
Belgium	500	(2.4)	101	(1.3)	365	(3.9)	504	(2.9)	629	(2.7)
B-S-J-Z (China)	564	(2.8)	87	(1.9)	450	(4.3)	568	(2.9)	673	(4.1)
Canada	522	(2.0)	102	(1.0)	387	(2.8)	526	(2.5)	650	(2.2)
Chile	451	(2.8)	95	(1.5)	326	(3.7)	451	(3.3)	574	(3.2)
Chinese Taipei	506	(2.9)	103	(1.6)	369	(4.1)	512	(3.2)	636	(3.7)
Colombia	412	(3.4)	91	(1.6)	297	(3.8)	406	(4.1)	535	(4.7)
Croatia	478	(2.8)	92	(1.7)	357	(4.2)	480	(3.1)	597	(3.4)
Czech Republic	494	(2.7)	100	(1.8)	362	(4.6)	496	(3.2)	625	(3.1)
Denmark	503	(1.8)	93	(1.1)	380	(3.0)	506	(2.4)	620	(2.6)
England	509	(3.2)	103	(1.7)	374	(5.7)	512	(3.3)	640	(4.7)
Estonia	529	(1.9)	93	(1.2)	407	(3.4)	529	(2.5)	649	(2.9)
Finland	520	(2.4)	100	(1.2)	385	(3.9)	526	(2.9)	644	(2.8)
France	495	(2.5)	104	(1.6)	355	(4.1)	500	(3.1)	628	(3.4)
Germany	497	(3.2)	107	(1.5)	353	(4.6)	502	(3.9)	633	(3.7)
Greece	458	(3.6)	100	(1.7)	324	(5.5)	460	(4.1)	587	(3.8)
Hong Kong (China)	529	(2.9)	103	(1.6)	389	(5.9)	538	(3.0)	654	(3.0)
Hungary	480	(2.6)	101	(1.4)	344	(3.5)	482	(3.3)	611	(3.7)
Iceland	479	(1.7)	99	(1.2)	348	(3.8)	480	(2.3)	608	(3.2)
Israel	471	(4.0)	127	(1.9)	294	(6.6)	478	(5.3)	634	(4.1)
Italy	481	(2.6)	100	(1.9)	347	(4.9)	486	(3.0)	607	(3.8)
Japan	506	(2.8)	102	(1.8)	370	(4.7)	510	(3.1)	636	(3.6)
Korea	525	(3.1)	104	(1.9)	385	(5.5)	533	(3.1)	653	(4.0)
Latvia	483	(1.7)	92	(1.1)	362	(2.7)	484	(2.3)	602	(3.6)
Lithuania	475	(1.7)	98	(1.0)	344	(3.0)	477	(2.3)	600	(2.7)

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Luxembourg	475	(1.4)	110	(1.1)	329	(2.5)	476	(2.2)	618	(3.2)
Macao (China)	530	(1.5)	91	(1.3)	411	(3.0)	535	(2.2)	645	(3.1)
Mexico	419	(2.8)	84	(1.7)	312	(3.9)	417	(3.0)	530	(4.7)
Netherlands	495	(2.5)	100	(1.7)	364	(4.0)	496	(3.0)	626	(3.3)
New Zealand	509	(2.1)	106	(1.3)	365	(4.1)	515	(2.7)	643	(2.6)
Northern Ireland	502	(4.5)	99	(2.4)	368	(5.6)	507	(5.4)	627	(6.2)
Norway	502	(2.3)	105	(1.3)	360	(4.3)	508	(3.0)	635	(2.9)
Poland	514	(2.7)	98	(1.7)	386	(3.8)	517	(3.3)	638	(4.5)
Portugal	494	(2.5)	99	(1.4)	360	(3.8)	499	(3.1)	617	(3.1)
Republic of Ireland	517	(2.4)	94	(1.0)	391	(3.7)	519	(2.9)	637	(3.3)
Russian Federation	482	(3.1)	95	(1.8)	358	(5.4)	484	(3.6)	604	(3.6)
Scotland	506	(3.1)	97	(2.1)	380	(4.9)	507	(3.9)	631	(5.5)
Singapore	553	(1.7)	109	(1.1)	402	(3.9)	562	(2.4)	686	(2.1)
Slovak Republic	465	(2.2)	101	(1.6)	334	(4.3)	466	(2.8)	596	(3.8)
Slovenia	497	(1.5)	96	(1.2)	372	(3.3)	499	(2.0)	619	(3.6)
Sweden	511	(3.1)	109	(1.6)	364	(5.4)	517	(3.7)	649	(3.1)
Switzerland	489	(3.2)	103	(1.6)	350	(3.8)	492	(3.8)	621	(4.0)
Turkey	471	(2.4)	91	(1.7)	352	(3.8)	471	(2.8)	589	(4.0)
United Kingdom	508	(2.7)	102	(1.4)	373	(4.6)	510	(2.9)	638	(4.0)
United States	505	(3.7)	110	(1.5)	357	(5.3)	509	(4.4)	645	(4.7)
Wales	489	(3.8)	98	(1.6)	362	(5.2)	490	(4.6)	615	(4.6)
OECD Average	490	(0.4)	101	(0.2)	356	(0.7)	493	(0.5)	619	(0.6)

Source: PISA 2018 database

Table B1.7 Percentage of pupils at each proficiency level in reading

Country	Below Level 1c (less than 189.33 score points)		Level 1c (from 189.33 to less than 262.04 score points)		Level 1b (from 262.04 to less than 334.75 score points)		Level 1a (from 334.75 to less than 407.47 score points)		Level 2 (from 407.47 to less than 480.18 score points)		Level 3 (from 480.18 to less than 552.89 score points)		Level 4 (from 552.89 to less than 625.61 score points)		Level 5 (from 625.61 to less than 698.32 score points)		Level 6 (above 698.32 score points)	
-	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Australia	0.1	(0.1)	1.4	(0.2)	5.6	(0.3)	12.5	(0.4)	21.1	(0.5)	25.4	(0.5)	20.9	(0.5)	10.3	(0.4)	2.7	(0.2)
Austria	0.0	(0.0)	0.9	(0.2)	6.4	(0.6)	16.3	(0.8)	23.5	(0.8)	26.2	(0.9)	19.3	(0.8)	6.7	(0.5)	0.7	(0.1)
Belarus	0.0	(0.0)	0.8	(0.2)	5.8	(0.5)	16.8	(0.8)	28.7	(0.8)	28.0	(1.0)	16.0	(0.7)	3.7	(0.4)	0.3	(0.1)
Belgium	0.1	(0.1)	1.2	(0.2)	6.0	(0.4)	14.0	(0.6)	22.4	(0.7)	26.5	(0.7)	20.4	(0.7)	8.3	(0.5)	1.3	(0.2)
B-S-J-Z (China)	0.0	(0.0)	0.1	(0.1)	0.7	(0.2)	4.3	(0.5)	14.3	(0.8)	27.9	(1.0)	30.8	(1.0)	17.5	(0.9)	4.2	(0.6)
Canada	0.0	(0.0)	0.7	(0.1)	3.1	(0.2)	10.0	(0.4)	20.1	(0.6)	27.2	(0.5)	24.0	(0.5)	12.2	(0.5)	2.8	(0.2)
Chile	0.1	(0.1)	1.7	(0.2)	8.9	(0.6)	21.0	(0.9)	29.5	(0.9)	24.4	(0.9)	11.8	(0.6)	2.4	(0.3)	0.2	(0.1)
Chinese Taipei	0.1	(0.1)	1.2	(0.2)	4.5	(0.4)	12.0	(0.6)	21.8	(0.7)	27.4	(0.8)	22.0	(0.9)	9.3	(0.7)	1.6	(0.3)
Colombia	0.2	(0.1)	3.6	(0.4)	15.8	(0.9)	30.3	(1.0)	27.7	(1.0)	15.8	(0.9)	5.7	(0.5)	0.9	(0.2)	0.0	(0.0)
Croatia	0.0	(0.0)	0.7	(0.2)	5.0	(0.5)	15.9	(0.8)	28.3	(0.9)	29.0	(1.0)	16.4	(0.8)	4.3	(0.4)	0.4	(0.1)
Czech Republic	0.1	(0.1)	0.7	(0.2)	5.0	(0.5)	15.0	(0.8)	25.0	(0.9)	26.9	(0.9)	19.1	(0.8)	7.2	(0.5)	1.1	(0.2)
Denmark	0.0	(0.0)	0.5	(0.1)	3.5	(0.3)	11.9	(0.5)	23.9	(0.8)	30.1	(0.9)	21.6	(0.8)	7.3	(0.5)	1.1	(0.2)
England	0.0	(0.0)	0.8	(0.2)	4.2	(0.5)	12.1	(0.8)	22.6	(0.8)	27.1	(0.8)	21.2	(1.0)	9.8	(0.7)	2.1	(0.3)

Country	Below Level 1c (less than 189.33 score points)		Level 1c (from 189.33 to less than 262.04 score points)		Level 1b (from 262.04 to less than 334.75 score points)		Level 1a (from 334.75 to less than 407.47 score points)		Level 2 (from 407.47 to less than 480.18 score points)		Level 3 (from 480.18 to less than 552.89 score points)		Level 4 (from 552.89 to less than 625.61 score points)		Level 5 (from 625.61 to less than 698.32 score points)		Level 6 (above 698.32 score points)	
-	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Estonia	0.0	c	0.3	(0.1)	2.1	(0.2)	8.7	(0.5)	21.2	(0.9)	29.9	(0.9)	24.0	(0.8)	11.1	(0.6)	2.8	(0.3)
Finland	0.0	(0.0)	0.8	(0.2)	3.3	(0.4)	9.4	(0.6)	19.2	(0.7)	27.6	(0.8)	25.4	(0.8)	11.9	(0.7)	2.4	(0.3)
France	0.0	(0.0)	1.1	(0.2)	5.7	(0.4)	14.0	(0.7)	22.8	(0.8)	26.6	(0.8)	20.5	(0.7)	8.1	(0.6)	1.1	(0.2)
Germany	0.1	(0.1)	1.3	(0.3)	5.7	(0.5)	13.6	(0.8)	21.1	(0.8)	25.4	(0.8)	21.5	(0.9)	9.5	(0.6)	1.8	(0.2)
Greece	0.1	(0.1)	2.1	(0.3)	9.3	(0.7)	19.0	(0.9)	27.3	(0.8)	25.2	(1.0)	13.3	(0.8)	3.3	(0.4)	0.3	(0.1)
Hong Kong (China)	0.1	(0.1)	0.9	(0.2)	3.5	(0.4)	8.1	(0.6)	17.8	(0.7)	27.7	(0.7)	27.1	(0.8)	12.5	(0.6)	2.3	(0.3)
Hungary	0.0	(0.1)	1.2	(0.2)	7.0	(0.6)	17.0	(0.8)	25.2	(0.9)	26.3	(0.9)	17.5	(0.8)	5.2	(0.5)	0.5	(0.1)
Iceland	0.1	(0.1)	2.3	(0.3)	8.0	(0.7)	15.9	(0.8)	24.6	(0.9)	25.1	(0.8)	16.9	(0.7)	6.2	(0.6)	0.9	(0.2)
Israel	0.7	(0.2)	5.0	(0.5)	10.4	(0.7)	15.0	(0.9)	19.4	(0.7)	21.6	(0.8)	17.5	(0.8)	8.4	(0.6)	2.0	(0.3)
Italy	0.1	(0.1)	1.7	(0.3)	6.7	(0.6)	14.8	(0.7)	26.3	(0.9)	28.2	(0.9)	16.9	(0.7)	4.9	(0.4)	0.5	(0.1)
Japan	0.1	(0.0)	0.7	(0.2)	4.1	(0.4)	12.0	(0.7)	22.5	(0.9)	28.6	(1.0)	21.9	(0.8)	8.6	(0.6)	1.7	(0.3)
Korea	0.1	(0.1)	1.1	(0.2)	4.3	(0.4)	9.6	(0.7)	19.6	(0.7)	27.6	(0.8)	24.6	(0.8)	10.8	(0.6)	2.3	(0.4)
Latvia	0.0	(0.0)	0.6	(0.1)	5.2	(0.4)	16.6	(0.6)	27.4	(0.8)	28.8	(0.8)	16.6	(0.7)	4.4	(0.4)	0.4	(0.1)
Lithuania	0.0	(0.0)	1.0	(0.2)	6.3	(0.4)	17.0	(0.6)	26.1	(0.8)	27.7	(0.7)	16.9	(0.6)	4.5	(0.4)	0.4	(0.1)

