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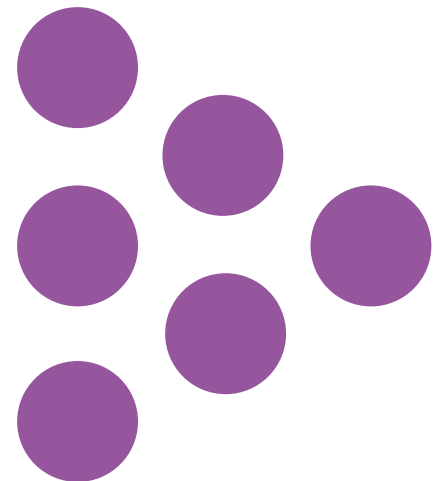
Achievement of 15-year-old pupils in Northern Ireland: PISA 2018 National report

National Foundation for Educational Research (NFER)
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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). Every 3 years PISA tests 15-year-old pupils from all over the world in reading, mathematics and science. The assessments are designed to gauge how well the pupils master these key subjects in order to be prepared for real-life situations in the adult world. Each round of PISA focuses on one of the three key subjects of mathematics, science and reading. In 2018, the major subject domain was reading, with science and mathematics as minor subject domains. Pupils and school principals also completed contextual questionnaires.

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.

Over half a million 15-year-olds from 79 countries and economies took the PISA test in 2018, including all members of the OECD and all 4 countries of the United Kingdom.

In Northern Ireland, PISA 2018 was conducted from October 2018 to January 2019, with a sample of 2360 15-year-old pupils in 75 schools.

Highlights

In 2018, for the first time the mean reading score in Northern Ireland was significantly above the OECD average. There has been no statistically significant change in the reading scores of pupils in Northern Ireland, and across the OECD countries, since 2006. In science and mathematics there were no statistically significant differences between the PISA 2018 scores in Northern Ireland and the OECD averages.

As with previous cycles of PISA, east Asian countries were the highest-performing, 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 subjects.

Northern Ireland, England and Scotland had mean scores significantly higher than Wales for reading. However in both science and mathematics Northern Ireland, Wales and Scotland showed no significant differences, while the mean score for both subjects in England was significantly higher than in the other UK countries.

Achievement in reading

There has been no statistically significant change in the mean reading score of pupils in Northern Ireland since 2006. However, because of a non-significant increase in the mean

score in Northern Ireland and a non-significant decrease in the OECD average score, for the first time in 2018, the mean reading score in Northern Ireland was significantly higher than the OECD average.

In PISA 2018, there were 10 countries where the mean reading score was statistically significantly higher than that in Northern Ireland. The top performers in reading were in the east Asian countries of B-S-J-Z (China), Singapore, Macao (China) and Hong Kong (China), with Estonia, Canada and Finland also scoring highly.

Although Northern Ireland's mean reading score has not shown a statistically significant change since PISA 2006, the relationship to other countries has changed. In PISA 2009, the last time reading was the major domain, 16 countries performed similarly to Northern Ireland. In 2018, 15 of these countries participated in PISA, 4 of which performed significantly below Northern Ireland (Switzerland, Iceland, Netherlands and Hungary); 8 performed similarly (Belgium, Norway, the United States, Sweden, Germany, France, Chinese Taipei and Denmark); and 3 outperformed Northern Ireland (the Republic of Ireland, Estonia and Poland).

In 2018 the attainment gap between high and low achieving pupils in Northern Ireland was not significantly different from the OECD average. The scores for high achievers in Northern Ireland have increased significantly since 2015 but the scores amongst low achievers have not changed significantly.

Northern Ireland had a similar proportion of pupils working at the higher proficiency levels (Levels 5 and 6) to the OECD countries, and a significantly lower proportion of pupils working at the lower proficiency levels (below Level 2).

Pupils in Northern Ireland 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 Northern Ireland outperformed boys in reading; the gender gap in reading was similar to the OECD average.

Achievement in science

The mean score for Northern Ireland in science was not significantly different from the OECD average and not significantly different from that in 2015. However, the decrease in the science score over the longer term, since 2006 and 2009, was statistically significant.

The top performers in science were again from the east Asian countries of (B-S-J-Z (China), Singapore and Macao (China)). Estonia and Finland were the highest-scoring European countries. Amongst all countries that participated in PISA 2018, the majority (46) had science scores significantly below Northern Ireland and 16 countries' mean scores were significantly above Northern Ireland's.

In Northern Ireland, the attainment gap between high and low achievers in science was similar to the OECD average.

There were similar proportions of both low performers in Northern Ireland (below Level 2 of the OECD proficiency levels) and top performers (Levels 5 and 6) compared with the OECD average.

Girls performed significantly better than boys in science, which was also the case with the OECD average where there was a small but statistically significant gender gap in favour of girls.

Achievement in mathematics

Northern Ireland's mean score in mathematics has remained stable and similar to the OECD average since PISA 2006. In 2018, Northern Ireland significantly outperformed the majority of participants, 45 countries, and was significantly outperformed by 17. The number of countries significantly outperforming Northern Ireland in mathematics was similar in 2015 (18).

The 7 highest-performing countries in mathematics were all from east Asia (B-S-J-Z (China), Singapore, Macao (China), Hong Kong (China), Chinese Taipei, Japan and Korea). The highest scoring European countries were Estonia and the Netherlands and, in contrast to reading and science, Finland was not among the top performers.

Northern Ireland had a similar attainment gap between high and low achievers to the OECD average. Between 2015 and 2018, scores amongst high and low achievers have remained similar.

A significantly lower proportion of pupils in Northern Ireland performed at the highest PISA proficiency levels (above Level 5) compared with the OECD average but a significantly lower proportion were working at the lowest levels (below Level 2).

There was no significant difference between boys' and girls' mean scores in mathematics in Northern Ireland, in contrast to the OECD average which showed a significantly higher score for boys.

Variation in reading scores by pupil characteristics

In common with all other countries, pupils from the most advantaged backgrounds in Northern Ireland had higher reading achievement than those from less socio-economically advantaged homes. This gap in achievement was significantly smaller in Northern Ireland than the OECD average disadvantage gap, which was partly because of better performance of the most disadvantaged pupils in Northern Ireland but also partly accounted for by a narrower gap in the socio-economic status of the most and least disadvantaged pupils.

The national measure usually used to understand the effects of disadvantage in education is entitlement to free school meals (FSM). Twenty-four per cent of pupils in the Northern Ireland PISA sample were entitled to FSM and these pupils scored significantly below pupils not entitled to FSM.

The reading performance of pupils in Northern Ireland with an immigrant background was significantly lower than non-immigrant pupils, which is in line with the international trend. The difference is smaller, although still significant, when gender and socio-economic status are taken into account.

The reading performance of pupils in Northern Ireland with special educational needs (SEN) was significantly below that for pupils with no SEN.

Pupils' attitudes and wellbeing

A higher proportion of Northern Ireland pupils considered themselves to be good readers than across the OECD countries on average. However, attitudes towards reading were generally more negative in Northern Ireland than the OECD. Pupils in Northern Ireland were less likely to read books and less likely to read for enjoyment than pupils in the OECD.

Despite these generally negative attitudes, pupils in Northern Ireland performed above the OECD average in reading.

Pupils reported reading online materials far more frequently than printed materials. The most popular reading activity was chatting online, a frequent activity for 91% of pupils in Northern Ireland.

Pupils in Northern Ireland were, overall, less satisfied with their lives than pupils across the OECD. They were more likely to feel sad, scared or worried and less likely to agree that their life has a clear meaning or purpose.

Schools

In Northern Ireland and across the OECD countries, there were larger differences in reading achievement between pupils attending the same school than there were between pupils in different schools. However, the variation of performance between schools was larger in Northern Ireland than the OECD average, as would be expected in a system in which a substantial number of pupils are admitted to post-primary schools on the basis of their academic attainment.

Pupils at grammar schools had a significantly higher mean reading score than those at non-grammar schools, although this analysis did not take into account prior attainment or pupils' socio-economic background.

It was more common in Northern Ireland than the OECD average for principals to report grouping pupils by ability within schools, either by grouping them into different classes or by grouping within classes.

Principals in Northern Ireland 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. They also reported that their fellow pupils were more competitive than cooperative; the reverse was the case for the OECD average.

Principals in Northern Ireland were less likely than those in the OECD to report insufficient numbers of teaching or support staff, but more likely to report insufficiencies of school equipment and poor quality physical infrastructure.

Generally, principals in Northern Ireland reported that their schools were less prepared to enhance learning and teaching using digital devices than schools across the OECD, although they had a greater number of computers per pupil than the OECD on average.

PISA across the UK

There were no significant differences between mean scores for reading in Northern Ireland, England and Scotland and all 3 were significantly above the OECD average. The mean reading score in Wales was significantly lower than the other countries of the UK but not significantly different from the OECD average.

In science and mathematics, the mean scores in Northern Ireland did not differ significantly from those in Scotland and Wales or from the OECD average. The mean scores in England for science and mathematics were significantly higher than the other countries of the UK and also higher than the OECD average.

There were no statistically significant changes in the mean reading scores in Northern Ireland, England and Wales since 2006. However, there was a significant improvement in the mean score for reading in Scotland compared with PISA 2015. In science, Northern Ireland, Wales and Scotland have shown a decline in performance over successive cycles of PISA, each with mean scores in PISA 2018 that were significantly lower than those in PISA 2006, while the mean score in England has remained stable over the same period. In mathematics, Northern Ireland has remained stable while England and Wales have shown improvements. Scotland's mean score in mathematics has declined significantly since PISA 2006.

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, there were no significant differences in Northern Ireland or Wales but boys significantly outperformed girls in England and Scotland.

Headteachers in Scotland reported more problems with pupil truancy and teacher absenteeism than headteachers in England and Wales and principals in Northern Ireland. Principals in Northern Ireland reported insufficient or poor physical school infrastructure more often than headteachers in England, Wales and Scotland, while headteachers in Wales reported greater shortages or inadequacies of educational materials (e.g. textbooks, IT equipment etc.) than the other countries of the UK.

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

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 Northern Ireland were the most satisfied with their lives, compared with the rest of the UK.

1   Introduction

This report presents the reading, mathematics and science results of the international comparison study PISA 2018 for 15-year-olds[1] in Northern Ireland. 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. It 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.

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[1] Refer to Appendix A.4 for a fuller description of the PISA age range

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   List of countries that took part in PISA 2018

In PISA 2018, 79 countries took part. Of these, 37 were members of the OECD (highlighted in bold 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 4 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 technical issues.

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 also the way in which they will be measured. The PISA 2018 framework is available on the OECD website[2]. 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[3], 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.

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[2] https://www.oecd-ilibrary.org/education/pisa-2018-assessment-and-analytical-framework_5c07e4f1-en

[3] Referred to as the Student Questionnaire in international reports and databases.

The PISA school questionnaire is completed by the principal 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 Northern Ireland, 2360 15-year-old pupils in 75 schools completed a 2-hour computer-based assessment and pupil questionnaire. The study was carried out during October 2018 to January 2019, and the majority of pupils who took part were due to complete their GCSEs in 2019. Others were in the year below. While GCSEs tend to focus on assessing a pupil's learning based on the curriculum, PISA is 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 Northern Ireland, 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 were 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 Northern Ireland's sample was representative of its 15-year-old pupil 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 Northern Ireland, 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-old pupils in schools.

The schools which had been selected in the sample were then invited to participate in the study. For all schools that agreed to take part, NFER used software supplied by the international PISA contractor to randomly select 40 pupils who met the PISA age definition within each school. In Northern Ireland, the majority of pupils were in Year 12. 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 replacement schools. 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 A.