Country	Below Level 1c (less than 189.33 score points)		Level 1c (from 189.33 to less than 262.04 score points)		Level 1b (from 262.04 to less than 334.75 score points)		Level 1a (from 334.75 to less than 407.47 score points)		Level 2 (from 407.47 to less than 480.18 score points)		Level 3 (from 480.18 to less than 552.89 score points)		Level 4 (from 552.89 to less than 625.61 score points)		Level 5 (from 625.61 to less than 698.32 score points)		Level 6 (above 698.32 score points)	
-	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Luxembourg	0.2	(0.1)	2.4	(0.2)	9.2	(0.4)	17.6	(0.6)	23.7	(0.7)	23.5	(0.7)	15.9	(0.6)	6.4	(0.4)	1.3	(0.2)
Macao (China)	0.0	(0.0)	0.3	(0.1)	2.2	(0.2)	8.2	(0.6)	19.4	(0.8)	29.8	(0.8)	26.1	(0.7)	11.7	(0.6)	2.1	(0.3)
Mexico	0.0	(0.1)	2.5	(0.4)	13.1	(0.8)	29.1	(1.1)	31.7	(1.0)	17.5	(0.9)	5.3	(0.6)	0.7	(0.2)	0.0	(0.0)
Netherlands	0.1	(0.1)	1.3	(0.2)	7.0	(0.6)	15.6	(0.7)	23.7	(0.8)	24.3	(1.0)	18.8	(0.8)	7.9	(0.6)	1.2	(0.2)
New Zealand	0.1	(0.1)	1.0	(0.2)	5.2	(0.5)	12.7	(0.6)	20.8	(0.7)	24.6	(0.7)	22.5	(0.7)	10.7	(0.6)	2.4	(0.3)
Northern Ireland	0.0	(0.1)	0.7	(0.2)	4.5	(0.7)	12.6	(1.0)	22.1	(1.4)	28.6	(1.3)	21.9	(1.4)	8.1	(0.9)	1.3	(0.4)
Norway	0.1	(0.1)	1.7	(0.2)	5.6	(0.4)	11.9	(0.6)	21.5	(0.7)	26.4	(0.9)	21.6	(0.8)	9.6	(0.6)	1.6	(0.2)
Poland	0.0	(0.0)	0.5	(0.1)	3.3	(0.3)	10.8	(0.6)	22.4	(0.8)	27.7	(0.8)	23.0	(0.8)	10.1	(0.7)	2.1	(0.3)
Portugal	0.0	(0.0)	0.9	(0.2)	5.0	(0.5)	14.3	(0.7)	23.3	(0.7)	28.2	(0.8)	21.0	(0.9)	6.5	(0.6)	0.8	(0.2)
Republic of Ireland	0.0	(0.0)	0.2	(0.1)	2.1	(0.3)	9.5	(0.6)	21.7	(0.8)	30.3	(0.9)	24.1	(0.8)	10.3	(0.6)	1.8	(0.3)
Russian Federation	0.0	(0.0)	1.0	(0.2)	5.6	(0.6)	15.5	(0.9)	28.1	(0.8)	28.0	(0.8)	16.4	(0.7)	4.8	(0.5)	0.6	(0.1)
Scotland	0.0	(0.0)	0.5	(0.2)	3.2	(0.4)	11.8	(0.8)	25.3	(1.1)	28.2	(1.0)	20.7	(0.9)	8.7	(0.8)	1.7	(0.4)
Singapore	0.0	(0.0)	0.5	(0.1)	3.0	(0.3)	7.7	(0.4)	14.2	(0.5)	22.3	(0.7)	26.4	(0.6)	18.5	(0.7)	7.3	(0.4)

Country	Below Level 1c (less than 189.33 score points)		Level 1c (from 189.33 to less than 262.04 score points)		Level 1b (from 262.04 to less than 334.75 score points)		Level 1a (from 334.75 to less than 407.47 score points)		Level 2 (from 407.47 to less than 480.18 score points)		Level 3 (from 480.18 to less than 552.89 score points)		Level 4 (from 552.89 to less than 625.61 score points)		Level 5 (from 625.61 to less than 698.32 score points)		Level 6 (above 698.32 score points)	
-	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Slovak Republic	0.1	(0.1)	2.3	(0.3)	9.2	(0.7)	19.8	(0.8)	26.9	(0.9)	23.5	(0.9)	13.6	(0.7)	4.1	(0.4)	0.5	(0.2)
Slovenia	0.0	(0.1)	0.6	(0.2)	4.3	(0.4)	12.9	(0.5)	24.5	(0.8)	29.5	(0.9)	20.3	(0.7)	6.8	(0.5)	1.0	(0.2)
Sweden	0.2	(0.1)	1.5	(0.2)	5.1	(0.5)	11.6	(0.7)	20.6	(0.8)	25.5	(0.8)	22.3	(0.8)	10.9	(0.7)	2.4	(0.3)
Switzerland	0.1	(0.1)	1.3	(0.3)	7.1	(0.6)	15.1	(0.7)	23.4	(0.9)	26.3	(0.8)	18.5	(0.8)	6.9	(0.6)	1.2	(0.2)
Turkey	0.0	(0.0)	0.7	(0.2)	6.3	(0.6)	19.1	(0.7)	30.2	(0.9)	26.9	(1.0)	13.5	(0.6)	3.1	(0.5)	0.2	(0.1)
Ukraine	0.2	(0.1)	1.8	(0.3)	7.2	(0.7)	16.7	(0.9)	27.7	(0.8)	28.5	(1.0)	14.5	(0.8)	3.2	(0.4)	0.2	(0.1)
United Kingdom	0.0	(0.0)	0.8	(0.2)	4.2	(0.4)	12.3	(0.7)	23.0	(0.7)	27.2	(0.7)	21.0	(0.8)	9.5	(0.6)	2.0	(0.2)
United States	0.1	(0.1)	1.1	(0.2)	5.4	(0.5)	12.7	(0.8)	21.1	(0.8)	24.7	(0.8)	21.4	(0.8)	10.7	(0.7)	2.8	(0.4)
Wales	0.1	(0.1)	1.1	(0.3)	5.2	(0.6)	15.6	(1.1)	26.5	(0.9)	26.7	(1.0)	17.8	(1.0)	5.9	(0.7)	1.1	(0.2)
OECD Average	0.1	(0.0)	1.4	(0.0)	6.2	(0.1)	15.0	(0.1)	23.7	(0.1)	26.0	(0.1)	18.9	(0.1)	7.4	(0.1)	1.3	(0.0)

Notes:

c: There are too few observations or no observation to provide reliable estimates (i.e. there are fewer than 30 pupils or fewer than 5 schools with valid data).

Source: PISA 2018 database

Table B1.8 Reading performance by gender

Country	Boys		Girls		Gender differences (girls - boys)	
	Mean score		Mean score		Mean score	
	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
Australia	487	(2.2)	519	(2.0)	**31**	(2.6)
Austria	471	(3.7)	499	(3.7)	**28**	(5.2)
Belarus	463	(2.8)	486	(2.8)	**23**	(2.9)
Belgium	482	(2.9)	504	(2.8)	**22**	(3.2)
B-S-J-Z (China)	549	(3.1)	562	(2.8)	**13**	(2.4)
Canada	506	(2.1)	535	(2.0)	**29**	(2.1)
Chile	442	(3.4)	462	(2.9)	**20**	(3.6)
Chinese Taipei	492	(4.1)	514	(3.9)	**22**	(5.7)
Colombia	407	(4.0)	417	(3.3)	**10**	(3.3)
Croatia	462	(3.3)	495	(2.9)	**33**	(3.7)
Czech Republic	474	(3.1)	507	(2.9)	**33**	(3.1)
Denmark	486	(2.3)	516	(2.3)	**29**	(3.0)
England	495	(3.8)	515	(3.6)	**20**	(4.2)
Estonia	508	(2.4)	538	(2.2)	**31**	(2.6)
Finland	495	(2.9)	546	(2.3)	**52**	(2.7)
France	480	(2.8)	505	(2.8)	**25**	(3.1)
Germany	486	(3.4)	512	(3.2)	**26**	(3.0)
Greece	437	(4.2)	479	(3.7)	**42**	(3.5)
Hong Kong (China)	507	(3.5)	542	(2.8)	**35**	(3.3)
Hungary	463	(2.8)	489	(3.2)	**26**	(4.1)
Iceland	454	(2.5)	494	(2.6)	**41**	(3.8)
Israel	445	(5.6)	493	(3.7)	**48**	(5.8)
Italy	464	(3.1)	489	(2.7)	**25**	(3.1)
Japan	493	(3.8)	514	(3.0)	**20**	(4.3)
Korea	503	(4.0)	526	(3.6)	**24**	(4.9)
Latvia	462	(2.2)	495	(2.0)	**33**	(2.7)

Country	Boys		Girls		Gender differences (girls - boys)	
	Mean score		Mean score		Mean score	
	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
Lithuania	457	(1.8)	496	(1.8)	**39**	(2.2)
Luxembourg	456	(1.5)	485	(1.6)	**29**	(2.2)
Macao (China)	514	(1.9)	536	(1.8)	**22**	(2.8)
Mexico	415	(3.1)	426	(3.0)	**11**	(2.5)
Netherlands	470	(3.5)	499	(2.6)	**29**	(3.2)
New Zealand	491	(2.7)	520	(2.7)	**29**	(3.7)
Northern Ireland	482	(6.2)	519	(4.5)	**36**	(7.3)
Norway	476	(2.6)	523	(2.6)	**47**	(2.9)
Poland	495	(3.0)	528	(2.9)	**33**	(2.6)
Portugal	480	(2.8)	504	(2.9)	**24**	(2.8)
Republic of Ireland	506	(3.0)	530	(2.5)	**23**	(3.3)
Russian Federation	466	(3.2)	491	(3.3)	**25**	(2.2)
Scotland	497	(3.7)	511	(3.6)	**15**	(4.1)
Singapore	538	(2.0)	561	(1.9)	**23**	(2.3)
Slovak Republic	441	(2.7)	475	(3.0)	**34**	(3.4)
Slovenia	475	(1.7)	517	(1.9)	**42**	(2.6)
Sweden	489	(3.2)	523	(3.4)	**34**	(2.8)
Switzerland	469	(3.4)	500	(3.2)	**31**	(2.9)
Turkey	453	(3.0)	478	(2.7)	**25**	(3.8)
Ukraine	450	(4.2)	484	(3.6)	**33**	(3.9)
United Kingdom	494	(3.2)	514	(3.1)	**20**	(3.6)
United States	494	(4.2)	517	(3.6)	**24**	(3.5)
Wales	470	(4.3)	497	(4.3)	**26**	(3.4)
OECD Average	472	(0.5)	502	(0.5)	**30**	(0.5)

Bold font indicates a difference that was statistically significant.

Source: PISA 2018 database

Table B1.9 Socio-economic status and reading performance

Country	Reading performance		Socio-economic gradients				Reading performance, by socio-economic status (ESCS)									
							National quarter of ESCS									
	Score, unadjusted		Strength: Percentage of variance in reading performance explained by ESCS (R^2)		Slope: Score-point difference in reading performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter	
	Mean	S.E.	%	S.E.	dif.	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	dif.	S.E.
B-S-J-Z (China)	555	(2.7)	12.6	(1.3)	**29**	(1.8)	519	(3.9)	545	(3.2)	558	(3.3)	600	(4.6)	**82**	(5.7)
Singapore	549	(1.6)	13.2	(0.9)	**43**	(1.5)	495	(3.0)	535	(2.9)	570	(3.0)	599	(3.3)	**104**	(4.2)
Macao (China)	525	(1.2)	1.7	(0.4)	**13**	(1.6)	511	(2.6)	524	(3.1)	524	(3.2)	542	(3.1)	**31**	(4.3)
Hong Kong (China)	524	(2.7)	5.1	(1.1)	**21**	(2.2)	497	(3.9)	523	(3.6)	529	(3.7)	555	(4.9)	**59**	(6.1)
Estonia	523	(1.8)	6.2	(0.8)	**29**	(2.1)	497	(3.7)	509	(3.6)	531	(2.9)	558	(2.9)	**61**	(4.8)
Canada	520	(1.8)	6.7	(0.6)	**32**	(1.6)	485	(2.4)	512	(2.5)	539	(3.0)	553	(2.5)	**68**	(3.3)

Country	Reading performance		Socio-economic gradients				Reading performance, by socio-economic status (ESCS)									
							National quarter of ESCS									
	Score, unadjusted		Strength: Percentage of variance in reading performance explained by ESCS (R^2)		Slope: Score-point difference in reading performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter	
	Mean	S.E.	%	S.E.	dif.	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	dif.	S.E.
Finland	520	(2.3)	9.2	(1.0)	**38**	(2.2)	483	(3.2)	509	(3.3)	533	(4.1)	562	(3.6)	**79**	(4.7)
Republic of Ireland	518	(2.2)	10.7	(1.1)	**34**	(1.7)	482	(3.4)	511	(3.8)	527	(2.9)	557	(3.5)	**75**	(4.7)
Korea	514	(2.9)	8.0	(1.1)	**37**	(2.8)	477	(4.2)	503	(4.1)	525	(3.8)	552	(4.7)	**75**	(6.0)
Poland	512	(2.7)	11.6	(1.4)	**39**	(2.6)	469	(3.1)	504	(3.4)	518	(4.6)	560	(4.8)	**90**	(5.7)
Sweden	506	(3.0)	10.7	(1.2)	**39**	(2.2)	460	(4.4)	501	(4.6)	526	(4.1)	549	(4.3)	**89**	(6.2)
New Zealand	506	(2.0)	12.9	(1.0)	**39**	(1.6)	462	(3.6)	490	(3.2)	525	(3.2)	558	(3.4)	**96**	(4.9)
United States	505	(3.6)	12.0	(1.4)	**36**	(2.1)	460	(5.4)	488	(4.7)	517	(5.4)	558	(4.9)	**99**	(6.8)
England	505	(3.0)	9.8	(1.2)	**34**	(2.1)	471	(3.8)	495	(4.3)	517	(4.4)	553	(4.6)	**82**	(5.7)

Country	Reading performance		Socio-economic gradients				Reading performance, by socio-economic status (ESCS)									
							National quarter of ESCS									
	Score, unadjusted		Strength: Percentage of variance in reading performance explained by ESCS (R^2)		Slope: Score-point difference in reading performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter	
	Mean	S.E.	%	S.E.	dif.	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	dif.	S.E.
Vietnam	505	(3.6)	m	m	m	m	m	m	m	m	m	m	m	m	m	m
Scotland	504	(3.0)	8.3	(1.4)	**32**	(2.8)	472	(4.8)	492	(4.6)	515	(5.8)	544	(5.3)	**72**	(6.9)
United Kingdom	504	(2.6)	9.3	(1.0)	**33**	(1.8)	471	(3.1)	493	(3.5)	516	(3.9)	550	(4.0)	**80**	(4.7)
Japan	504	(2.7)	8.0	(1.2)	**38**	(2.8)	465	(4.5)	499	(3.8)	517	(3.6)	537	(3.8)	**72**	(5.9)
Australia	503	(1.6)	10.1	(0.6)	**38**	(1.2)	460	(2.6)	490	(2.5)	519	(3.0)	549	(2.4)	**89**	(2.9)
Chinese Taipei	503	(2.8)	11.4	(1.1)	**37**	(2.0)	461	(3.3)	492	(2.8)	510	(4.6)	550	(4.8)	**89**	(5.0)
Denmark	501	(1.8)	9.9	(0.9)	**38**	(1.8)	462	(3.0)	493	(3.3)	514	(3.4)	540	(2.8)	**78**	(3.8)
Northern Ireland	501	(4.0)	6.9	(1.1)	**29**	(2.6)	476	(4.8)	483	(6.3)	516	(7.1)	539	(6.6)	**62**	(6.8)

Country	Reading performance		Socio-economic gradients				Reading performance, by socio-economic status (ESCS)									
							National quarter of ESCS									
	Score, unadjusted		Strength: Percentage of variance in reading performance explained by ESCS (R^2)		Slope: Score-point difference in reading performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter	
	Mean	S.E.	%	S.E.	dif.	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	dif.	S.E.
Norway	499	(2.2)	7.5	(0.9)	**35**	(2.0)	459	(3.6)	496	(3.9)	520	(3.6)	532	(3.5)	**73**	(4.7)
Germany	498	(3.0)	17.2	(1.4)	**42**	(1.7)	450	(5.1)	492	(3.8)	518	(4.6)	564	(4.3)	**113**	(5.9)
Slovenia	495	(1.2)	12.1	(1.0)	**41**	(1.8)	462	(2.5)	476	(3.0)	506	(3.0)	541	(3.0)	**80**	(3.9)
Belgium	493	(2.3)	17.2	(0.8)	**46**	(1.3)	440	(3.0)	477	(3.5)	512	(3.6)	550	(2.6)	**109**	(3.2)
France	493	(2.3)	17.5	(1.3)	**47**	(2.0)	443	(2.8)	474	(3.7)	509	(3.9)	550	(4.2)	**107**	(5.3)
Portugal	492	(2.4)	13.5	(1.2)	**31**	(1.4)	448	(4.3)	480	(3.6)	501	(4.1)	543	(3.5)	**95**	(4.8)
Czech Republic	490	(2.5)	16.5	(1.4)	**45**	(2.1)	439	(4.7)	481	(3.9)	498	(3.4)	544	(3.3)	**105**	(5.7)
Netherlands	485	(2.7)	10.5	(1.3)	**39**	(2.5)	448	(5.1)	470	(4.2)	495	(3.7)	536	(4.4)	**88**	(6.4)
Austria	484	(2.7)	13.0	(1.2)	**40**	(1.9)	440	(3.9)	475	(4.5)	496	(3.6)	533	(4.1)	**93**	(5.3)
Switzerland	484	(3.1)	15.6	(1.6)	**43**	(2.3)	435	(4.5)	469	(3.7)	499	(4.4)	539	(5.7)	**104**	(7.0)

Country	Reading performance		Socio-economic gradients				Reading performance, by socio-economic status (ESCS)									
							National quarter of ESCS									
	Score, unadjusted		Strength: Percentage of variance in reading performance explained by ESCS (R^2)		Slope: Score-point difference in reading performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter	
	Mean	S.E.	%	S.E.	dif.	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	dif.	S.E.
Wales	483	(4.0)	4.0	(0.8)	**22**	(2.4)	466	(4.7)	478	(5.6)	491	(5.9)	515	(5.8)	**49**	(6.6)
Croatia	479	(2.7)	7.7	(0.8)	**32**	(1.8)	455	(3.4)	463	(3.3)	480	(3.5)	518	(3.8)	**63**	(4.2)
Latvia	479	(1.6)	7.2	(0.8)	**29**	(1.7)	447	(2.9)	470	(3.1)	490	(3.0)	512	(3.0)	**65**	(4.0)
Russian Federation	479	(3.1)	7.3	(1.0)	**34**	(2.6)	443	(4.5)	469	(3.7)	493	(4.4)	510	(4.2)	**67**	(5.3)
Italy	476	(2.4)	8.9	(1.0)	**32**	(1.9)	436	(3.7)	474	(3.1)	487	(3.3)	511	(4.1)	**75**	(5.2)
Hungary	476	(2.3)	19.1	(1.7)	**46**	(2.2)	420	(4.1)	463	(3.8)	489	(3.7)	534	(4.1)	**113**	(5.9)
Lithuania	476	(1.5)	13.2	(1.0)	**40**	(1.6)	432	(2.9)	464	(2.9)	488	(3.0)	522	(2.6)	**89**	(3.8)
Iceland	474	(1.7)	6.6	(1.0)	**33**	(2.7)	437	(3.7)	463	(4.2)	495	(3.5)	510	(4.1)	**72**	(5.7)
Belarus	474	(2.4)	19.8	(1.5)	**51**	(2.2)	423	(3.3)	458	(4.0)	489	(3.4)	525	(3.7)	**102**	(5.0)
Israel	470	(3.7)	14.0	(1.0)	**47**	(1.9)	407	(4.4)	455	(5.8)	507	(4.7)	529	(4.4)	**121**	(5.5)

Country	Reading performance		Socio-economic gradients				Reading performance, by socio-economic status (ESCS)									
							National quarter of ESCS									
	Score, unadjusted		Strength: Percentage of variance in reading performance explained by ESCS (R^2)		Slope: Score-point difference in reading performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter	
	Mean	S.E.	%	S.E.	dif.	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	dif.	S.E.
Luxembourg	470	(1.1)	17.8	(1.0)	**40**	(1.2)	415	(2.7)	445	(2.6)	488	(2.8)	537	(3.0)	**122**	(4.4)
Ukraine	466	(3.5)	14.0	(1.4)	**45**	(2.5)	422	(4.8)	456	(4.7)	476	(4.5)	511	(3.9)	**90**	(5.9)
Turkey	466	(2.2)	11.4	(1.8)	**25**	(1.8)	437	(3.8)	452	(3.1)	461	(2.9)	513	(5.2)	**76**	(7.2)
Slovak Republic	458	(2.2)	17.5	(1.5)	**46**	(2.0)	404	(4.3)	449	(3.4)	468	(3.2)	511	(4.1)	**106**	(5.9)
Greece	457	(3.6)	10.9	(1.2)	**35**	(2.1)	417	(4.5)	444	(4.0)	468	(4.8)	502	(4.5)	**84**	(5.3)
Chile	452	(2.6)	12.7	(1.1)	**32**	(1.5)	415	(3.4)	443	(3.7)	455	(3.5)	502	(3.9)	**87**	(4.7)
OECD Average	487	(0.4)	12.0	(0.2)	**37**	(0.3)	445	(0.6)	476	(0.6)	500	(0.6)	534	(0.7)	**89**	(0.9)

Notes:

ESCS refers to the PISA index of economic, social and cultural status.

Values that are statistically significant are indicated in **bold**.

Source: PISA 2018 database

Table B1.10 Mean reading performance and academic resilience, by immigrant background (Based on pupils' reports)

Country	Percentage of immigrant pupils		Reading performance									
			Average performance		Non-immigrant pupils		Immigrant pupils		Second-generation immigrant pupils		First-generation immigrant pupils	
	%	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
Vietnam	0.1	(0.0)	m	m	m	m	m	m	m	m	m	m
B-S-J-Z (China)	0.2	(0.1)	555	(2.7)	556	(2.7)	c	c	c	c	c	c
Singapore	24.8	(0.7)	549	(1.6)	546	(1.5)	565	(4.3)	587	(4.0)	554	(6.0)
Macao (China)	62.9	(0.7)	525	(1.2)	512	(2.2)	533	(1.8)	528	(2.5)	540	(2.8)
Hong Kong (China)	37.9	(1.3)	524	(2.7)	529	(2.9)	522	(4.7)	533	(4.3)	502	(6.9)
Estonia	10.4	(0.5)	523	(1.8)	528	(1.9)	489	(4.5)	492	(4.9)	453	(16.8)
Canada	35.0	(1.4)	520	(1.8)	525	(1.6)	522	(3.0)	535	(3.9)	508	(3.6)
Finland	5.8	(0.5)	520	(2.3)	527	(2.1)	435	(7.5)	456	(10.3)	420	(9.0)
Republic of Ireland	17.9	(0.9)	518	(2.2)	522	(2.3)	508	(3.8)	509	(5.3)	508	(5.3)
Korea	0.2	(0.1)	514	(2.9)	515	(2.9)	c	c	c	c	c	c
Poland	0.6	(0.2)	512	(2.7)	514	(2.7)	c	c	c	c	c	c
Sweden	20.5	(1.3)	506	(3.0)	525	(2.7)	443	(5.8)	471	(6.4)	410	(6.9)
New Zealand	26.5	(1.3)	506	(2.0)	510	(2.3)	508	(3.5)	518	(5.3)	500	(4.0)
United States	23.0	(1.5)	505	(3.6)	510	(3.6)	503	(6.0)	512	(6.1)	479	(8.3)
England	21.8	(1.4)	505	(3.0)	513	(3.2)	490	(4.4)	492	(5.9)	488	(7.6)
Scotland	8.4	(0.9)	504	(3.0)	506	(2.8)	514	(10.7)	521	(13.7)	509	(13.6)
United Kingdom	19.8	(1.2)	504	(2.6)	511	(2.7)	491	(4.2)	493	(5.7)	488	(6.9)

Country	Percentage of immigrant pupils		Reading performance									
			Average performance		Non-immigrant pupils		Immigrant pupils		Second-generation immigrant pupils		First-generation immigrant pupils	
	%	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
Japan	0.6	(0.1)	504	(2.7)	w	w	w	w	w	w	w	w
Australia	27.7	(0.8)	503	(1.6)	504	(2.0)	511	(3.3)	523	(4.5)	501	(3.9)
Chinese Taipei	0.7	(0.2)	503	(2.8)	504	(2.8)	428	(49.1)	c	c	c	c
Denmark	10.7	(0.4)	501	(1.8)	509	(1.9)	444	(3.5)	447	(3.7)	435	(7.4)
Northern Ireland	9.7	(0.8)	501	(4.0)	508	(4.1)	465	(9.9)	508	(23.4)	455	(10.4)
Norway	12.4	(0.8)	499	(2.2)	509	(2.1)	457	(4.7)	463	(7.0)	451	(5.5)
Germany	22.2	(1.1)	498	(3.0)	519	(3.3)	456	(6.5)	477	(6.6)	405	(11.8)
Slovenia	8.9	(0.3)	495	(1.2)	502	(1.3)	439	(6.0)	464	(7.3)	422	(8.2)
Belgium	18.1	(0.9)	493	(2.3)	506	(2.4)	445	(3.8)	459	(4.7)	427	(5.2)
France	14.3	(0.9)	493	(2.3)	502	(2.7)	449	(5.3)	461	(5.7)	425	(7.5)
Portugal	7.0	(0.6)	492	(2.4)	495	(2.6)	463	(7.8)	483	(10.1)	436	(9.1)
Czech Republic	4.1	(0.4)	490	(2.5)	493	(2.5)	440	(9.7)	459	(10.5)	421	(14.4)
Netherlands	13.8	(1.2)	485	(2.7)	498	(2.9)	426	(6.2)	433	(6.7)	399	(13.0)
Austria	22.7	(1.2)	484	(2.7)	500	(2.6)	437	(4.2)	446	(4.3)	421	(5.5)