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 trialed 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 A.

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 next, 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[4]. It aims to assess the reading ability of pupils in particular year groups (grades) and is more closely aligned to the curriculum content in the participating countries than PISA. The samples are grade-based and participating pupils are in 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).

1.4 Organisation of this report

Chapters 2, 4 and 5 describe PISA results for reading, science and mathematics respectively in Northern Ireland. 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 principals 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.

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

In each chapter of this report, we make comparisons between the results for Northern Ireland 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 Northern Ireland.

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 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 publishes full details of how this analysis is done in the Technical Report (OECD, forthcoming). The full international results are available on the OECD website[5].

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[5] http://www.oecd.org/pisa/

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, however, 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 not be replicated. 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 Northern Ireland. It draws on findings outlined in the PISA International report (OECD, 2019b) and places outcomes for Northern Ireland 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 Northern Ireland achieved a mean score of 501 in reading, a score which was significantly above the OECD average (487) for the first time.
- Northern Ireland's mean reading score has increased by 4 score points since 2015, but this difference is not statistically significant.
- PISA reading scores in Northern Ireland and the OECD have not changed significantly between 2006 and 2018. However, Northern Ireland now outperforms the OECD average by 14 score points, compared to 7 points in 2015, based on current OECD membership.

Gender gap
- Girls significantly outperformed boys in all participating countries.
- Northern Ireland's gender gap (36 score points) was not significantly different from the OECD gender gap (30 score points).
- In 2015, the gender gap in Northern Ireland was at its lowest (14 score points). This was significantly lower than in 2018, when it had increased by 22 score points.

Attainment gap between the highest and lowest achievers
- The attainment gap in Northern Ireland (255) was similar to the OECD average (260).
- Scores amongst the higher-achieving pupils have significantly improved since 2015, but the scores of lower-achieving pupils have not significantly changed in that time.

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

Reading subscales
- In Northern Ireland, pupils achieved higher mean scores in 'locating information' (505) and 'evaluating and reflecting' (504) than in 'understanding' (495).
- Pupils also had higher mean scores for multiple-source texts (502) than for single-source texts (495).

Reading performance in relation to other countries
- 52 countries scored significantly below Northern Ireland in 2018. Thirteen performed at a level that was not significantly different from that of Northern Ireland, while the remaining 10 countries performed significantly better.
- Of the countries that performed similarly to Northern Ireland in 2009, the last time reading was the major domain, 4 performed significantly below Northern Ireland in 2018, 8 performed similarly and 3 outperformed Northern Ireland.

2.1 Northern Ireland's performance in reading

In 2018, pupils in Northern Ireland achieved a mean score of 501 in reading which was significantly[6] above the OECD average (487)[7] for the first time. There was a non-significant increase of 4 score points since 2015 in Northern Ireland's mean reading score. The OECD countries and Northern Ireland have maintained their average level of performance in reading, with no significant change since 2006. However, as seen in Figure 2.1 Northern Ireland's (non-significant) increase and the OECD's (non-significant) decrease in mean scores has resulted in a wider, significant, score difference between the 2.

It is worth noting that although 2018 was the first time performance in Northern Ireland was significantly higher than the OECD average in a given year, had the same countries that made up the OECD average in 2018 also constituted the OECD average in previous years, then Northern Ireland's mean score would have also been significantly above the OECD average in 2006 and 2009. See Chapter 1 for further information on the countries included in the 2018 OECD average.

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

Figure 2.1   Trends over time in reading scores in Northern Ireland and the OECD[8]
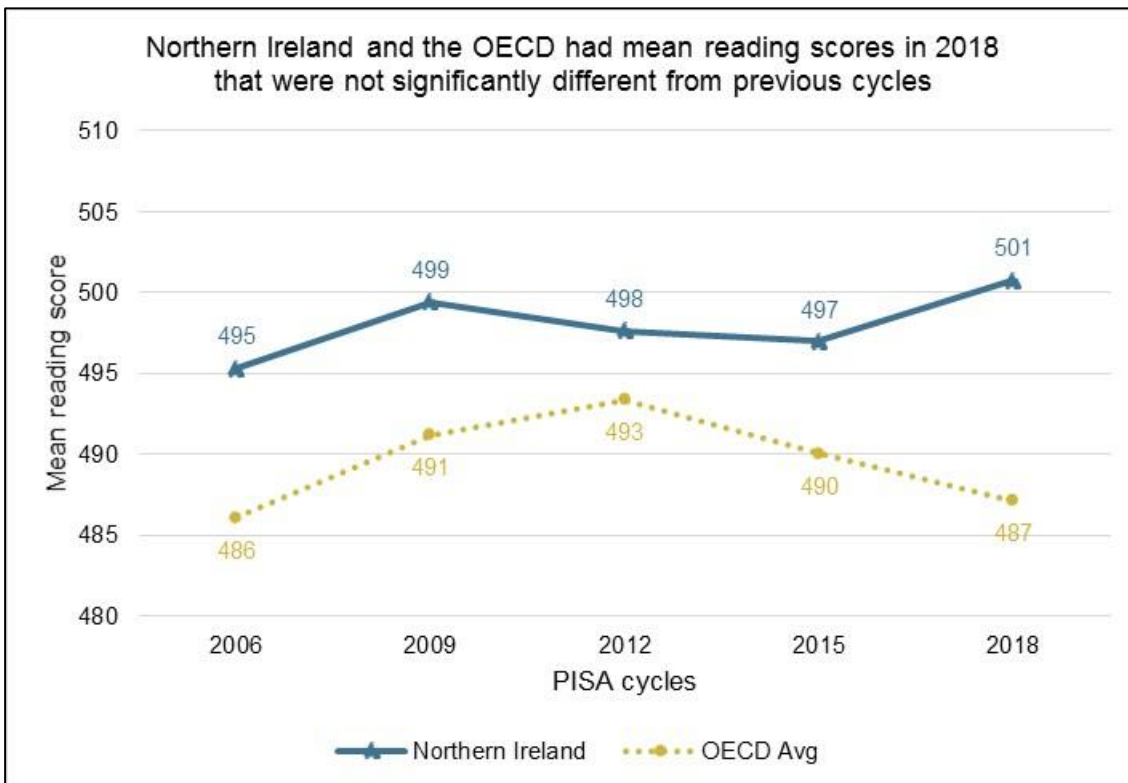
Source: PISA 2018 database; Bradshaw *et al.*, 2007; Bradshaw *et al.*, 2010; Wheater *et al.*, 2014; Jerrim *et al.*, 2016

Key point

In PISA 2018, Northern Ireland's mean score for reading was significantly higher than the OECD average for the first time.

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[8] Note: the OECD average for 2012, 2015 and 2018 is based upon AVR36a 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 on AV35a results (excluding Austria and Spain) while the OECD average for 2006 is based upon AV35b results (excluding the United States and Spain), both are also presented in the OECD International results Table 1.B1.10.

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, 2019).

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 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[9] points 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 in 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.

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

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, i.e. texts composed of several units of text, created separately by different authors. These types of text 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 combination of questions that a pupil saw depended on their 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 on 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 Northern Ireland's performance in the PISA reading assessment and compare it with the OECD average. This includes 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, we draw on a range of other countries for comparison to Northern Ireland.

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 Northern Ireland (and the 3 other UK countries) are 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[10] participating countries, 52 countries performed significantly below Northern Ireland, 13 countries performed at a level that was not significantly different and 10 scored significantly higher. These countries are shown in Table 2.1[11]. 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, 6 outperformed Northern Ireland, 12 performed similarly and 17 performed less well. This indicates that, in terms of reading achievement, Northern Ireland, 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, Luxembourg and Colombia.)

Of the 10 participating countries with mean reading scores that were significantly higher than Northern Ireland, 2 are English speaking (the 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 Northern Ireland's.

Compared with previous cycles, Northern Ireland was outperformed by fewer countries in 2018 (10) than in 2015 (12) (Jerrim *et al.,* 2016) and 2012 (19) (Wheater *et al.,* 2013). In fact, in 2018, the mean reading score of Northern Ireland's pupils was not significantly different from the mean scores of pupils in 4 countries that had outperformed them in 2015 (New Zealand, Japan, Norway and Germany). Additionally, Northern Ireland's pupils outperformed pupils in 6 countries that had scores that were not significantly different to them in 2015 (Czech Republic, Netherlands, Switzerland, the Russian Federation, Croatia and Latvia).

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[10] 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.
[11] Note: Please refer to section 1.4 in Chapter 1 when interpreting these results.

Key point

In 2018, 10 countries significantly outperformed Northern Ireland in reading. This compares to 12 in 2015 and 19 in 2012.

Key point

In 2018, the mean reading score in Northern Ireland was not significantly different from the mean scores of 4 countries that had significantly outperformed Northern Ireland in 2015.

Table 2.1   PISA International results for reading

Participants with significantly HIGHER reading scores than Northern Ireland

Country	Scale score		Country	Scale score	
*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		Poland	512	

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

Country	Scale score		Country	Scale score	
Sweden	506		**Northern Ireland**	**501**	
New Zealand	506		Norway	499	∨
United States	505		Germany	498	
Japan	504	∨	Slovenia	495	∨
Australia	503		Belgium	493	
Chinese Taipei	503		France	493	
Denmark	501		Portugal	492	

Participants with significantly LOWER reading scores than Northern Ireland

Country	Scale score		Country	Scale score	
Czech Republic	490		*Belarus*	*474*	
OECD Average	**487**		Israel	470	
Netherlands	485	∨	Luxembourg	470	∨
Austria	484		*Ukraine*	*466*	
Switzerland	484		Turkey	466	∧
Croatia	*479*		Slovak Republic	458	
Latvia	479	∨	Greece	457	
Russian Federation	*479*	∨	Chile	452	
Italy	476		Mexico	420	
Hungary	476		Colombia	412	∨
Lithuania	476		plus 31 other countries scoring <450		
Iceland	474				

∧∨ Indicates a statistically significant change in reading since PISA 2015
OECD countries (not italicised)
Countries not in OECD (italicised)
* B-S-J-Z (China) different provinces from 2015

Source: PISA 2018 database

The last time reading was a major domain in PISA was 2009. It is useful, therefore, to look at the longer term trends from 2009 and other cycles where relevant. There were 16 countries that performed similarly to Northern Ireland in 2009 (Bradshaw *et al.,* 2010). In 2018, 4 of these performed significantly below Northern Ireland (Switzerland, Iceland, Netherlands and Hungary), 8 performed similarly (Belgium, Norway, the United States, Sweden, Germany, France, Chinese Taipei and Denmark) and 3 outperformed Northern Ireland (the Republic of Ireland, Estonia and Poland). One country, Liechtenstein, did not participate in 2018.

Among the group of countries that performed similarly to Northern Ireland in 2009, some had significantly higher scores in 2018 than in 2009 (such as Poland and Estonia), whereas some had significantly lower scores (such as Hungary and Belgium) showing varied patterns of performance.