Country	Percentage of immigrant pupils		Reading performance									
			Average performance		Non-immigrant pupils		Immigrant pupils		Second-generation immigrant pupils		First-generation immigrant pupils	
	%	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
Switzerland	33.9	(1.4)	484	(3.1)	503	(3.2)	451	(4.3)	453	(4.6)	448	(6.3)
Wales	7.0	(0.9)	483	(4.0)	487	(4.0)	490	(6.8)	500	(9.3)	481	(10.9)
Croatia	9.1	(0.5)	479	(2.7)	481	(2.6)	471	(5.5)	473	(5.7)	464	(11.8)
Latvia	4.4	(0.3)	479	(1.6)	480	(1.6)	476	(8.7)	467	(9.2)	515	(19.9)
Russian Federation	5.8	(0.3)	479	(3.1)	480	(3.1)	478	(6.3)	491	(6.9)	457	(8.4)
Italy	10.0	(0.5)	476	(2.4)	482	(2.6)	440	(4.9)	445	(5.9)	433	(7.1)
Hungary	2.6	(0.3)	476	(2.3)	477	(2.3)	490	(9.8)	510	(11.1)	468	(16.5)
Lithuania	1.6	(0.1)	476	(1.5)	478	(1.5)	457	(11.1)	454	(11.5)	469	(27.3)
Iceland	5.6	(0.4)	474	(1.7)	481	(1.8)	407	(7.6)	412	(10.9)	402	(9.5)
Belarus	4.1	(0.3)	474	(2.4)	475	(2.5)	457	(7.3)	461	(6.7)	447	(16.3)
Israel	16.4	(1.1)	470	(3.7)	481	(3.5)	470	(6.6)	493	(6.1)	398	(10.4)
Luxembourg	54.9	(0.6)	470	(1.1)	491	(1.9)	455	(1.7)	450	(2.9)	461	(2.9)
Ukraine	2.3	(0.2)	466	(3.5)	468	(3.4)	443	(9.9)	456	(11.7)	419	(18.7)
Turkey	0.9	(0.1)	466	(2.2)	467	(2.2)	462	(12.7)	474	(15.1)	c	c

Country	Percentage of immigrant pupils		Reading performance									
			Average performance		Non-immigrant pupils		Immigrant pupils		Second-generation immigrant pupils		First-generation immigrant pupils	
	%	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
Slovak Republic	1.2	(0.2)	458	(2.2)	460	(2.2)	407	(13.6)	424	(17.8)	387	(17.3)
Greece	11.7	(0.7)	457	(3.6)	465	(3.4)	414	(6.1)	420	(6.9)	397	(9.2)
Chile	3.4	(0.4)	452	(2.6)	456	(2.7)	438	(7.5)	447	(18.3)	435	(8.5)
OECD Average	13.1	(0.1)	487	(0.4)	494	(0.4)	452	(1.3)	465	(1.6)	440	(2.1)

Notes:
Symbols for missing data:
c: There were too few observations to provide reliable estimates (i.e. there were fewer than 30 pupils or fewer than 5 schools with valid data).
m: Data are not available. There was no observation in the sample; these data were not collected by the country; or these data were collected but subsequently removed from the publication for technical reasons.
w: Results were withdrawn at the request of the country concerned.

Source: PISA 2018 database

Table B1.11 (continued) Mean reading performance and academic resilience, by immigrant background (Based on pupils' reports)

Country	Score-point difference in reading performance associated with immigrant background				Academic resilience	
-	Before accounting for gender, and pupils' and schools' socio-economic profile[1]		After accounting for gender, and pupils' and schools' socio-economic profile		Academically resilient immigrant pupils[2]	
-	Score dif.	S.E.	Score dif.	S.E.	%	S.E.
Vietnam	m	m	m	m	m	m
B-S-J-Z (China)	c	c	c	c	m	m
Singapore	**19**	(4.5)	**-9**	(4.2)	28.9	(1.5)
Macao (China)	**22**	(3.0)	**26**	(3.1)	27.3	(0.9)
Hong Kong (China)	-7	(5.0)	**9**	(4.2)	24.0	(1.3)
Estonia	**-39**	(4.6)	**-35**	(4.5)	13.6	(1.5)
Canada	-3	(2.9)	-1	(2.6)	26.2	(1.2)
Finland	**-92**	(7.3)	**-74**	(6.7)	7.9	(1.8)
Republic of Ireland	**-14**	(3.8)	**-9**	(3.2)	21.6	(1.5)
Korea	c	c	c	c	m	m
Poland	c	c	c	c	m	m
Sweden	**-83**	(5.9)	**-54**	(4.7)	10.3	(1.5)
New Zealand	-2	(4.0)	**-8**	(3.3)	26.5	(1.3)
United States	-7	(5.9)	**16**	(4.5)	24.5	(2.2)
England	**-22**	(4.8)	-5	(4.4)	20.4	(1.7)
Scotland	8	(9.9)	7	(8.4)	26.2	(4.8)
United Kingdom	**-20**	(4.4)	-4	(4.1)	20.5	(1.6)
Japan	w	w	w	w	w	w
Australia	**8**	(3.5)	**7**	(3.0)	29.1	(1.3)
Chinese Taipei	-76	(49.0)	-82	(59.4)	17.3	(8.8)
Denmark	**-65**	(3.8)	**-34**	(3.7)	9.3	(1.2)

Country	Score-point difference in reading performance associated with immigrant background				Academic resilience	
-	Before accounting for gender, and pupils' and schools' socio-economic profile[1]		After accounting for gender, and pupils' and schools' socio-economic profile		Academically resilient immigrant pupils[2]	
-	Score dif.	S.E.	Score dif.	S.E.	%	S.E.
Northern Ireland	**-43**	(9.2)	**-28**	(7.6)	17.6	(3.4)
Norway	**-52**	(4.4)	**-33**	(4.5)	13.9	(1.5)
Germany	**-63**	(6.8)	**-17**	(5.6)	16.0	(1.7)
Slovenia	**-63**	(6.3)	**-28**	(6.2)	8.8	(1.8)
Belgium	**-61**	(4.1)	**-21**	(4.0)	12.0	(1.2)
France	**-52**	(6.2)	**-13**	(5.0)	13.4	(1.7)
Portugal	**-32**	(8.2)	**-26**	(6.2)	17.1	(2.8)
Czech Republic	**-53**	(9.4)	**-34**	(7.3)	12.3	(2.5)
Netherlands	**-72**	(7.1)	**-23**	(6.5)	8.9	(1.7)
Austria	**-63**	(4.5)	**-33**	(3.6)	11.2	(1.2)
Switzerland	**-52**	(4.7)	**-25**	(3.6)	15.7	(1.3)
Wales	3	(7.5)	7	(6.9)	19.1	(2.8)
Croatia	-10	(5.2)	-3	(4.1)	21.2	(2.6)
Latvia	-4	(8.8)	-7	(8.1)	27.5	(3.8)
Russian Federation	-2	(5.4)	-7	(5.1)	25.8	(2.8)
Italy	**-43**	(5.1)	**-22**	(4.0)	14.1	(1.6)
Hungary	13	(9.7)	-7	(9.4)	31.0	(5.3)
Lithuania	-21	(11.2)	**-27**	(9.0)	20.3	(4.2)
Iceland	**-74**	(8.0)	**-55**	(7.9)	7.0	(2.6)
Belarus	**-19**	(7.2)	-9	(6.5)	22.6	(2.9)
Israel	-11	(6.4)	6	(5.3)	24.3	(1.8)
Luxembourg	**-35**	(2.8)	**-17**	(2.8)	21.8	(0.7)
Ukraine	**-25**	(8.7)	**-25**	(8.4)	15.3	(4.0)
Turkey	-5	(12.6)	**-27**	(12.2)	25.1	(7.0)

Country	Score-point difference in reading performance associated with immigrant background				Academic resilience	
-	Before accounting for gender, and pupils' and schools' socio-economic profile[1]		After accounting for gender, and pupils' and schools' socio-economic profile		Academically resilient immigrant pupils[2]	
-	Score dif.	S.E.	Score dif.	S.E.	%	S.E.
Slovak Republic	**-53**	(13.7)	**-40**	(12.7)	12.6	(4.6)
Greece	**-51**	(5.3)	**-22**	(5.1)	12.1	(1.7)
Chile	**-18**	(7.1)	**-14**	(6.9)	18.6	(2.9)
OECD Average	**-41**	(1.3)	**-24**	(1.2)	16.8	(0.5)

Notes:

[1] The socio-economic profile is measured by the PISA index of economic, social and cultural status (ESCS).

[2] Immigrant pupils who scored in the top quarter of performance in reading amongst pupils in their own country.

Values that are statistically significant are indicated in **bold**.

Symbols for missing data:

c: There were too few observations to provide reliable estimates (i.e. there were fewer than 30 pupils or fewer than 5 schools with valid data).

m: Data are not available. There was no observation in the sample; these data were not collected by the country; or these data were collected but subsequently removed from the publication for technical reasons.

w: Results were withdrawn at the request of the country concerned.

Source: PISA 2018 database

Appendix C Science Tables

You can find accessible versions of these tables in the appendix data tables file on the **PISA 2018: national report for England** page.

Table C1.1 Mean science scores and variations in science performance

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
B-S-J-Z (China)	590	(2.7)	83	(1.7)	482	(4.0)	594	(2.8)	695	(3.7)
Singapore	551	(1.5)	97	(1.0)	416	(3.2)	560	(2.1)	670	(1.8)
Macao (China)	544	(1.5)	83	(1.0)	434	(3.0)	547	(1.8)	648	(2.2)
Estonia	530	(1.9)	88	(1.2)	417	(3.5)	531	(2.4)	644	(2.7)
Japan	529	(2.6)	92	(1.6)	405	(4.4)	534	(2.9)	646	(3.5)
Finland	522	(2.5)	96	(1.3)	393	(4.1)	526	(2.9)	643	(2.9)
Korea	519	(2.8)	98	(1.7)	388	(4.1)	524	(3.3)	642	(3.8)
Canada	518	(2.2)	96	(1.0)	393	(2.3)	520	(2.6)	640	(2.5)
Hong Kong (China)	517	(2.5)	86	(1.2)	401	(4.3)	522	(2.7)	623	(3.3)
Chinese Taipei	516	(2.9)	99	(1.5)	382	(3.9)	521	(3.2)	641	(4.0)
Poland	511	(2.6)	92	(1.4)	392	(3.4)	511	(3.0)	630	(4.0)
New Zealand	508	(2.1)	102	(1.4)	371	(3.7)	512	(2.7)	640	(2.9)
England	507	(3.0)	100	(1.6)	375	(4.6)	509	(3.2)	635	(3.8)
Slovenia	507	(1.3)	88	(1.1)	390	(3.4)	510	(1.9)	621	(2.8)
United Kingdom	505	(2.6)	99	(1.4)	374	(3.8)	507	(2.7)	632	(3.2)
Netherlands	503	(2.8)	104	(1.9)	364	(5.2)	508	(3.7)	636	(3.5)
Germany	503	(2.9)	103	(1.6)	363	(4.0)	508	(3.9)	633	(3.3)
Australia	503	(1.8)	101	(1.1)	369	(2.6)	506	(2.3)	631	(2.7)
United States	502	(3.3)	99	(1.6)	371	(4.9)	505	(3.9)	629	(3.9)
Sweden	499	(3.1)	98	(1.5)	368	(5.1)	503	(3.4)	624	(3.3)
Belgium	499	(2.2)	99	(1.3)	363	(4.0)	505	(2.6)	624	(2.3)
Czech Republic	497	(2.5)	94	(1.6)	373	(4.0)	497	(3.1)	620	(2.9)
Republic of Ireland	496	(2.2)	88	(1.2)	380	(3.5)	498	(2.6)	610	(3.2)