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

Some countries that were similar to Northern Ireland in 2009 have since followed different patterns of performance

	2006	2009	2012	2015	2018
Northern Ireland	495	499	498	497	501
Estonia	501*	501*	516	519	523
Republic of Ireland	517	496*	523	521	518
Denmark	494	495	496	500	501
Netherlands	507*	508*	511*	503*	485
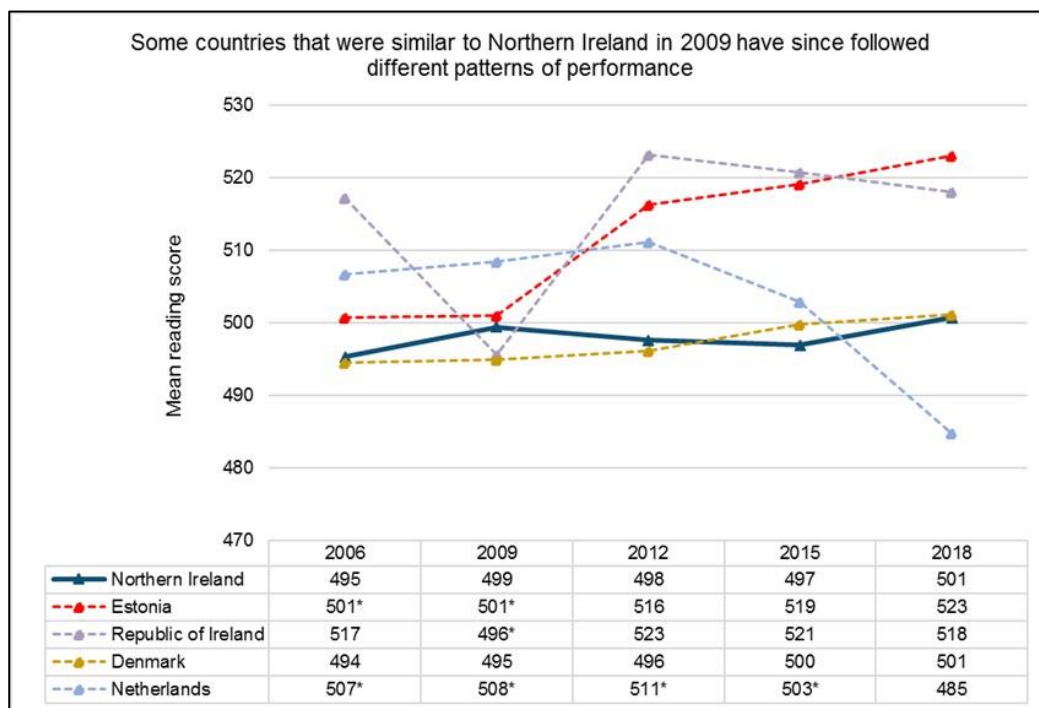
*Indicates a score is significantly different from the given country's 2018 score

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

As highlighted earlier, Northern Ireland has maintained a similar pattern of performance in reading over time, with a 2018 score not significantly different to previous cycles. This was also the case for Denmark, which has had a very similar pattern to Northern Ireland over PISA cycles. The Netherlands, however, had a 2018 mean score significantly lower than previous mean reading scores, showing a decline in performance over time. In 2015, the Netherlands' score was not significantly different from Northern Ireland's, but in 2018 it was significantly below.

Estonia scored similarly to Northern Ireland in 2006 and 2009 but the upward trend in terms of its performance over the last 3 cycles has put it among the highest performers in reading. The Republic of Ireland had a mean reading score in 2009 that was significantly below its 2018 mean score. As Figure 2.2 suggests, although the reading score for the Republic of Ireland was similar to Northern Ireland in 2009, this was due to a dip in the Republic's performance; it has since had higher mean scores, putting it significantly above Northern Ireland.

2.4   Reading subscale scores in Northern Ireland

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. Northern Ireland's overall mean score for reading was 501 score points.

The PISA 2018 reading literacy framework[12] 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 previously referred to as 'accessing and retrieving' in the 2009 PISA reading literacy framework. Readers need to assess the relevancy, 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.

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[12] 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
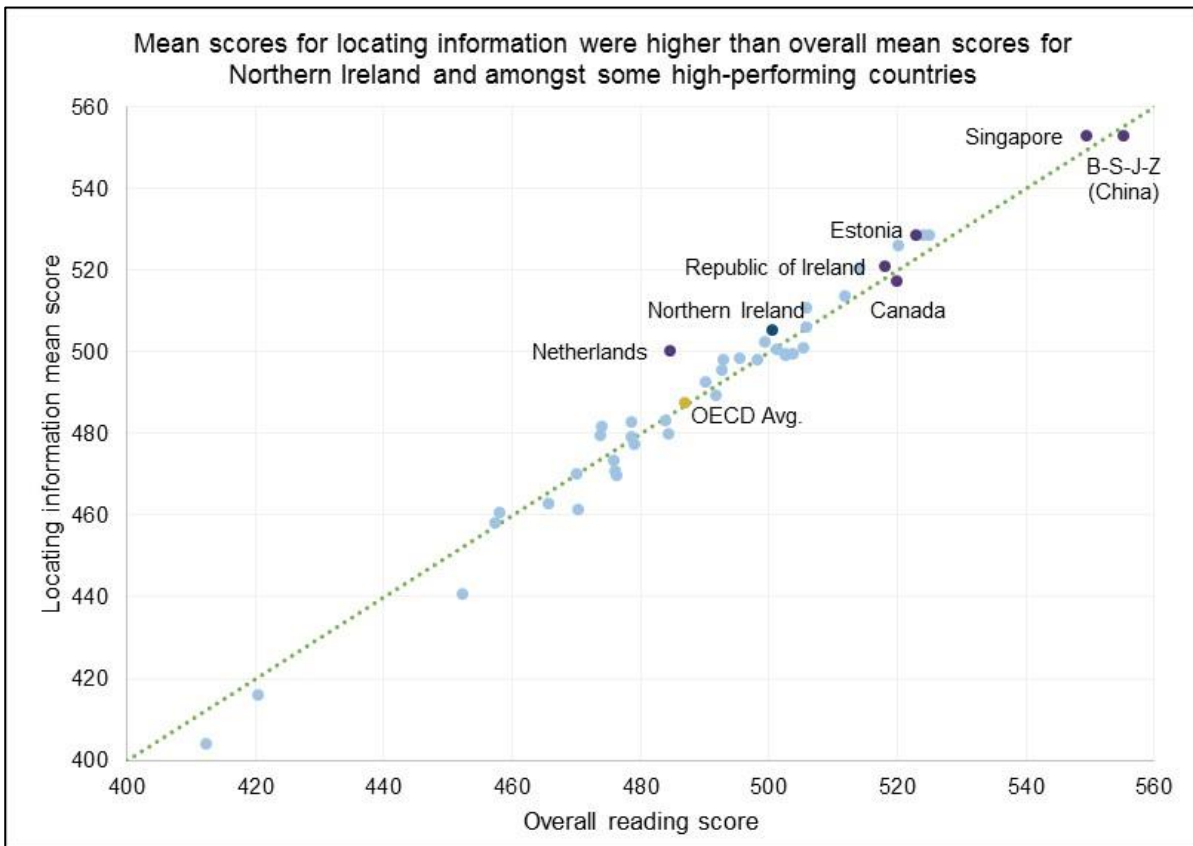
Mean scores for locating information were higher than overall mean scores for Northern Ireland and amongst some high-performing countries

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

Northern Ireland's mean score for locating information (505) was 4 score points higher than its overall reading score. For the OECD average, both the overall mean reading score and the score for locating information were 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 between the overall mean score and the score for locating information, 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 score points higher than the 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 higher-performing countries, such as Singapore, Estonia and in the Republic of Ireland.

In 2009, Northern Ireland's mean score for locating information (then known as accessing and retrieving) was 1 score point lower than its overall the mean reading score (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 reading literacy frameworks this has been called 'integrating and interpreting', and 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
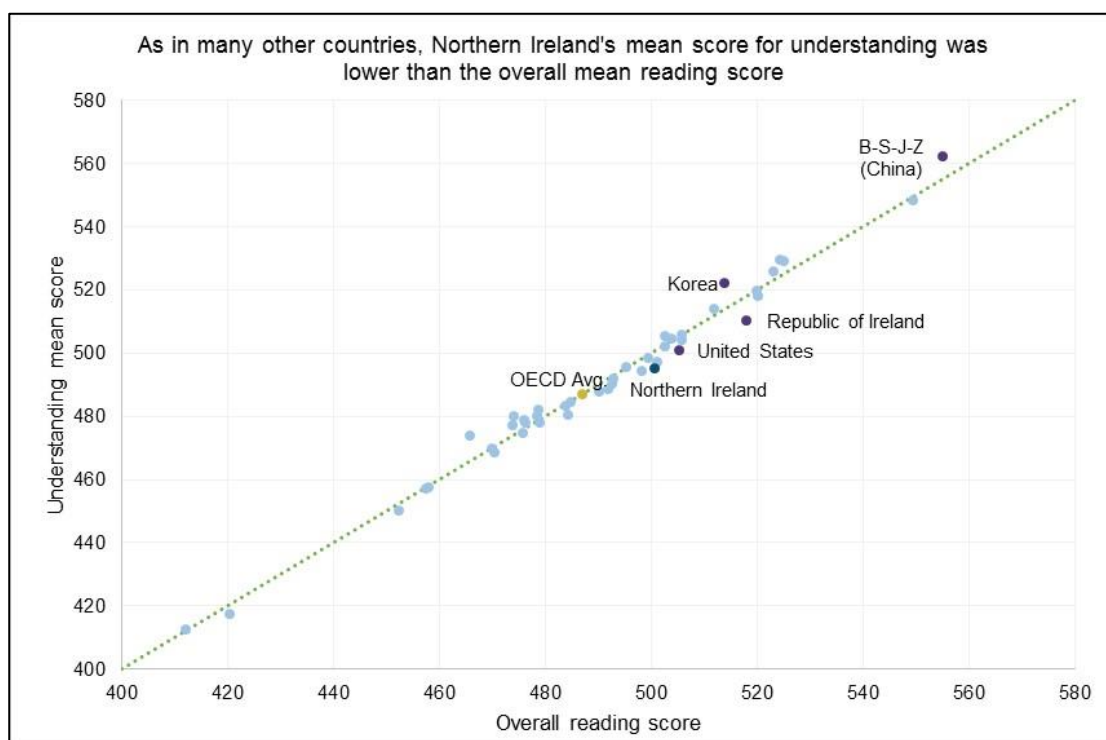
Note: This scatterplot contains all countries either in the OECD or with a score above 450

Source: PISA 2018 database

Northern Ireland's pupils' score in understanding (495) was 6 score points lower than their overall mean reading score. As Figure 2.4 shows, lower mean scores for understanding were seen in many other countries such as the United States, the Republic of Ireland and with the OECD average (by 1 score point). However, some 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.

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In 2009, Northern Ireland also had a lower mean score in understanding (then known as integrating and interpreting). This was 2 score points lower than the overall mean.