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Switzerland	495	(3.0)	97	(1.4)	367	(3.5)	497	(3.8)	622	(4.6)
France	493	(2.2)	96	(1.4)	364	(3.5)	497	(3.1)	615	(3.2)
Denmark	493	(1.9)	91	(1.3)	372	(3.4)	496	(2.5)	609	(3.1)
Portugal	492	(2.8)	92	(1.3)	368	(4.3)	494	(3.0)	609	(3.5)
Northern Ireland	491	(4.6)	92	(2.1)	370	(5.7)	494	(5.4)	609	(6.2)
Norway	490	(2.3)	98	(1.2)	357	(3.9)	495	(2.5)	616	(2.9)
Scotland	490	(4.0)	98	(2.9)	366	(5.7)	490	(5.0)	617	(5.9)
Austria	490	(2.8)	96	(1.2)	361	(3.1)	493	(3.5)	614	(3.3)
OECD Average	489	(0.4)	94	(0.2)	365	(0.6)	491	(0.5)	609	(0.5)
Wales	488	(3.8)	89	(1.5)	371	(5.3)	490	(4.5)	603	(4.6)
Latvia	487	(1.8)	84	(1.2)	377	(3.3)	489	(2.2)	595	(2.7)
Spain	483	(1.6)	89	(0.8)	365	(2.4)	485	(1.7)	598	(2.2)
Lithuania	482	(1.6)	90	(1.0)	364	(2.9)	483	(2.2)	599	(2.3)
Hungary	481	(2.3)	94	(1.4)	356	(3.9)	484	(3.1)	602	(3.6)
Russian Federation	478	(2.9)	84	(1.7)	369	(4.1)	478	(3.2)	586	(3.7)
Luxembourg	477	(1.2)	98	(1.2)	347	(2.6)	477	(1.7)	606	(2.9)
Iceland	475	(1.8)	91	(1.0)	354	(3.1)	476	(2.6)	594	(3.1)
Croatia	472	(2.8)	90	(1.6)	356	(4.0)	471	(3.2)	590	(3.5)
Belarus	471	(2.4)	85	(1.3)	361	(3.5)	472	(2.9)	581	(2.7)
Ukraine	469	(3.3)	91	(1.8)	351	(4.4)	469	(3.8)	588	(4.5)
Turkey	468	(2.0)	84	(1.6)	361	(3.1)	466	(2.3)	579	(3.9)
Italy	468	(2.4)	90	(1.7)	348	(3.9)	470	(3.0)	583	(3.7)
Slovak Republic	464	(2.3)	96	(1.5)	338	(3.5)	464	(2.9)	589	(3.5)
Israel	462	(3.6)	111	(1.9)	314	(5.0)	464	(5.0)	607	(3.8)
Chile	444	(2.4)	83	(1.4)	336	(3.1)	442	(2.9)	553	(3.3)
Mexico	419	(2.6)	74	(1.6)	326	(3.9)	416	(2.7)	518	(4.3)
Colombia	413	(3.1)	82	(1.4)	311	(3.7)	409	(3.6)	524	(4.1)

Source: PISA 2018 database

Table C1.2 Percentage of pupils at each proficiency level in science

Country	All pupils															
	Below Level 1b (below 260.54 score points)		Level 1b (from 260.54 to less than 334.94 score points)		Level 1a (from 334.94 to less than 409.54 score points)		Level 2 (from 409.54 to less than 484.14 score points)		Level 3 (from 484.14 to less than 558.73 score points)		Level 4 (from 558.73 to less than 633.33 score points)		Level 5 (from 633.33 to less than 707.93 score points)		Level 6 (above 707.93 score points)	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Australia	0.6	(0.1)	4.5	(0.3)	13.7	(0.5)	23.0	(0.6)	27.5	(0.6)	21.2	(0.6)	7.9	(0.4)	1.6	(0.2)
Austria	0.6	(0.2)	4.8	(0.5)	16.5	(0.9)	25.0	(0.8)	27.6	(0.8)	19.2	(0.8)	5.8	(0.6)	0.5	(0.1)
Belarus	0.5	(0.2)	5.0	(0.5)	18.7	(0.9)	31.3	(0.9)	28.8	(0.8)	13.1	(0.8)	2.5	(0.4)	0.1	(0.1)
Belgium	0.6	(0.1)	5.3	(0.5)	14.2	(0.6)	22.2	(0.7)	28.4	(0.8)	21.3	(0.7)	7.3	(0.4)	0.7	(0.2)
B-S-J-Z (China)	0.0	(0.0)	0.3	(0.1)	1.8	(0.3)	8.4	(0.6)	23.4	(0.9)	34.6	(1.0)	24.3	(1.1)	7.2	(0.7)
Canada	0.4	(0.1)	2.6	(0.2)	10.5	(0.4)	22.4	(0.6)	29.3	(0.6)	23.5	(0.7)	9.5	(0.5)	1.8	(0.2)
Chile	1.0	(0.2)	8.8	(0.7)	25.5	(1.0)	33.1	(1.0)	22.6	(1.0)	7.9	(0.6)	1.0	(0.2)	0.0	(0.0)
Chinese Taipei	0.7	(0.2)	3.3	(0.3)	11.2	(0.6)	21.1	(0.9)	28.5	(0.9)	23.5	(0.8)	10.0	(0.8)	1.6	(0.3)
Colombia	2.1	(0.3)	15.3	(1.1)	33.0	(1.1)	29.6	(1.2)	15.4	(0.8)	4.2	(0.4)	0.4	(0.1)	0.0	(0.0)
Croatia	0.6	(0.2)	5.6	(0.5)	19.1	(0.9)	30.0	(0.8)	26.9	(0.9)	14.2	(0.7)	3.3	(0.4)	0.3	(0.1)
Czech Republic	0.4	(0.1)	3.9	(0.4)	14.5	(0.8)	25.9	(1.0)	28.7	(1.0)	19.1	(0.8)	6.6	(0.5)	1.0	(0.2)
Denmark	0.7	(0.2)	4.1	(0.3)	13.9	(0.6)	26.6	(0.7)	30.1	(0.9)	19.1	(0.8)	5.0	(0.5)	0.5	(0.2)
England	0.6	(0.2)	3.8	(0.5)	12.5	(0.7)	23.5	(1.0)	28.0	(0.9)	21.3	(0.9)	8.7	(0.7)	1.6	(0.3)
Estonia	0.1	(0.1)	1.1	(0.2)	7.5	(0.5)	21.5	(0.7)	32.1	(0.9)	25.4	(0.8)	10.2	(0.5)	2.0	(0.2)

Country	All pupils															
	Below Level 1b (below 260.54 score points)		Level 1b (from 260.54 to less than 334.94 score points)		Level 1a (from 334.94 to less than 409.54 score points)		Level 2 (from 409.54 to less than 484.14 score points)		Level 3 (from 484.14 to less than 558.73 score points)		Level 4 (from 558.73 to less than 633.33 score points)		Level 5 (from 633.33 to less than 707.93 score points)		Level 6 (above 707.93 score points)	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Finland	0.4	(0.1)	2.8	(0.3)	9.7	(0.6)	21.1	(0.7)	28.9	(0.8)	24.9	(0.8)	10.5	(0.6)	1.8	(0.3)
France	0.6	(0.2)	5.0	(0.4)	14.9	(0.8)	24.6	(0.9)	28.3	(0.7)	20.0	(0.9)	5.9	(0.5)	0.6	(0.1)
Germany	0.8	(0.2)	5.0	(0.5)	13.8	(0.7)	22.0	(0.9)	26.9	(0.9)	21.5	(1.0)	8.5	(0.6)	1.5	(0.2)
Hong Kong (China)	0.2	(0.1)	2.4	(0.3)	8.9	(0.6)	21.7	(0.8)	33.8	(0.9)	25.0	(0.9)	7.1	(0.6)	0.7	(0.2)
Hungary	0.6	(0.2)	5.7	(0.6)	17.8	(0.9)	26.1	(1.0)	28.1	(0.9)	17.0	(0.7)	4.3	(0.5)	0.4	(0.1)
Iceland	0.5	(0.2)	5.9	(0.5)	18.6	(0.8)	28.3	(0.9)	27.7	(1.0)	15.2	(0.8)	3.6	(0.4)	0.2	(0.1)
Israel	3.2	(0.4)	10.7	(0.7)	19.2	(0.9)	23.1	(0.9)	22.9	(0.8)	15.1	(0.8)	5.2	(0.4)	0.7	(0.1)
Italy	1.1	(0.2)	6.6	(0.5)	18.2	(0.9)	30.2	(1.0)	27.8	(1.1)	13.4	(0.7)	2.6	(0.4)	0.2	(0.1)
Japan	0.2	(0.1)	1.8	(0.3)	8.9	(0.6)	19.9	(0.8)	29.7	(1.1)	26.5	(0.9)	11.4	(0.7)	1.6	(0.3)
Korea	0.5	(0.1)	3.1	(0.3)	10.6	(0.7)	21.0	(0.8)	28.6	(0.9)	24.5	(0.9)	10.0	(0.6)	1.8	(0.3)
Latvia	0.3	(0.1)	3.4	(0.4)	14.8	(0.7)	29.5	(0.8)	31.5	(1.1)	16.8	(0.8)	3.5	(0.4)	0.3	(0.1)
Lithuania	0.5	(0.2)	4.7	(0.4)	17.0	(0.8)	28.4	(0.8)	28.7	(0.8)	16.3	(0.6)	4.0	(0.3)	0.5	(0.1)
Luxembourg	0.8	(0.2)	6.8	(0.4)	19.2	(0.6)	25.7	(0.8)	25.6	(0.8)	16.6	(0.6)	4.9	(0.5)	0.5	(0.2)
Macao (China)	0.1	(0.1)	0.8	(0.2)	5.1	(0.5)	17.2	(0.7)	32.3	(1.0)	30.8	(0.9)	11.9	(0.6)	1.7	(0.3)
Mexico	1.0	(0.3)	11.6	(1.0)	34.2	(1.3)	33.9	(0.9)	15.5	(0.9)	3.5	(0.5)	0.3	(0.1)	0.0	c

Country	All pupils															
	Below Level 1b (below 260.54 score points)		Level 1b (from 260.54 to less than 334.94 score points)		Level 1a (from 334.94 to less than 409.54 score points)		Level 2 (from 409.54 to less than 484.14 score points)		Level 3 (from 484.14 to less than 558.73 score points)		Level 4 (from 558.73 to less than 633.33 score points)		Level 5 (from 633.33 to less than 707.93 score points)		Level 6 (above 707.93 score points)	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Netherlands	0.9	(0.2)	4.8	(0.5)	14.4	(0.8)	22.4	(0.8)	24.9	(1.1)	22.1	(1.0)	9.1	(0.7)	1.5	(0.3)
New Zealand	0.6	(0.2)	4.3	(0.4)	13.1	(0.6)	22.0	(0.6)	26.8	(0.7)	21.8	(0.7)	9.5	(0.6)	1.8	(0.3)
Northern Ireland	0.6	(0.2)	4.2	(0.7)	14.6	(1.3)	26.4	(1.5)	29.4	(1.2)	19.3	(1.5)	5.1	(1.0)	0.4	(0.2)
Norway	1.1	(0.2)	5.7	(0.4)	14.1	(0.8)	25.0	(0.9)	28.6	(0.7)	18.7	(0.7)	6.1	(0.5)	0.7	(0.1)
Poland	0.2	(0.1)	2.5	(0.3)	11.1	(0.7)	24.9	(0.8)	30.0	(1.0)	22.0	(0.8)	8.1	(0.7)	1.2	(0.2)
Portugal	0.4	(0.1)	4.4	(0.6)	14.7	(0.9)	26.2	(0.9)	29.4	(1.0)	19.2	(0.9)	5.1	(0.5)	0.5	(0.2)
Republic of Ireland	0.3	(0.1)	3.3	(0.3)	13.4	(0.7)	26.9	(0.9)	31.3	(0.9)	19.0	(0.7)	5.4	(0.5)	0.5	(0.2)
Russian Federation	0.4	(0.2)	4.1	(0.5)	16.7	(0.9)	31.7	(0.9)	30.0	(0.9)	14.0	(0.8)	2.9	(0.4)	0.2	(0.1)
Scotland	0.9	(0.3)	4.4	(0.6)	15.8	(1.0)	26.6	(1.4)	27.5	(1.2)	17.6	(1.2)	6.1	(0.7)	1.1	(0.3)
Singapore	0.2	(0.1)	1.8	(0.2)	7.1	(0.4)	15.1	(0.7)	25.4	(0.7)	29.7	(0.7)	17.0	(0.5)	3.8	(0.3)
Slovak Republic	1.4	(0.2)	7.9	(0.6)	19.9	(0.7)	28.5	(0.9)	25.3	(0.8)	13.2	(0.6)	3.4	(0.3)	0.3	(0.1)
Slovenia	0.2	(0.1)	2.5	(0.3)	11.9	(0.6)	24.6	(0.8)	31.8	(1.0)	21.8	(0.9)	6.7	(0.5)	0.6	(0.2)
Spain	0.6	(0.1)	4.5	(0.3)	16.2	(0.5)	28.4	(0.5)	29.4	(0.5)	16.8	(0.4)	3.9	(0.2)	0.3	(0.1)
Sweden	0.6	(0.2)	4.6	(0.5)	13.8	(0.7)	24.0	(0.7)	28.0	(0.8)	20.7	(0.9)	7.3	(0.5)	1.0	(0.2)

Country	All pupils															
	Below Level 1b (below 260.54 score points)		Level 1b (from 260.54 to less than 334.94 score points)		Level 1a (from 334.94 to less than 409.54 score points)		Level 2 (from 409.54 to less than 484.14 score points)		Level 3 (from 484.14 to less than 558.73 score points)		Level 4 (from 558.73 to less than 633.33 score points)		Level 5 (from 633.33 to less than 707.93 score points)		Level 6 (above 707.93 score points)	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Switzerland	0.4	(0.1)	4.6	(0.5)	15.2	(0.8)	24.9	(0.9)	27.8	(0.9)	19.3	(1.0)	6.9	(0.7)	0.9	(0.2)
Turkey	0.3	(0.1)	4.7	(0.4)	20.1	(0.8)	32.8	(1.0)	27.3	(1.0)	12.3	(0.7)	2.3	(0.4)	0.1	(0.1)
Ukraine	1.0	(0.2)	6.3	(0.6)	19.2	(0.9)	30.0	(1.1)	26.7	(1.1)	13.4	(0.8)	3.2	(0.5)	0.3	(0.1)
United Kingdom	0.6	(0.2)	3.9	(0.4)	12.9	(0.6)	24.0	(0.8)	28.1	(0.8)	20.8	(0.7)	8.2	(0.6)	1.5	(0.2)
United States	0.5	(0.2)	4.4	(0.5)	13.7	(0.8)	23.6	(0.9)	27.5	(0.9)	21.1	(0.9)	7.9	(0.7)	1.3	(0.2)
Wales	0.4	(0.1)	4.0	(0.6)	15.2	(1.1)	28.3	(1.1)	29.7	(1.1)	17.7	(1.1)	4.4	(0.6)	0.4	(0.2)
OECD Average	0.7	(0.0)	5.2	(0.1)	16.0	(0.1)	25.8	(0.1)	27.4	(0.1)	18.1	(0.1)	5.9	(0.1)	0.8	(0.0)