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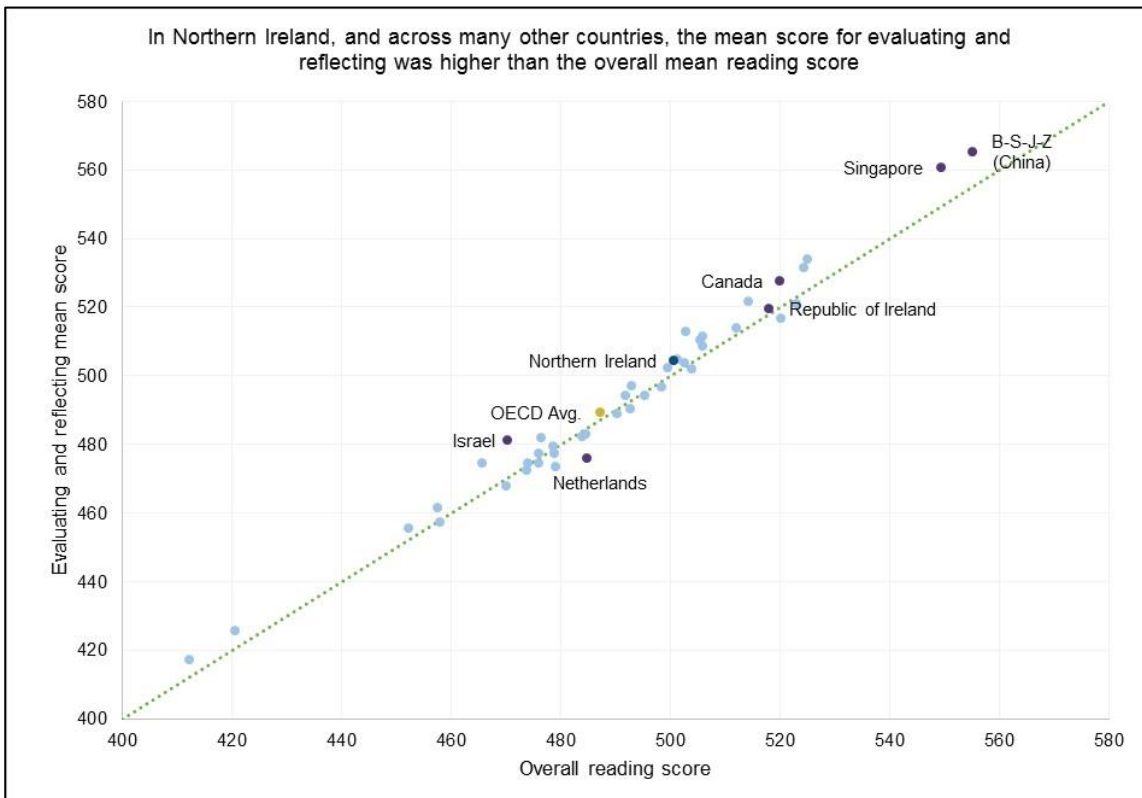
Note: This scatterplot includes all OECD countries and those with a mean score above 450

As was the case for locating information, Northern Ireland's pupils' score for evaluating and reflecting (504) was 4 score points[13] higher than their overall mean score. This pattern was seen across many high-performing countries, such as Canada, Singapore, B-S-J-Z (China), the Republic of Ireland and with the OECD average. Israel and Singapore both had the largest difference between mean scores, with a mean score for evaluating and reflecting that was 11 score points above the overall mean reading score.

In 2009, evaluating and reflecting was the strongest process in Northern Ireland, with a difference of 5 score points above the overall reading mean (Bradshaw *et al.,* 2010).

Key point

Northern Ireland's mean score for locating information and evaluating and reflecting was higher than their score for understanding.

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[13] after taking into account the rounding of figures

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 shop.

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. The 2018 reading literacy framework was consequently 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).

2.4.6 Source

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

Figure 2.6   Reading process source subscale scores across countries: multiple-source vs. single-source texts
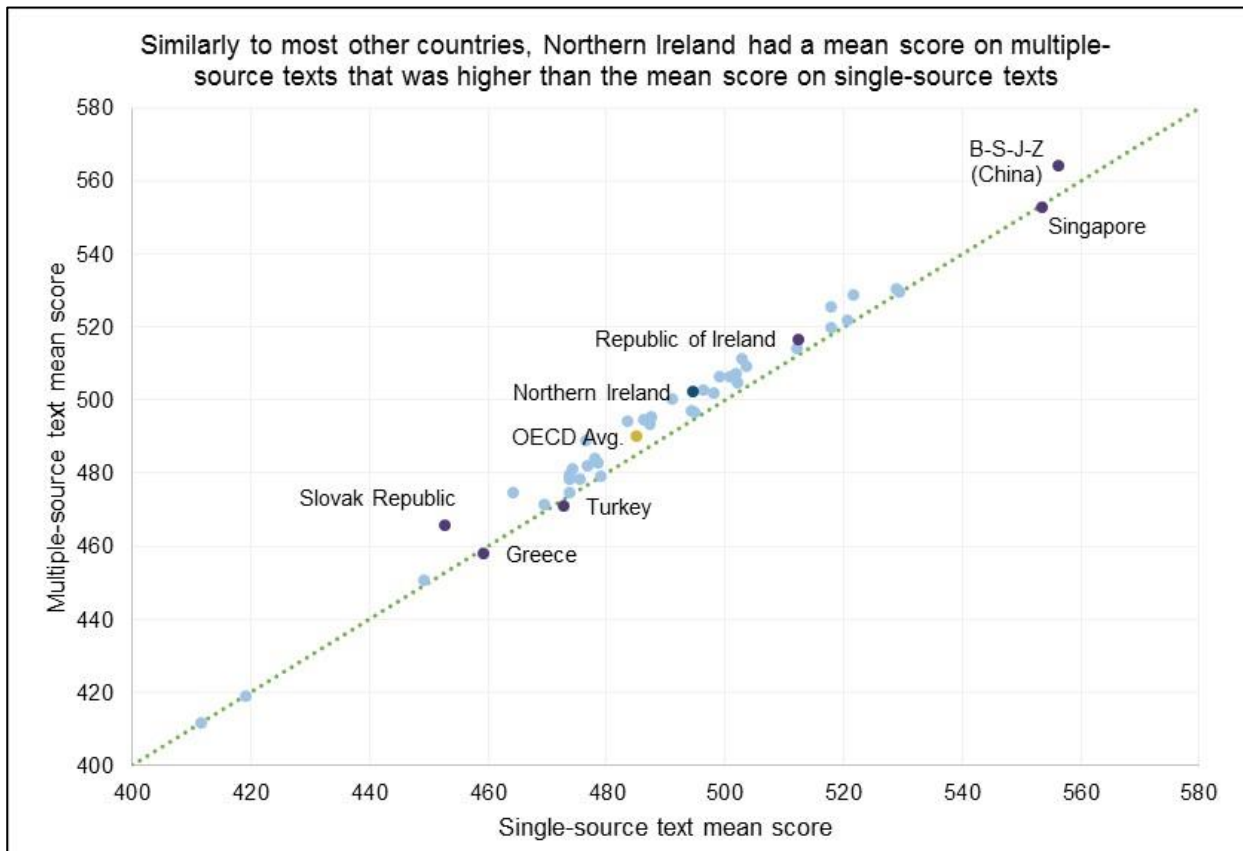
Note: This scatterplot includes all OECD countries and those with a mean score above 450

Source: PISA 2018 database

Northern Ireland's mean score on multiple-source texts (502) was 8 score points[14] higher than the mean score for single-source texts (495). 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. Interestingly, Singapore had a higher mean score on single-source texts (by 1 score point), which was also seen in Greece and Turkey (both with a 2 score point difference).

Key point

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

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[14] after taking into account the rounding of figures

2.5   Differences between highest and lowest achievers

In addition to knowing how well pupils in Northern Ireland 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 proportions of high- and low-scoring pupils (the highest and lowest achievers). A country with a wide spread of attainment may have large proportions of pupils who are underachieving as well as pupils performing at the highest levels. A country with a lower spread of attainment may have a smaller proportion of 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 Northern Ireland and the OECD
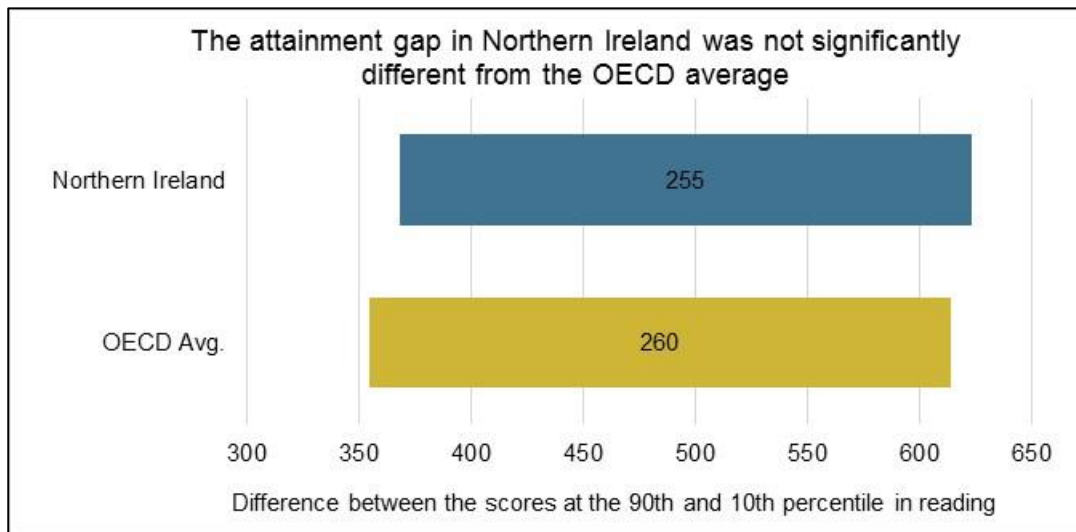
The attainment gap in Northern Ireland was not significantly
different from the OECD average

The attainment gap between Northern Ireland's highest and lowest achieving pupils was 255 score points. This was not significantly different from the OECD average of 260 score points. As Figure 2.7 shows, lower-achieving pupils in Northern Ireland scored higher than lower-achieving pupils in the OECD (368 for Northern Ireland, 354 for the OECD average), as did pupils at the 90th percentile, scoring 623 in Northern Ireland compared with 614 for the OECD average.

In 2015, the attainment gap in reading in Northern Ireland was 220 score points (Jerrim *et al.,* 2016); pupils at the 10th percentile scored 385, while those at the 90th percentile scored 605. Since 2015, scores at the 90th percentile have improved significantly, while those at the 10th percentile have not changed significantly.

> **Key point**
>
> Northern Ireland's attainment gap was 5 score points lower than, but not significantly different from, the OECD average.

> **Key point**
>
> Since 2015, scores at the 90th percentile have significantly improved, whereas the score at the 10th percentile has not changed significantly.

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[15]: 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. Northern Ireland is categorised as higher-performing compared to the OECD average, and with a similar gap.

Most countries cluster around the OECD average, although some differ noticeably. For example, high-performer B-S-J-Z (China) had a lower attainment gap than many other countries, including Northern Ireland, whereas another high-performing country, Singapore, had a much wider gap. Israel, which scored significantly below Northern Ireland in reading had an attainment gap of 332 points, noticeably wider than any other country. The gap for Northern Ireland was smaller than in some of the countries which scored similarly overall, such as Australia.

Figure 2.8   Attainment gap in reading scores across PISA 2018 countries
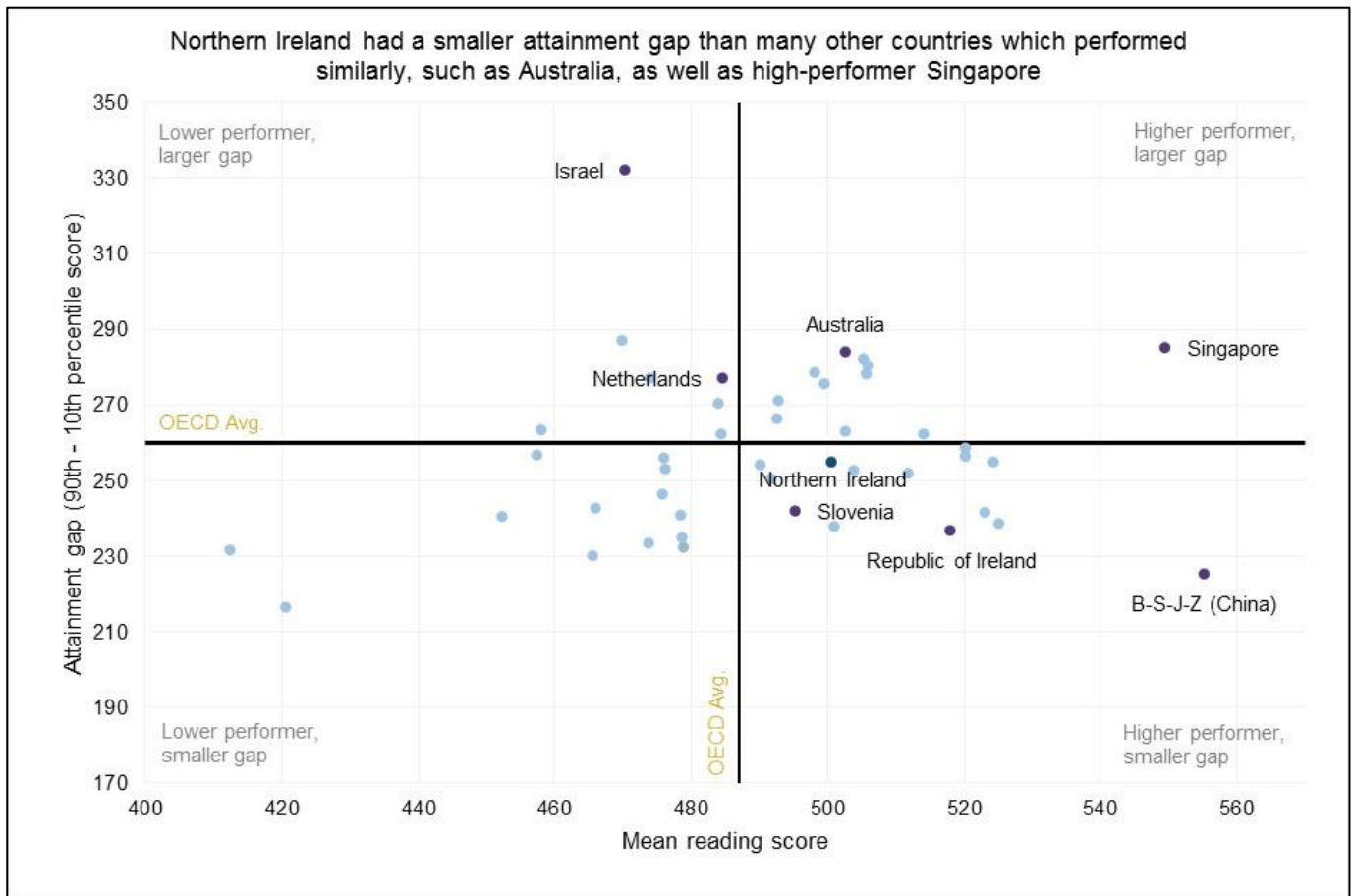
Note: This scatterplot includes all OECD countries and those with a mean score above 450

Source: PISA 2018 database

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[15] Note: statistical significance, in relation to the OECD, is not accounted for in this graph.

To further consider Northern Ireland'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 2.9 shows countries with similar scores at either the 10th or 90th percentile to Northern Ireland. A country which performed similarly to Northern Ireland may have a different profile of performance when looking at high and low achievers. For example, Slovenia had a similar score at the 10th percentile, but a lower score at the 90th percentile. This gave Slovenia a smaller attainment gap.

The Republic of Ireland had a score at the 90th percentile that was slightly above that of Northern Ireland (by 11 score points), and a score at the 10th percentile that was 30 score points higher, leading to the Republic of Ireland's higher overall score and smaller attainment gap.

We also saw earlier how Northern Ireland's mean reading score was significantly above that of the Netherlands'. Figure 2.9 illustrates how the difference between the 2 countries is based on Northern Ireland's higher performance at the 10th percentile; scores at the 90th percentile are only 3 score points apart.

Figure 2.9   Attainment gap in countries with similar performances to Northern Ireland at either the 10th or 90th percentiles

The Netherlands and Slovenia had different sized attainment gaps from Northern Ireland, despite having similar scores at either the 10th or 90th percentiles

Netherlands   277
Republic of Ireland   236
Northern Ireland   255
Slovenia   242

Difference between the scores at the 90th and 10th percentile in reading
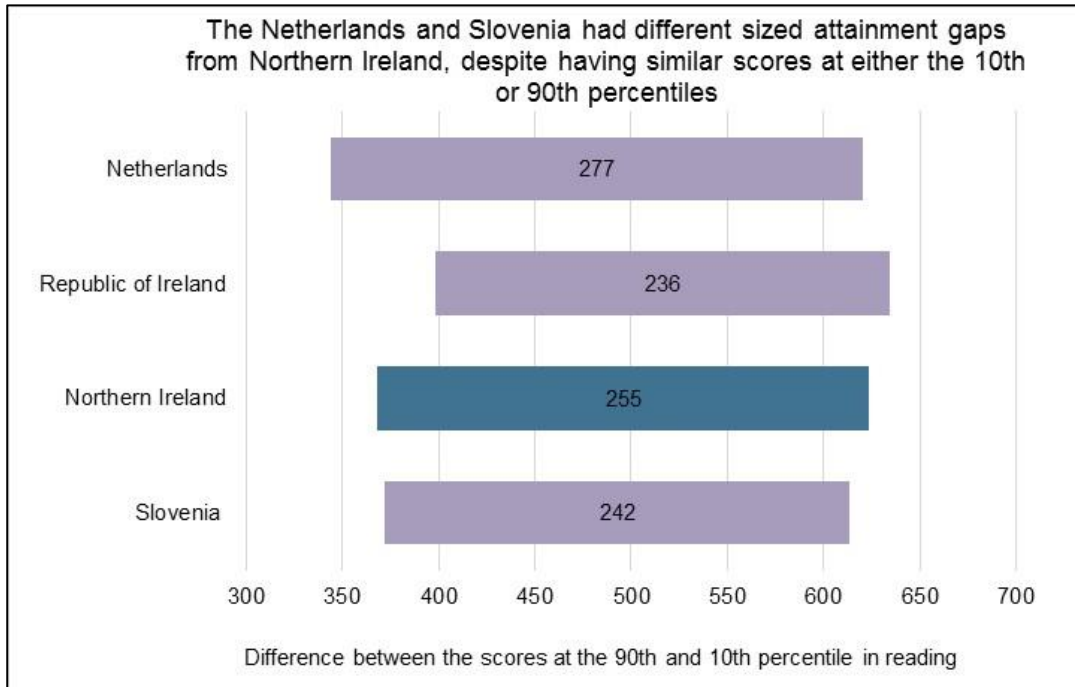
2.5.2 Performance across PISA proficiency levels

The second way of examining the spread of attainment is by looking at Northern Ireland'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. These performance levels are outlined in Appendix A3. In 2018, an additional proficiency level was added, Level 1c. This was as a result of the PISA for Development Programme (OECD, 2018a), introducing some less-difficult questions and providing more information about the pupils who would have previously been classified as below Level 1b (see Chapter 5 of the OECD International report for more details).

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

Figure 2.10   Reading proficiency levels in Northern Ireland and the OECD
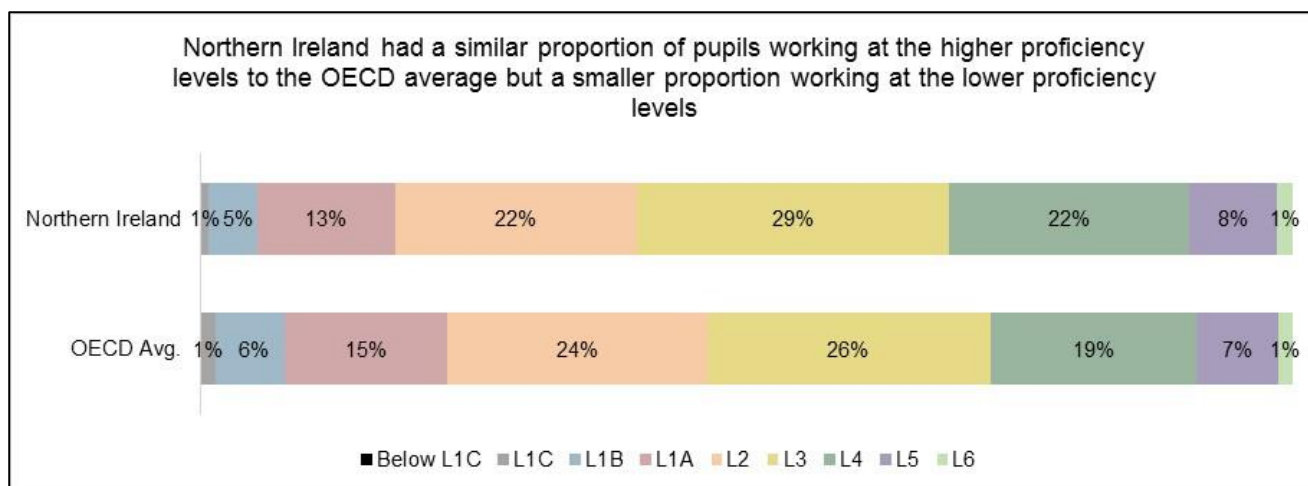
Note: All percentages are rounded

Source: PISA 2018 database

Northern Ireland had a significantly smaller proportion of pupils working at the lower proficiency levels (below Level 2) than the OECD, 18%[16] and 23%[17] respectively. In comparison, the proportions of pupils working at the higher level (Levels 5 and 6) was the same in Northern Ireland as in the OECD countries, 9%[18].

The proportion of pupils working at the higher proficiency levels (Levels 5 and 6) in Northern Ireland increased significantly between 2015 and 2018, from 6% in 2015 to 9% in

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[16] after taking into account the rounding of figures
[17] after taking into account the rounding of figures
[18] after taking into account the rounding of figures

2018. However, the proportions of pupils working below Level 2 has not changed significantly during that time (15% in 2015, 18% in 2018)[19].

Figure 2.11 Reading Proficiency levels by cognitive process in Northern Ireland

The proportion of pupils achieving at each proficiency level in Northern Ireland was similar for all reading processes

	Below L1C	L1C	L1B	L1A	L2	L3	L4	L5	L6
Locating information	1%	4%	12%	22%	28%	22%	9%	2%	
Understanding	1%	5%	14%	23%	28%	20%	8%	1%	
Evaluating and reflecting	1%	5%	12%	22%	27%	22%	9%	2%	
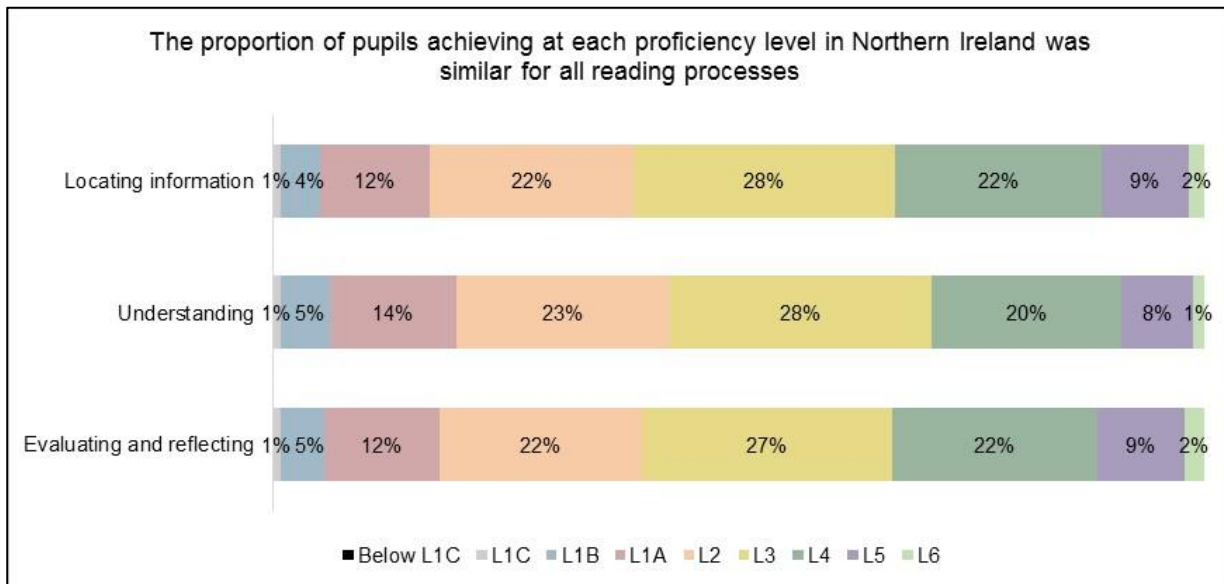
Note: All percentages are rounded

Source: PISA 2018 database

In general, pupils in Northern Ireland had a mean score which was higher in the evaluating and reflecting process and the locating information process than understanding. While the distribution of proficiency levels was similar across all 3 processes, there were 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), performance Northern Ireland has remained stable. In 2009 and 2018, similar proportions of pupils achieved at each proficiency level for each subscale.