Source: PISA 2018 database

Table C1.3 Science performance by gender

Country	Boys		Girls		Gender differences (girls - boys)	
-	Mean score		Mean score		Mean score	
-	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
Australia	504	(2.4)	502	(2.0)	-2	(2.6)
Austria	491	(3.8)	489	(3.6)	-2	(5.0)
Belarus	473	(3.0)	470	(2.8)	-3	(3.0)
Belgium	501	(2.6)	496	(2.7)	-5	(3.0)
B-S-J-Z (China)	596	(2.9)	584	(2.9)	**-12**	(2.2)
Canada	516	(2.7)	520	(2.5)	3	(2.9)
Chile	445	(3.2)	442	(2.6)	-3	(3.3)
Chinese Taipei	516	(4.1)	515	(4.1)	-1	(5.9)
Colombia	420	(3.8)	407	(2.9)	**-12**	(2.9)
Croatia	470	(3.5)	474	(3.4)	4	(4.0)
Czech Republic	496	(3.2)	498	(3.1)	2	(3.7)
Denmark	492	(2.5)	494	(2.2)	2	(2.8)
England	509	(3.6)	506	(3.7)	-3	(4.2)
Estonia	528	(2.3)	533	(2.3)	**5**	(2.5)
Finland	510	(2.9)	534	(2.9)	**24**	(3.0)
France	493	(2.7)	493	(2.8)	1	(3.1)
Germany	502	(3.2)	504	(3.3)	1	(3.0)
Hong Kong (China)	512	(3.4)	521	(2.8)	**9**	(3.6)
Hungary	484	(3.1)	478	(3.1)	-6	(4.0)
Iceland	471	(2.3)	479	(2.8)	**8**	(3.6)
Israel	452	(5.3)	471	(3.5)	**19**	(5.3)
Italy	470	(3.0)	466	(2.6)	-3	(2.9)
Japan	531	(3.5)	528	(3.0)	-3	(4.0)
Korea	521	(3.9)	517	(3.6)	-4	(5.0)
Latvia	483	(2.2)	491	(2.4)	**8**	(3.0)
Lithuania	479	(2.3)	485	(2.1)	**6**	(3.0)

Country	Boys		Girls		Gender differences (girls - boys)	
-	Mean score		Mean score		Mean score	
-	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
Luxembourg	475	(1.7)	479	(1.7)	**5**	(2.3)
Macao (China)	543	(2.1)	545	(2.0)	2	(2.9)
Mexico	424	(2.8)	415	(2.9)	**-9**	(2.4)
Netherlands	499	(3.6)	508	(3.1)	**8**	(3.6)
New Zealand	509	(2.9)	508	(2.8)	-2	(3.9)
Northern Ireland	483	(6.5)	500	(5.3)	**17**	(7.4)
Norway	485	(2.6)	496	(2.8)	**11**	(2.9)
Poland	511	(2.8)	511	(3.1)	0	(2.7)
Portugal	494	(3.0)	489	(3.3)	-5	(3.1)
Republic of Ireland	495	(3.0)	497	(2.6)	1	(3.4)
Russian Federation	477	(3.0)	478	(3.2)	1	(2.3)
Scotland	494	(5.5)	486	(4.4)	-8	(5.8)
Singapore	553	(2.0)	549	(1.9)	-4	(2.5)
Slovak Republic	461	(2.8)	467	(3.0)	6	(3.7)
Slovenia	502	(1.6)	512	(2.0)	**10**	(2.6)
Spain	484	(1.9)	482	(1.8)	-2	(2.1)
Sweden	496	(3.2)	503	(3.7)	**8**	(3.1)
Switzerland	495	(3.3)	495	(3.3)	0	(2.8)
Turkey	465	(2.9)	472	(2.5)	**7**	(3.6)
Ukraine	470	(3.9)	468	(3.6)	-2	(3.7)
United Kingdom	506	(3.1)	503	(3.2)	-2	(3.6)
United States	503	(3.9)	502	(3.5)	-1	(3.3)
Wales	486	(4.5)	491	(3.7)	5	(3.2)
OECD Average	488	(0.5)	490	(0.5)	2	(0.5)

Bold font indicates a difference that was statistically significant.

Source: PISA 2018 database

Appendix D Mathematics Tables

You can find accessible versions of these tables in the appendix data tables file on the **PISA 2018: national report for England** page.

Table D1.1 Mean scores and variation in mathematics performance

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
B-S-J-Z (China)	591	(2.5)	80	(1.8)	486	(4.2)	596	(2.7)	691	(3.2)
Singapore	569	(1.6)	94	(1.2)	441	(2.9)	576	(2.0)	684	(2.7)
Macao (China)	558	(1.5)	81	(1.5)	452	(3.6)	561	(2.3)	659	(2.6)
Hong Kong (China)	551	(3.0)	94	(1.9)	426	(5.4)	557	(3.1)	667	(3.5)
Chinese Taipei	531	(2.9)	100	(1.7)	397	(3.9)	537	(3.1)	656	(4.4)
Japan	527	(2.5)	86	(1.6)	413	(3.9)	530	(2.9)	637	(3.8)
Korea	526	(3.1)	100	(2.0)	393	(4.4)	530	(3.4)	651	(4.6)
Estonia	523	(1.7)	82	(1.1)	419	(2.9)	524	(2.0)	628	(2.7)
Netherlands	519	(2.6)	93	(1.8)	394	(4.8)	524	(3.0)	638	(3.6)
Poland	516	(2.6)	90	(1.7)	398	(3.8)	517	(2.8)	631	(4.2)
Switzerland	515	(2.9)	94	(1.4)	391	(3.5)	518	(3.7)	636	(4.3)
Canada	512	(2.4)	92	(1.1)	392	(3.0)	513	(2.6)	629	(2.7)
Denmark	509	(1.7)	82	(1.0)	401	(2.6)	512	(2.3)	613	(2.8)
Slovenia	509	(1.4)	89	(1.4)	392	(3.0)	511	(1.8)	622	(2.8)
Belgium	508	(2.3)	95	(1.7)	377	(4.1)	514	(2.5)	628	(3.4)
Finland	507	(2.0)	82	(1.2)	399	(3.4)	510	(2.5)	612	(2.5)
England	504	(3.0)	93	(1.7)	383	(4.9)	506	(3.2)	623	(3.7)
Sweden	502	(2.7)	91	(1.4)	383	(4.6)	505	(3.2)	618	(3.3)
United Kingdom	502	(2.6)	93	(1.4)	381	(4.0)	504	(2.7)	620	(3.3)
Norway	501	(2.2)	90	(1.3)	381	(3.9)	504	(2.8)	617	(3.1)
Germany	500	(2.6)	95	(1.5)	373	(4.2)	504	(3.5)	621	(3.2)
Republic of Ireland	500	(2.2)	78	(1.0)	397	(3.3)	502	(2.5)	599	(3.0)
Czech Republic	499	(2.5)	93	(1.7)	378	(4.6)	501	(2.7)	619	(3.1)
Austria	499	(3.0)	93	(1.5)	374	(4.4)	503	(3.7)	618	(3.3)

Country	Mean score		Standard deviation		10th percentile		Median (50th)		90th percentile	
-	Mean	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Latvia	496	(2.0)	80	(1.1)	393	(3.2)	497	(2.4)	599	(3.1)
France	495	(2.3)	93	(1.5)	370	(3.4)	502	(3.0)	611	(3.3)
Iceland	495	(2.0)	90	(1.2)	374	(4.2)	499	(2.7)	609	(3.0)
New Zealand	494	(1.7)	93	(1.1)	372	(3.0)	496	(2.3)	614	(2.2)
Portugal	492	(2.7)	96	(1.3)	362	(3.8)	497	(3.2)	614	(3.6)
Northern Ireland	492	(4.2)	85	(2.5)	377	(6.4)	496	(4.4)	600	(5.3)
Australia	491	(1.9)	92	(1.2)	371	(3.0)	492	(2.1)	609	(2.7)
OECD Average	489	(0.4)	91	(0.2)	370	(0.6)	492	(0.5)	605	(0.6)
Scotland	489	(3.9)	95	(2.9)	367	(6.0)	490	(4.3)	610	(5.7)
Russian Federation	488	(3.0)	86	(1.9)	376	(4.3)	489	(3.1)	597	(3.9)
Wales	487	(3.9)	82	(1.5)	381	(5.4)	488	(4.4)	592	(4.4)
Italy	487	(2.8)	94	(1.8)	363	(4.7)	490	(3.5)	605	(3.9)
Slovak Republic	486	(2.6)	100	(1.7)	353	(5.4)	492	(3.0)	610	(3.1)
Luxembourg	483	(1.1)	98	(1.3)	353	(2.9)	485	(2.0)	611	(2.4)
Spain	481	(1.5)	88	(1.0)	365	(2.4)	484	(1.6)	593	(2.2)
Lithuania	481	(2.0)	91	(1.1)	362	(3.6)	483	(2.3)	598	(2.8)
Hungary	481	(2.3)	91	(1.6)	360	(4.0)	484	(2.9)	597	(3.7)
United States	478	(3.2)	92	(1.5)	357	(4.6)	479	(3.8)	598	(4.3)
Belarus	472	(2.7)	93	(1.4)	351	(3.4)	473	(3.0)	592	(3.5)
Malta	472	(1.9)	102	(1.4)	334	(3.4)	478	(2.7)	599	(3.5)
Croatia	464	(2.5)	87	(1.7)	354	(3.9)	463	(2.9)	577	(3.9)
Israel	463	(3.5)	108	(1.9)	315	(5.5)	468	(4.0)	600	(3.9)
Turkey	454	(2.3)	88	(1.8)	343	(3.8)	450	(2.4)	571	(4.0)
Ukraine	453	(3.6)	94	(1.9)	331	(4.4)	454	(4.1)	573	(5.0)
Greece	451	(3.1)	89	(1.8)	334	(4.7)	454	(3.3)	565	(3.8)
Cyprus	451	(1.4)	95	(1.1)	325	(2.8)	454	(1.9)	571	(2.4)
Chile	417	(2.4)	85	(1.4)	311	(3.5)	416	(2.9)	528	(3.5)
Mexico	409	(2.5)	78	(1.6)	311	(3.6)	408	(2.7)	510	(3.6)
Colombia	391	(3.0)	81	(2.0)	290	(3.9)	387	(3.5)	499	(4.5)

Source: PISA 2018 database

Table D1.2 Percentage of pupils at each proficiency level in mathematics

Country	All pupils													
	Below Level 1 (below 357.77 score points)		Level 1 (from 357.77 to less than 420.07 score points)		Level 2 (from 420.07 to less than 482.38 score points)		Level 3 (from 482.38 to less than 544.68 score points)		Level 4 (from 544.68 to less than 606.99 score points)		Level 5 (from 606.99 to less than 669.30 score points)		Level 6 (above 669.30 score points)	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Australia	7.6	(0.5)	14.8	(0.5)	23.4	(0.5)	25.6	(0.5)	18.2	(0.5)	8.0	(0.4)	2.5	(0.3)
Austria	7.3	(0.7)	13.8	(0.8)	20.8	(1.0)	24.9	(0.9)	20.6	(0.8)	10.0	(0.7)	2.5	(0.3)
Belarus	11.4	(0.7)	18.0	(0.7)	24.7	(0.9)	23.4	(0.7)	15.2	(0.7)	6.1	(0.5)	1.2	(0.2)
Belgium	6.9	(0.7)	12.8	(0.6)	18.6	(0.7)	23.8	(0.8)	22.2	(0.7)	12.5	(0.6)	3.2	(0.4)
B-S-J-Z (China)	0.5	(0.1)	1.9	(0.3)	6.9	(0.5)	17.5	(0.8)	28.9	(1.0)	27.8	(1.0)	16.5	(1.1)
Canada	5.0	(0.4)	11.3	(0.5)	20.8	(0.6)	25.9	(0.6)	21.7	(0.7)	11.3	(0.5)	4.0	(0.3)
Chile	24.7	(1.1)	27.2	(0.9)	25.5	(0.9)	15.6	(0.8)	5.7	(0.5)	1.1	(0.2)	0.1	(0.0)
Chinese Taipei	5.0	(0.4)	9.0	(0.5)	16.1	(0.7)	23.2	(0.8)	23.5	(0.8)	15.6	(0.8)	7.6	(0.8)
Colombia	35.5	(1.7)	29.9	(1.2)	21.1	(0.9)	10.0	(0.7)	3.1	(0.4)	0.5	(0.1)	0.0	(0.0)
Croatia	11.0	(0.8)	20.2	(0.8)	27.4	(0.9)	23.3	(0.8)	13.0	(0.8)	4.3	(0.5)	0.8	(0.2)
Cyprus	17.2	(0.6)	19.7	(0.7)	24.7	(0.9)	22.0	(0.8)	12.1	(0.5)	3.7	(0.4)	0.7	(0.1)
Czech Republic	6.6	(0.7)	13.8	(0.7)	22.1	(0.8)	25.2	(0.9)	19.6	(0.7)	9.5	(0.5)	3.1	(0.3)
Denmark	3.7	(0.4)	10.9	(0.6)	22.0	(0.9)	28.8	(0.8)	23.0	(0.8)	9.5	(0.6)	2.1	(0.3)

Country	All pupils													
	Below Level 1 (below 357.77 score points)		Level 1 (from 357.77 to less than 420.07 score points)		Level 2 (from 420.07 to less than 482.38 score points)		Level 3 (from 482.38 to less than 544.68 score points)		Level 4 (from 544.68 to less than 606.99 score points)		Level 5 (from 606.99 to less than 669.30 score points)		Level 6 (above 669.30 score points)	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
England	6.2	(0.6)	12.5	(0.8)	21.6	(0.9)	25.3	(0.8)	20.8	(0.8)	10.2	(0.7)	3.4	(0.4)
Estonia	2.1	(0.3)	8.1	(0.6)	20.8	(0.8)	29.0	(0.8)	24.6	(0.8)	11.8	(0.7)	3.7	(0.4)
Finland	3.8	(0.4)	11.1	(0.6)	22.3	(0.9)	28.9	(1.0)	22.7	(0.8)	9.3	(0.5)	1.8	(0.3)
France	8.0	(0.5)	13.2	(0.6)	21.1	(0.8)	25.6	(0.8)	21.0	(0.8)	9.2	(0.6)	1.8	(0.3)
Germany	7.6	(0.7)	13.5	(0.8)	20.7	(0.9)	24.0	(0.8)	20.8	(0.8)	10.5	(0.7)	2.8	(0.3)
Greece	15.3	(1.1)	20.5	(0.9)	26.8	(0.9)	22.5	(1.0)	11.1	(0.6)	3.2	(0.4)	0.5	(0.2)
Hong Kong (China)	2.8	(0.4)	6.4	(0.6)	13.5	(0.7)	22.1	(0.7)	26.3	(0.9)	19.5	(0.8)	9.5	(0.8)
Hungary	9.6	(0.7)	16.1	(0.8)	23.6	(0.9)	25.2	(1.0)	17.5	(0.8)	6.5	(0.5)	1.4	(0.3)
Iceland	7.4	(0.5)	13.3	(0.7)	22.0	(1.0)	26.7	(1.0)	20.2	(0.9)	8.5	(0.6)	1.9	(0.3)
Israel	17.7	(1.1)	16.4	(0.8)	20.7	(0.7)	21.0	(0.8)	15.4	(0.8)	7.0	(0.6)	1.8	(0.3)
Italy	9.1	(0.8)	14.8	(0.9)	22.9	(1.0)	25.6	(0.9)	18.1	(0.8)	7.5	(0.6)	2.0	(0.3)
Japan	2.9	(0.4)	8.6	(0.6)	18.7	(0.8)	26.4	(0.9)	25.1	(1.0)	14.0	(0.8)	4.3	(0.5)
Korea	5.4	(0.5)	9.6	(0.6)	17.3	(0.8)	23.4	(0.7)	22.9	(0.8)	14.4	(0.7)	6.9	(0.8)
Latvia	4.4	(0.5)	12.9	(0.8)	25.8	(0.9)	29.4	(1.0)	19.0	(0.8)	7.1	(0.5)	1.4	(0.2)
Lithuania	9.3	(0.6)	16.4	(0.7)	24.2	(0.7)	25.2	(0.9)	16.5	(0.8)	6.8	(0.5)	1.7	(0.2)

Country	All pupils													
	Below Level 1 (below 357.77 score points)		Level 1 (from 357.77 to less than 420.07 score points)		Level 2 (from 420.07 to less than 482.38 score points)		Level 3 (from 482.38 to less than 544.68 score points)		Level 4 (from 544.68 to less than 606.99 score points)		Level 5 (from 606.99 to less than 669.30 score points)		Level 6 (above 669.30 score points)	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Luxembourg	10.9	(0.6)	16.4	(0.6)	21.7	(0.8)	22.6	(0.7)	17.7	(0.7)	8.6	(0.5)	2.3	(0.3)
Macao (China)	1.0	(0.2)	4.0	(0.4)	12.3	(0.8)	24.8	(0.9)	30.3	(1.2)	20.0	(0.8)	7.7	(0.6)
Malta	14.3	(0.7)	15.9	(0.8)	21.5	(1.0)	23.2	(1.1)	16.6	(0.7)	6.7	(0.6)	1.8	(0.3)
Mexico	26.0	(1.2)	30.3	(0.9)	26.4	(0.9)	13.1	(0.8)	3.7	(0.5)	0.5	(0.1)	0.0	(0.0)
Netherlands	4.5	(0.6)	11.2	(0.7)	19.0	(1.0)	23.2	(1.1)	23.6	(0.9)	14.2	(0.8)	4.3	(0.5)
New Zealand	7.6	(0.5)	14.2	(0.6)	22.8	(0.8)	25.0	(0.7)	18.9	(0.7)	8.8	(0.4)	2.7	(0.3)
Northern Ireland	6.9	(1.1)	13.4	(1.0)	23.7	(1.4)	27.8	(1.3)	19.9	(1.7)	7.0	(1.1)	1.3	(0.3)
Norway	6.5	(0.5)	12.4	(0.6)	21.8	(0.8)	26.5	(0.8)	20.6	(0.9)	9.8	(0.6)	2.4	(0.4)
Poland	4.2	(0.5)	10.5	(0.6)	20.7	(0.8)	26.5	(0.8)	22.3	(0.7)	11.7	(0.7)	4.1	(0.5)
Portugal	9.3	(0.6)	14.0	(0.8)	20.9	(0.8)	24.5	(1.1)	19.7	(0.8)	9.1	(0.6)	2.5	(0.3)
Republic of Ireland	3.8	(0.5)	11.9	(0.7)	24.7	(0.8)	30.5	(0.8)	20.8	(0.8)	7.2	(0.6)	1.0	(0.2)
Russian Federation	6.8	(0.7)	14.9	(0.8)	25.0	(0.9)	27.5	(0.9)	17.8	(0.8)	6.6	(0.6)	1.5	(0.2)
Scotland	8.5	(1.0)	15.0	(1.2)	23.4	(1.1)	24.5	(1.2)	18.0	(1.1)	8.2	(0.8)	2.5	(0.6)
Singapore	1.8	(0.2)	5.3	(0.4)	11.1	(0.5)	19.1	(0.7)	25.8	(0.8)	23.2	(0.7)	13.8	(0.8)
Slovak Republic	10.7	(0.9)	14.4	(0.6)	21.4	(0.9)	24.2	(0.9)	18.6	(0.9)	8.4	(0.6)	2.3	(0.3)

Country	All pupils													
	Below Level 1 (below 357.77 score points)		Level 1 (from 357.77 to less than 420.07 score points)		Level 2 (from 420.07 to less than 482.38 score points)		Level 3 (from 482.38 to less than 544.68 score points)		Level 4 (from 544.68 to less than 606.99 score points)		Level 5 (from 606.99 to less than 669.30 score points)		Level 6 (above 669.30 score points)	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Slovenia	4.8	(0.6)	11.7	(0.7)	21.6	(0.9)	26.4	(0.9)	22.0	(0.8)	10.5	(0.8)	3.1	(0.4)
Spain	8.7	(0.4)	16.0	(0.5)	24.4	(0.4)	26.0	(0.6)	17.5	(0.5)	6.2	(0.3)	1.1	(0.1)
Sweden	6.0	(0.6)	12.8	(0.8)	21.9	(0.9)	25.7	(0.8)	21.0	(0.8)	10.0	(0.7)	2.6	(0.3)
Switzerland	4.8	(0.4)	12.0	(0.8)	19.5	(0.9)	24.4	(1.0)	22.3	(0.9)	12.1	(0.7)	4.9	(0.5)
Turkey	13.8	(0.9)	22.9	(0.8)	27.3	(0.8)	20.4	(0.8)	10.9	(0.5)	3.9	(0.4)	0.9	(0.3)
Ukraine	15.6	(1.2)	20.3	(1.0)	26.2	(1.0)	21.5	(1.0)	11.5	(0.8)	4.0	(0.5)	1.0	(0.3)
United Kingdom	6.4	(0.5)	12.8	(0.6)	22.0	(0.8)	25.5	(0.7)	20.4	(0.7)	9.8	(0.6)	3.1	(0.4)
United States	10.2	(0.8)	16.9	(0.9)	24.2	(1.0)	24.1	(1.0)	16.3	(0.9)	6.8	(0.7)	1.5	(0.3)
Wales	5.9	(0.7)	14.9	(1.2)	26.4	(1.3)	27.7	(1.3)	18.2	(1.2)	6.1	(0.8)	0.8	(0.2)
OECD Average	9.1	(0.1)	14.8	(0.1)	22.2	(0.1)	24.4	(0.1)	18.5	(0.1)	8.5	(0.1)	2.4	(0.1)

Source: PISA 2018 database

Table D1.3 Mathematics performance by gender

Country	Boys		Girls		Gender differences (girls - boys)	
	Mean score		Mean score		Mean score	
	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
Australia	494	(2.4)	488	(2.5)	**-6**	(3.0)
Austria	505	(3.9)	492	(3.8)	**-13**	(5.1)
Belarus	475	(3.2)	469	(3.1)	-6	(3.3)
Belgium	514	(2.9)	502	(2.7)	**-12**	(3.3)
B-S-J-Z (China)	597	(2.9)	586	(2.6)	**-11**	(2.4)
Canada	514	(2.5)	510	(2.7)	**-5**	(2.3)
Chile	421	(3.3)	414	(2.7)	**-7**	(3.6)
Chinese Taipei	533	(4.3)	529	(4.1)	-4	(6.1)
Colombia	401	(3.8)	381	(3.1)	**-20**	(3.5)
Croatia	469	(3.0)	460	(3.4)	**-9**	(3.8)
Cyprus	447	(1.9)	455	(1.7)	**8**	(2.3)
Czech Republic	501	(2.9)	498	(3.2)	-4	(3.6)
Denmark	511	(2.3)	507	(2.3)	-4	(2.9)
England	511	(3.8)	498	(3.5)	**-13**	(4.1)
Estonia	528	(2.2)	519	(2.0)	**-8**	(2.5)
Finland	504	(2.5)	510	(2.2)	**6**	(2.6)
France	499	(2.7)	492	(2.8)	**-6**	(2.9)
Germany	503	(3.0)	496	(3.1)	**-7**	(2.9)
Greece	452	(3.9)	451	(3.2)	0	(3.6)
Hong Kong (China)	548	(3.6)	554	(3.4)	6	(3.6)
Hungary	486	(3.0)	477	(3.2)	**-9**	(4.1)
Iceland	490	(2.5)	500	(2.9)	**10**	(3.7)
Israel	458	(5.2)	467	(3.5)	9	(5.4)
Italy	494	(3.3)	479	(3.1)	**-16**	(3.5)
Japan	532	(3.4)	522	(2.9)	**-10**	(3.9)

Country	Boys		Girls		Gender differences (girls - boys)	
	Mean score		Mean score		Mean score	
	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
Korea	528	(4.1)	524	(4.0)	-4	(5.3)
Latvia	500	(2.2)	493	(2.5)	**-7**	(2.6)
Lithuania	480	(2.4)	482	(2.7)	2	(3.3)
Luxembourg	487	(1.5)	480	(1.7)	**-7**	(2.3)
Macao (China)	560	(2.2)	556	(2.2)	-4	(3.1)
Malta	466	(2.4)	478	(2.7)	**13**	(3.5)
Mexico	415	(2.9)	403	(2.7)	**-12**	(2.6)
Netherlands	520	(3.5)	519	(2.7)	-1	(3.3)
New Zealand	499	(2.5)	490	(2.3)	**-9**	(3.3)
Northern Ireland	489	(6.0)	495	(4.7)	7	(6.9)
Norway	497	(2.5)	505	(2.6)	7	(2.6)
Poland	516	(2.9)	515	(3.1)	-1	(3.0)
Portugal	497	(3.0)	488	(3.1)	**-9**	(3.1)
Republic of Ireland	503	(2.9)	497	(2.7)	-6	(3.4)
Russian Federation	490	(3.2)	485	(3.1)	**-5**	(2.2)
Scotland	497	(5.6)	481	(4.7)	**-16**	(4.1)
Singapore	571	(1.6)	567	(2.3)	-4	(2.3)
Slovak Republic	488	(3.2)	484	(3.2)	-5	(3.9)
Slovenia	509	(1.9)	509	(1.8)	-1	(2.5)
Spain	485	(2.1)	478	(1.5)	**-6**	(2.1)
Sweden	502	(3.1)	503	(3.1)	1	(3.1)
Switzerland	519	(3.0)	512	(3.5)	**-7**	(2.9)
Turkey	456	(3.2)	451	(2.9)	-5	(4.0)
Ukraine	456	(4.3)	449	(3.9)	-7	(3.8)
United Kingdom	508	(3.2)	496	(3.0)	**-12**	(3.6)
United States	482	(3.9)	474	(3.3)	-9	(3.2)
Wales	488	(4.1)	486	(4.5)	-2	(3.4)

Country	Boys		Girls		Gender differences (girls - boys)	
	Mean score		Mean score		Mean score	
	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
OECD Average	492	(0.5)	487	(0.5)	**-5**	(0.6)

Bold font indicates a difference that was statistically significant.