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[19] Note: the change in the proportion of pupils working below Level 2 before rounding is 2.579% (compared with 3.498% for Level 5 and above) and the standard errors are larger in 2015 and 2018 than for the proportion of pupils working at the higher proficiency levels. This is why, although both have changed by 3% (when rounded), the change for below Level 2 is not significant but the change for Level 5 and above is.

Figure 2.12 Reading proficiency levels by reading source in Northern Ireland
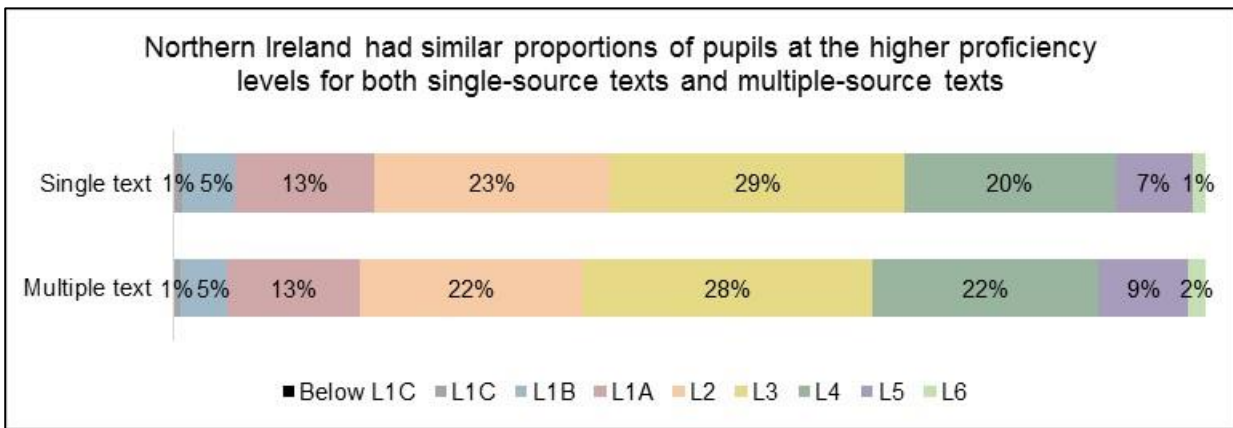
Note: All percentages are rounded

Source: PISA 2018 database

In Northern Ireland, as in many other countries, pupils had higher mean scores for multiple-source texts than for single-source texts. However, the proportions of pupils at each proficiency level for both sources were similar. For example, 9%[20] of pupils were working at the higher proficiency levels (Levels 5 and 6) for single-source texts compared with 10%[21] for multiple-source. Similarly there was a 1 percentage point difference[22] between proportions of pupils performing at the lower proficiency levels for each reading source.

The source subscales have a natural sequence; reading skills are developed first with single-source texts and readers progress to multiple-source texts (OECD, 2019b). Pupils at Level 4 and above can typically draw information from multiple-source texts (see Appendix A3).

2.6 Differences between boys and girls

In Northern Ireland, there was a significant difference between the mean reading scores for boys (482) and for girls (519), a difference of 36 score points[23]. This was larger than, but not significantly different from, the OECD average gap of 30 points (with scores of 472 for boys and 502 for girls).

In 2015, the gender difference was at its lowest in Northern Ireland (Jerrim *et al.,* 2016), with a 14 score point gap, significantly smaller than in 2018. Mean scores for girls and

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[20] after taking into account the rounding of figures
[21] after taking into account the rounding of figures
[22] after taking into account the rounding of figures
[23] after taking into account the rounding of figures

boys have not significantly changed between these 2 cycles, but the non-significant changes in mean score have led to a significant change in the size of the gender gap.

Figure 2.13 Gender differences in reading scores in Northern Ireland and the OECD

	Overall reading score	Mean score girls	Mean score boys	Difference girls - boys
Northern Ireland	501	519	482	+36*
OECD Avg.	487	502	472	+30*

*The difference is statistically significant
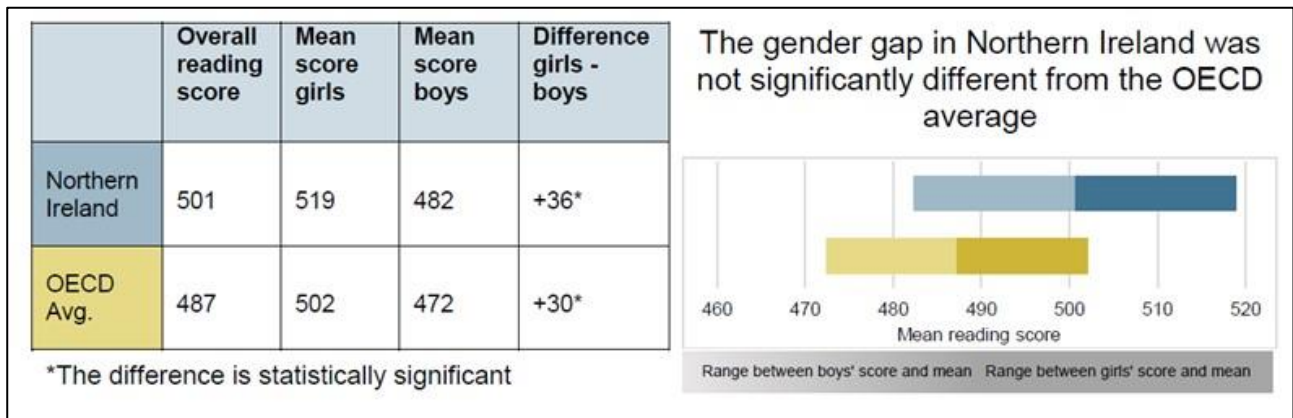
The gender gap in Northern Ireland was not significantly different from the OECD average

Internationally, girls significantly outperformed boys in reading in every participating country, although the gap was much wider in some countries than in others. This is evident 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 favour of girls.

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) for more detail.

Figure 2.14 Gender differences in reading scores across countries
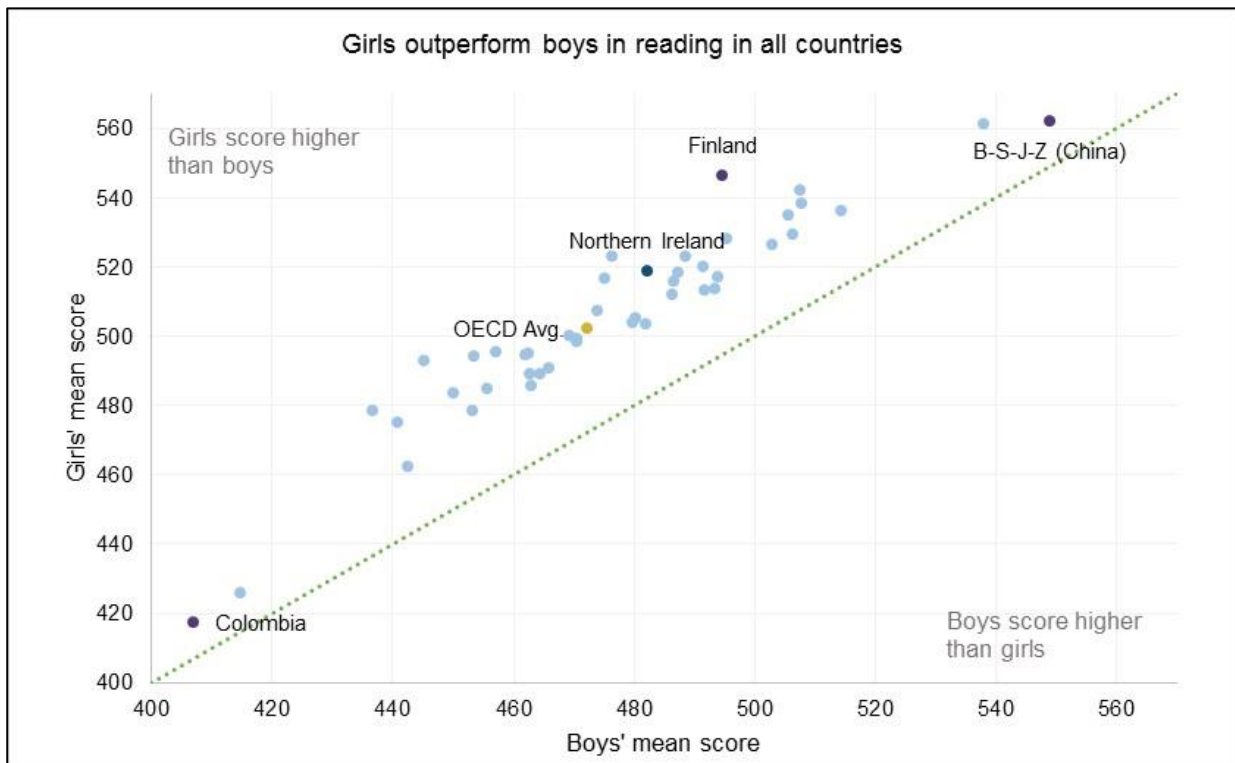
Note: This scatterplot includes all OECD countries and those with a mean score above 450

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

Key point

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

Figure 2.15 Gender differences in reading processes in Northern Ireland and the OECD

	Overall score	Mean score girls	Mean score boys	Difference girls - boys
Northern Ireland	505	523	488	+35*
OECD Avg.	487	502	472	+30*

*The difference is statistically significant

Locating information

	Overall score	Mean score girls	Mean score boys	Difference girls - boys
Northern Ireland	495	511	478	+33*
OECD Avg.	487	502	472	+30*

*The difference is statistically significant

Understanding

	Overall score	Mean score girls	Mean score boys	Difference girls - boys
Northern Ireland	504	522	487	+35*
OECD Avg.	489	502	477	+26*

*The difference is statistically significant

Evaluating and reflecting

Source: PISA 2018 database

As noted in section 2.4, the performance of pupils in Northern Ireland varied somewhat across the 3 reading subscales: pupils had a higher mean score in the evaluating and reflecting and locating information subscales than the understanding subscale. Girls in Northern Ireland significantly outperformed boys in all 3 processes, and the difference was similar across the processes. The gender gap for understanding was the smallest at 33 score points, compared with 35 for the other 2 processes.

In all 3 processes the gender gap was larger in Northern Ireland than the OECD average because, whilst boys in Northern Ireland achieved higher mean scores than the OECD average for each process, the scores for girls were even higher. Across OECD countries,

the gender gap was smallest in evaluating and reflecting, with a 26[24] score point difference compared with locating information and understanding where the gaps were 30 points each.

Figure 2.16 Gender differences in reading source in Northern Ireland and the OECD

	Overall score	Mean score girls	Mean score boys	Difference girls - boys
Northern Ireland	495	512	477	+36*
OECD Avg.	485	501	469	+32*

*The difference is statistically significant

	Overall score	Mean score girls	Mean score boys	Difference girls - boys
Northern Ireland	502	519	486	+33*
OECD Avg.	490	503	477	+26*

*The difference is statistically significant
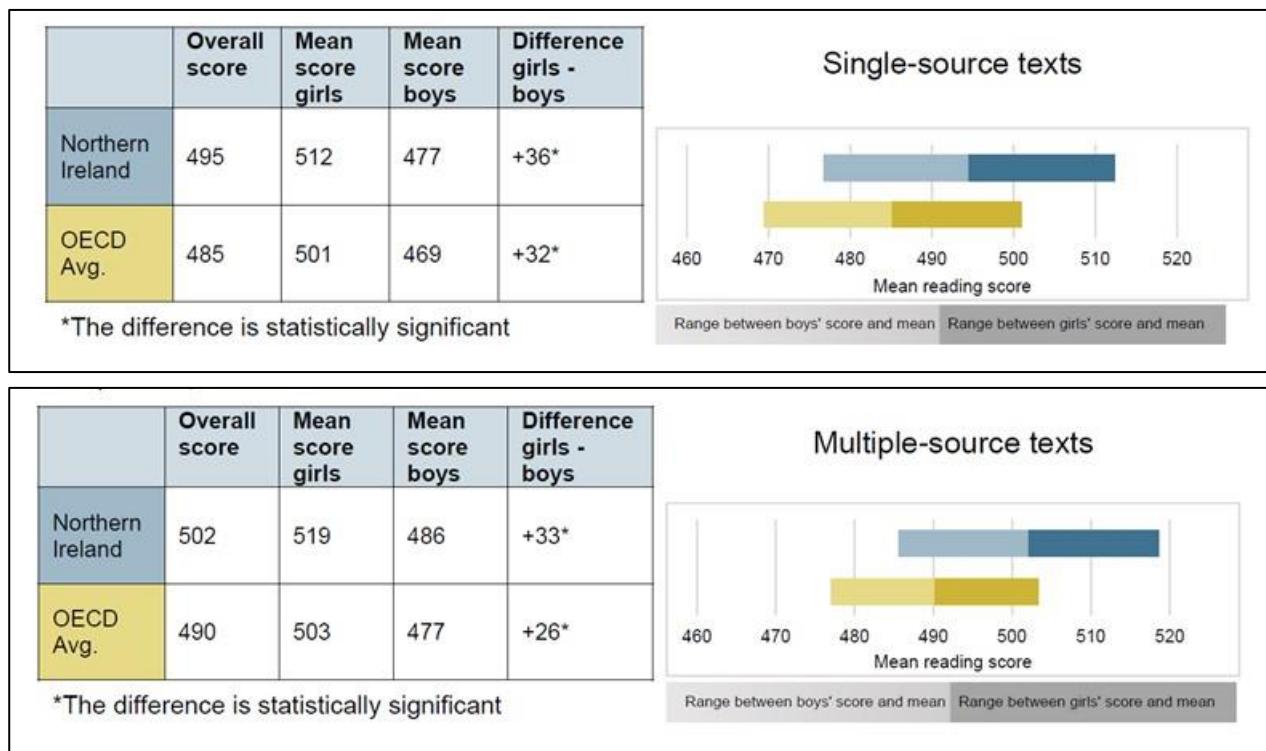
Source: PISA 2018 database

In Northern Ireland 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 36 score points[25] for single-source and 33 score points for multiple-source texts. This is unsurprising, given girls' performance in reading overall.

Across OECD countries, the gap between boys and girls was also 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 texts. The OECD average gap was slightly smaller than that in Northern Ireland, again because while boys in Northern Ireland scored higher than the OECD average, girls also did so but with a larger margin.

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[24] after taking account for the rounding of figures
[25] after taking account for the rounding of figures

3   Pupils

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

Key findings

Pupil background

- In PISA 2018, there was a gap in achievement between the most and least disadvantaged pupils in Northern Ireland, as was the case in all participating countries. The disadvantage gap in Northern Ireland was smaller, and pupils in Northern Ireland were relatively well able to overcome the disadvantages of their background, than across the OECD countries on average.
- In Northern Ireland, pupils entitled to free school meals scored 51 points below pupils not entitled to free school meals, on average. This difference was statistically significant.
- First- and second-generation immigrant pupils also performed significantly less well than non-immigrant pupils, in line with the international trend.
- 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.

Pupils' attitudes to reading

- Pupils in Northern Ireland were less likely to read books than pupils across the OECD countries: 51% of pupils in Northern Ireland reported *I rarely or never read books*, compared with 35% of pupils in the OECD.
- Pupils in Northern Ireland also had more negative attitudes towards reading than pupils across the OECD, with 61% reporting *I do not read for enjoyment*, compared with 42% across the OECD.

Pupils' experiences of reading

- The most commonly read text types were fiction (20% Northern Ireland, 29% OECD) and newspapers (19% Northern Ireland, 25% OECD) for pupils in Northern Ireland and the OECD countries.

- Pupils in Northern Ireland and the OECD read online materials far more frequently than other types of reading materials. In Northern Ireland, 91% of pupils chatted online at least several times a week (compared with 85% across the OECD countries).

Pupil wellbeing

- Pupils in Northern Ireland were less likely to agree that their life 'has a clear meaning or purpose' (60% Northern Ireland, 68% OECD), and that they had 'discovered a satisfactory meaning in life' (56% Northern Ireland, 62% OECD), than pupils across the OECD countries.
- Ninety-three per cent of pupils felt happy sometimes or always in Northern Ireland, and 91% in the OECD countries. However, pupils in Northern Ireland were more likely to sometimes or always feel sad (57% Northern Ireland, 51% OECD), scared (40% Northern Ireland, 34% OECD) or worried (65% Northern Ireland, 50% OECD) than pupils across the OECD.

Future aspirations

- Pupils in Northern Ireland were less likely to expect to complete a university degree-level qualification, and more likely to expect to leave education with GCSE-level qualifications than pupils across the OECD countries.
- In general, pupils' expectations of their future careers were similar in Northern Ireland and the OECD. There was a small difference in the proportion of pupils who expected to have a professional occupation (50% in Northern Ireland compared with 44% across the OECD).

3.1 Pupil background

This section examines the associations between pupils' background characteristics and reading scores in Northern Ireland, to explore educational inequalities and how they compare with other participating countries in PISA 2018. We consider how socio-economic background, immigrant background and language relate to reading performance.

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 entitlement to 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. Northern Ireland's mean score

on the ESCS Index was +0.20 indicating that, on average, pupils in Northern Ireland 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 the average pupil with high socio-economic status and with low socio-economic status. This can be seen as the 'steepness of the slope' (i.e. 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. Conversely, a large, weak effect would imply that there are large differences in attainment 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 countries participating in PISA 2018, 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 Northern Ireland. Figure 3.1 shows the average reading performance of pupils in Northern Ireland when they are divided into 4 equal groups (quartiles) according to their ESCS score, compared with the OECD average[26].

More advantaged pupils achieved higher mean reading scores than their less advantaged peers. There was a 62 score point difference in average reading performance between the most advantaged (4th quartile, score 539) and least advantaged (1st quartile, score 476) pupils in Northern Ireland. This disadvantage gap is statistically significantly[27] narrower than the equivalent OECD disadvantage gap, which is 89 score points.

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

The most disadvantaged pupils across the OECD countries scored lower than the most disadvantaged pupils in Northern Ireland, on average, whereas the least disadvantaged pupils scored similarly, on average. Therefore, the **size of the effect** of socio-economic status (ESCS) is smaller in Northern Ireland than across the OECD. It should be noted, however, that the gap in socio-economic status (ESCS score) between the most and least advantaged quartiles is less for pupils in Northern Ireland compared with the OECD countries (2.23 in Northern Ireland compared with 2.36 across the OECD). This implies that Northern Ireland's narrower disadvantage gap could partly be accounted for by a narrower gap in the socio-economic status of its most and least disadvantaged pupils.

Figure 3.1   Reading performance by ESCS Index quartile
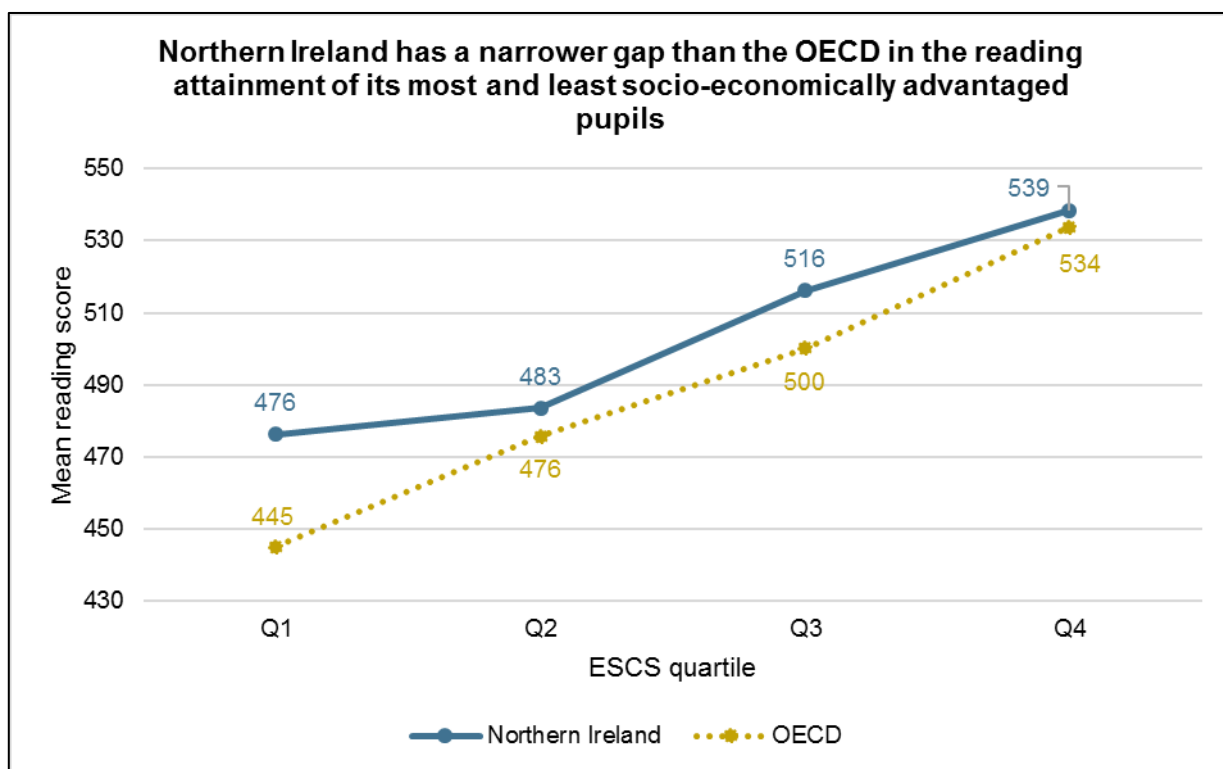
Source: PISA 2018 database

An interesting feature of Figure 3.1 is the mean reading score of the most disadvantaged quartile (Q1) of pupils in Northern Ireland compared with the OECD countries. While mean reading scores for quartiles 2, 3 and 4 are more similar for Northern Ireland and the OECD, the reading attainment of the most disadvantaged pupils in Northern Ireland is higher than that of the most disadvantaged pupils in the OECD countries. This tells us that the most disadvantaged pupils in Northern Ireland perform better than would be expected, and suggests that policies which target disadvantage in Northern Ireland may have had a positive impact in raising the attainment of disadvantaged pupils. Appendix B shows the ESCS Index for comparator countries.