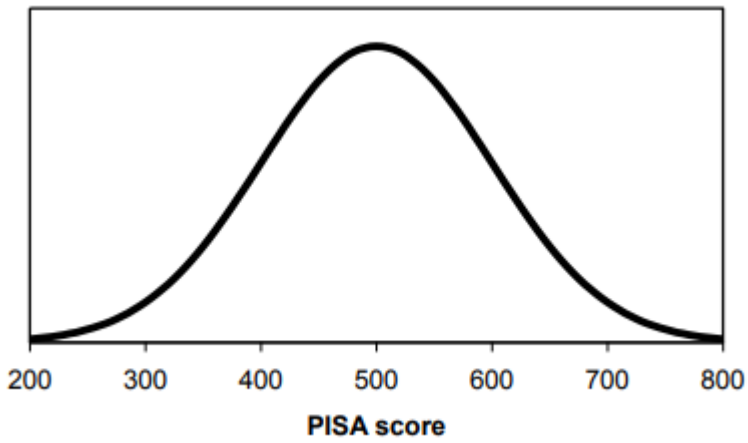
Source: PISA 2018 database

Appendix E Notes on PISA International Scale Scores

A key purpose of the PISA study is to provide data for monitoring and exploring the effectiveness of a country's education system. It is imperative, therefore, that rigorous scaling procedures are used to ensure that results, in PISA score points, are comparable with the results of previous PISA assessments and across countries.

PISA defines an international reporting scale for each subject. Each scale is based on the PISA assessment framework (OECD 2018a). The development of the PISA reporting scales is covered in detail in Chapter 2 of the OECD PISA 2018 International Report (OECD 2019b), and summarised briefly below.

When each subject was first run as a major focus, the 'OECD population' was defined as having a normal distribution with a mean of 500 and standard deviation of 100[80]. This is illustrated in the 'bell-shaped' curve below. In a normal distribution, 68% of pupils fall within one standard deviation of the mean – so in this case would score between 400 and 600 score points. Changes in the overall PISA population each cycle mean that the subject means can change slightly, but remain close to 500.



The OECD defines the population as follows:

1. The representative sample of pupils within each OECD country is selected;

[80] This means that the mean of 500, and the standard deviation of 100 for OECD countries relates to the year 2000 for Reading, 2003 for Mathematics and 2006 for Science.

2. Their results are weighted in such a way that each country[81] in the study has an equal importance (weight);

3. Pupils' scores are adjusted to have the above distribution within this hypothetical population.

Thus the important unit is the country, not the pupil – Russian Federation and Hong Kong have the same weights in that they provide the same amount of information for constructing the scale, despite differences in size.

PISA scores are thus defined on a scale which does not relate directly to any other test measure. In particular, there is no easy or valid way to relate them to 'months of progress' or any measure of individual development.

However, PISA scales are divided into proficiency levels which define the kinds of knowledge and skills needed to complete tasks successfully at each level. (See Appendices B, C and D). Each proficiency level corresponds to a range of about 80 score points. Hence, score-point differences of 80 points can be interpreted as the difference in described skills and knowledge between successive proficiency levels.

[81] PISA refers to the UK as a whole country and does not treat England, Scotland, Wales and Northern Ireland as separate entities.

Appendix F Effort Thermometer

Because of the low-stakes nature of the PISA tests, pupils may make less effort than in high-stakes examinations such as GCSEs or equivalent.

For this reason, at the end of the PISA assessments, pupils were asked to indicate how much effort they had invested in the PISA test, and how much they would have invested in it if the scores were going to be counted in their school marks, and therefore of importance to their future education or career.

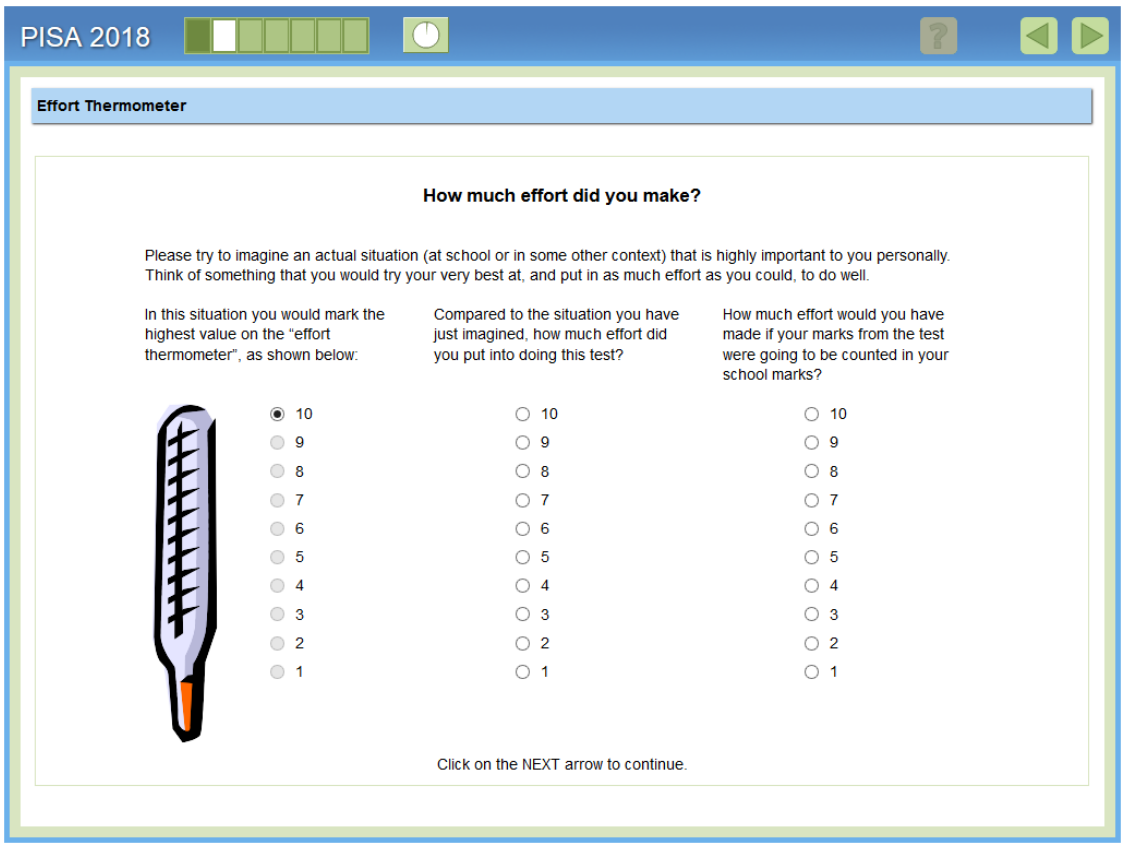


Table F1.1 shows these results and the percentage of pupils in each country that reported that they invested less effort in the PISA test than if their scores were going to be counted in their school marks.

Table F1.1 Effort invested in the PISA assessments (Pupil reports)

Country	Average effort invested in the PISA test (1-10) (10 indicates the effort invested in something that is highly important to pupils personally)		Average effort pupils would have invested in the PISA test (1-10) if scores on the test were going to be counted in their school marks		Percentage of pupils indicating that they invested less effort in the PISA test than if their scores were going to be counted in their school marks	
-	Mean	S.E.	Mean	S.E.	%	S.E.
Australia	7.43	0.03	9.17	0.02	73.37	0.47
Austria	7.15	0.03	9.02	0.03	76.08	0.59
Belarus	8.35	0.03	8.96	0.03	45.45	0.90
Belgium	7.28	0.02	8.91	0.02	76.24	0.62
B-S-J-Z (China)	8.98	0.03	9.63	0.02	38.10	1.04
Canada	7.47	0.02	9.37	0.01	78.76	0.40
Chile	8.00	0.03	9.35	0.02	65.87	0.87
Chinese Taipei	8.29	0.04	9.05	0.03	44.89	0.77
Colombia	8.47	0.04	9.07	0.04	47.44	1.13
Croatia	7.61	0.04	8.94	0.03	64.78	0.72
Czech Republic	7.27	0.03	8.79	0.03	72.18	0.96
Denmark	7.50	0.03	9.41	0.02	79.01	0.69
England	7.43	0.04	9.28	0.02	76.21	0.84
Estonia	7.72	0.03	9.04	0.02	67.97	0.62
Finland	7.98	0.03	9.30	0.02	69.68	0.73
France	7.16	0.04	8.92	0.03	73.70	0.83
Germany	7.17	0.04	9.14	0.03	80.17	0.66
Greece	7.50	0.03	8.89	0.03	68.81	0.85
Hong Kong (China)	7.40	0.03	8.91	0.03	66.84	0.80
Hungary	7.70	0.04	9.02	0.03	66.73	0.92
Iceland	7.66	0.04	9.08	0.03	61.93	0.82
Israel	7.87	0.04	9.28	0.03	62.76	0.75

Country	Average effort invested in the PISA test (1-10) (10 indicates the effort invested in something that is highly important to pupils personally)		Average effort pupils would have invested in the PISA test (1-10) if scores on the test were going to be counted in their school marks		Percentage of pupils indicating that they invested less effort in the PISA test than if their scores were going to be counted in their school marks	
-	Mean	S.E.	Mean	S.E.	%	S.E.
Italy	7.95	0.03	9.19	0.03	68.35	0.87
Japan	7.14	0.04	8.43	0.03	59.80	1.00
Korea	8.26	0.03	9.10	0.03	45.52	0.84
Latvia	7.73	0.03	8.76	0.03	61.09	0.83
Lithuania	7.98	0.02	9.07	0.02	62.07	0.77
Luxembourg	6.98	0.03	8.88	0.02	76.20	0.60
Macao (China)	8.11	0.02	8.82	0.03	53.24	0.84
Mexico	8.63	0.02	9.33	0.02	54.86	0.90
Netherlands	7.45	0.04	9.08	0.03	75.40	0.91
New Zealand	7.56	0.03	9.18	0.02	73.34	0.72
Northern Ireland	7.45	0.06	9.17	0.04	75.64	1.03
Norway	7.38	0.04	9.24	0.03	74.93	0.83
Poland	7.44	0.04	8.96	0.02	68.47	0.83
Portugal	7.50	0.03	9.26	0.02	75.32	0.77
Republic of Ireland	7.98	0.03	9.35	0.02	70.58	0.76
Russian Federation	7.79	0.05	8.78	0.04	51.90	0.89
Scotland	7.69	0.04	9.41	0.03	75.88	1.04
Singapore	7.53	0.03	9.24	0.02	74.19	0.67
Slovak Republic	7.32	0.03	8.67	0.03	65.97	0.94
Slovenia	7.56	0.03	9.13	0.02	72.77	0.64
Sweden	7.40	0.04	9.37	0.02	77.44	0.73
Switzerland	7.24	0.04	9.05	0.03	78.30	0.64
Turkey	8.91	0.04	9.34	0.02	37.15	0.97
Ukraine	8.08	0.03	9.19	0.03	59.61	0.92

Country	Average effort invested in the PISA test (1-10) (10 indicates the effort invested in something that is highly important to pupils personally)		Average effort pupils would have invested in the PISA test (1-10) if scores on the test were going to be counted in their school marks		Percentage of pupils indicating that they invested less effort in the PISA test than if their scores were going to be counted in their school marks	
-	Mean	S.E.	Mean	S.E.	%	S.E.
United Kingdom	7.46	0.03	9.29	0.02	76.01	0.72
United States	8.25	0.03	9.44	0.02	64.84	0.97
Wales	7.68	0.04	9.33	0.02	72.67	1.17
OECD Average	7.65	0.01	9.11	0.00	68.42	0.13

Source: PISA 2018 database

© National Foundation for Educational Research 2019

Reference: DFE-RR961

ISBN: 978-1-83870-075-1

The views expressed in this report are the authors' and do not necessarily reflect those of the Department for Education.

For any enquiries regarding this publication, contact us at:
international.surveys@education.gov.uk or www.education.gov.uk/contactus

This document is available for download at www.gov.uk/government/publications