While Figure 3.1 shows that the difference in performance (the **size of the effect)** 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 mean 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 Northern Ireland was 7%. This was significantly below the OECD average of 12%, and indicates that factors other than ESCS have a greater impact in Northern Ireland than across the OECD countries.

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 to pupils in Northern Ireland, achieving mean scores of 505 and 501 respectively. However, the difference between the most and least disadvantaged quartiles by socio-economic background in the United States was 99 score points, 36[28] points larger than in Northern Ireland, and the variance explained in reading performance by socio-economic status was 12%, 5 percentage points higher than Northern Ireland. Therefore, socio-economic background was associated with a greater difference in reading performance for pupils in the United States (size of effect). The extent to which socio-economic background predicted reading performance was also greater than in Northern Ireland (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 mean reading score between the most and least deprived quartiles was 31 score points and the amount of variance explained was 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 figure of 2.36 across the OECD countries. 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 wider range of socio-economic status than Northern Ireland.

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[29]. In Northern Ireland, 14% of pupils were academically resilient, which is not statistically significantly different from 11% across the OECD countries.

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[28] after taking into account rounding of figures
[29] 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.

The national measure usually used to understand the effects of disadvantage is entitlement to 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 presents the mean reading score for these 2 groups of pupils. In the analysis, pupil data was matched to the Northern Ireland school census database.[30] Twenty-four per cent of matched pupils in Northern Ireland were eligible for free school meals and, on average, these pupils scored 51 points below pupils not eligible for free school meals. This difference was statistically significant.

Table 3.1   FSM eligibility and PISA reading scores: Northern Ireland

	Number of pupils	Per cent	Mean score
Not entitled to FSM	1810	76	515
Entitled to FSM	547	24	465*

Note: * indicates statistically significant difference from the 'not eligible for FSM' group

Source: PISA 2018 school census matched database

3.1.2 Immigration background and language

The pupil questionnaire collects information which enables us to derive whether pupils are first- or second-generation immigrants.[31] The OECD international report notes that the percentage of pupils across the OECD countries with an immigrant background had 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 25 points when their socio-economic backgrounds

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[30] It was not possible to match 56 pupils from 5 schools.
[31] Performance by immigrant background was not reported in previous Northern Ireland national reports due to the small number of responses.

were taken into account. (OECD, 2019c). Given this context, it is interesting to examine how pupils with an immigrant background in Northern Ireland perform.

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

Table 3.2   Immigration background and PISA reading scores: Northern Ireland

	Number of pupils	Per cent	Mean score
Non-immigrant pupils	2036	90	508
First- and second-generation immigrant pupils	243	10	465*

Note: * indicates statistically significant difference

Source: PISA 2018 database

The proportion of pupils in Northern Ireland with an immigrant background (10%) was below the OECD average (12%). These pupils in Northern Ireland 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 mean reading score associated with having an immigrant background was -43 points (statistically significantly different from non-immigrant pupils) in Northern Ireland. When gender, and pupils' and schools' socio-economic profile were accounted for, this dropped to a score point difference of -28 points (significantly different from non-immigrant pupils).

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

Table 3.3   Language spoken at home and PISA reading scores: Northern Ireland

Language	Number of pupils	Per cent	Mean score
English	2205	94	504
Another language	159	6	472*

Note: * indicates statistically significant difference.

Source: PISA 2018 database

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

3.1.3 Special educational needs

There were 393 pupils who participated in PISA 2018 in Northern Ireland who were identified as having special educational needs (SEN) in the school census matched database. These pupils scored significantly less well than pupils with no special educational needs. It should be noted that the computer-based PISA assessment cannot be adapted for SEN pupils and there were no special accommodations (such as additional time). Additionally, up to 5% of pupils can be excluded from PISA due to their SEN and therefore we do not know how representative these pupils were of SEN pupils in Northern Ireland.[32]

Table 3.4   SEN and PISA reading scores: Northern Ireland

	Number of pupils	Per cent	Mean score
No SEN	1925	82	519
SEN	432	18	430*

Note: * indicates statistically significant difference

Source: PISA 2018 school census matched database

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[32] The percentage of SEN pupils in the PISA 2018 sample was close to the findings of the Northern Ireland school census (October 2018) which recorded that 17.3% of pupils in mainstream post-primary education had SEN stage 1-4 and 4.7% had statements, see Table 7 of https://www.education-ni.gov.uk/sites/default/files/publications/education/Revised%2029%20April%202019%20-%20Annual%20enrolments%20at%20schools%20and%20in%20pre-school%20education%20in%20Northern%20Ireland%2C%20201819_0.pdf

3.2 Pupils' attitudes to reading inside and outside school

This section reports on pupils' responses to questions in the pupil questionnaire 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 on 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*.

3.2.1 Perceptions of competence in reading

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

Table 3.5   Pupils' perception of reading competence

Percentage of pupils who agree or strongly agree with each statement

	Northern Ireland	OECD	Percentage point difference Northern Ireland-OECD
I find it difficult to answer questions about a text.	33	26	7
I am a good reader.	76	71	6
I have to read a text several times before I completely understand it.	48	44	4
I am able to understand difficult texts.	71	67	3
I have always had difficulty with reading	22	19	3
I read fluently.	72	77	-5

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

Source: PISA 2018 database, Student Questionnaire, question ST161

Pupils in Northern Ireland were most confident that they were good readers (76%) and in their ability to read fluently (72%).
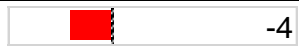
Compared with pupils in OECD countries, a larger proportion of pupils in Northern Ireland reported that they found it difficult to answer questions about a text (moderate difference), and a larger proportion said they were a good reader (small difference), but were less confident that they read fluently (small difference).

3.2.2 How do pupils read books?

Pupils were asked specifically about their reading of books (on any topic), and whether they most often read paper books or books on a digital device. The question did not specify if this was reading in or out of school. Table 3.6 compares the responses of pupils in Northern Ireland with pupils across the OECD countries.

Table 3.6 Pupils' reading mode preference

Percentage of pupils who read books in each mode

	Northern Ireland	OECD	Percentage point difference Northern Ireland - OECD
I rarely or never read books.	51	35	16
I read books on digital devices more often than on paper.	12	15	-3
I read paper books and books on digital devices equally often.	10	13	-4
I read paper books more often than books on digital devices.	28	36	-9

Source: PISA 2018 database, Student Questionnaire, question ST168

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

Pupils in Northern Ireland were less likely to report that they read books than pupils in OECD countries: 51% of pupils in Northern Ireland reported *I rarely or never read books* compared with 35% of pupils in the OECD countries, indicating a large difference. The proportion of pupils in Northern Ireland that read digital books most often was similar to the OECD average, and there was a small difference in the proportion of pupils who read paper books and digital books equally often (lower in Northern Ireland than the OECD average). However, there was a moderate difference in reading of paper books, with 28% of pupils in Northern Ireland reading paper books compared with 36% of pupils across the OECD.

3.2.3 Reading engagement

Pupils were asked about their attitudes towards reading. Pupils in Northern Ireland had more negative attitudes than pupils across the OECD countries, and on each measure the difference in attitudes was large. As we established in section 3.2.2, pupils in Northern Ireland were less likely to report reading 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 Northern Ireland and across the OECD countries. Compared with 2009, a similar proportion of pupils regarded reading as a favourite hobby in Northern Ireland, and this is also the case for the OECD. On the other measures (*read only if I have to*, *like talking about books*, *reading is a waste of time*, and *I read only to get information that I need*), pupils in Northern Ireland were less positive than they were in 2009, and the changes in Northern Ireland were greater than for the OECD countries.

Table 3.7   Pupils' reading engagement in 2018 compared with 2009

Percentage of pupils who agree or strongly agree with each statement

	2018		2009	
	Northern Ireland	**OECD**	**Northern Ireland**	**OECD**
I read only if I have to.	62	49	44	41
Reading is one of my favourite hobbies.	23	34	26	33
I like talking about books with other people.	24	37	33	38
For me, reading is a waste of time.	40	28	26	24
I read only to get information that I need.	64	50	51	46

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

3.2.4 Time spent reading for enjoyment

Pupils were also asked about the amount of time they spent reading for enjoyment. The results for Northern Ireland and the OECD countries are presented in Table 3.8, along with the results form 2009 when the same question was asked.

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

About how much time do you usually spend reading for enjoyment?

	2018		2009	
	Northern Ireland	**OECD**	**Northern Ireland**	**OECD**
I do not read for enjoyment	61	42	43	37
30 minutes or less a day	20	24	29	30
More than 30 minutes and less than 60 minutes a day	11	17	14	17
1 to 2 hours a day	5	11	10	11
More than 2 hours a day	3	6	4	5

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

Reading for pleasure was not a common activity for pupils in Northern Ireland: 39% of pupils read for enjoyment, and only 19% read for enjoyment for more than 30 minutes a day. The proportion of pupils who do not read for enjoyment had increased by 18 percentage points in Northern Ireland since 2009, compared with only 5 percentage points across the OECD countries.

Key point

Pupils in Northern Ireland were less likely to read books, had more negative attitudes towards reading, and were less likely to read for enjoyment than pupils in the OECD countries. In general, pupils in Northern Ireland and OECD had more negative attitudes towards reading than in 2009, and the change in attitudes of pupils in Northern Ireland was greater. Despite these comparatively negative attitudes, pupils in Northern Ireland performed above the OECD average in reading.

3.3   Pupils' experience of reading inside and outside school

3.3.1 Pupils' reading practices

Table 3.9 shows the materials pupils choose to read at least several times a month, in order of popularity in Northern Ireland. The most common reading materials (on paper and on digital devices) were fiction and newspapers for pupils in Northern Ireland and the OECD countries, although pupils in Northern Ireland were less likely to read both text types (moderate differences). This pattern was repeated across all text types; pupils in

Northern Ireland were less likely to read each text type than 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

	2018		2009	
	Northern Ireland	**OECD**	**Northern Ireland**	**OECD**
Fiction	20	29	32	31
Newspapers	19	25	67	63
Non-fiction books	14	21	21	20
Magazines	8	19	61	59
Comic books	6	15	7	23

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

The same question was asked in PISA 2009. The comparison shows that there were large decreases in the proportions of pupils reading fiction, newspapers and magazines, and that the decrease was larger in Northern Ireland than in the OECD on average. The change in popularity of newspapers and magazines was particularly large: in 2009, newspapers and magazines were read by 67% and 61% of pupils respectively at least several times a month in Northern Ireland. In 2018, they were read by 19% and 8% of pupils only. There were similar changes in reading 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 Northern Ireland and the OECD were less likely to use digital devices to read books than to read paper books. In Table 3.10 we can see that pupils can readily access digital devices. In Northern Ireland, 91% of pupils chatted online at least several times a week, compared with 88% of pupils across the OECD countries. Pupils in Northern Ireland were more likely to take part in online

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discussion groups than their counterparts across the OECD, but were less likely to search for practical or educational information online and read emails (moderate differences).

Pupils were also asked about their online reading in 2009. This had increased since 2009, except for reading emails which had declined in the OECD and, to a greater extent, in Northern Ireland.

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

Percentage of pupils who read these materials at least several times a week

	2018		2009	
	Northern Ireland	**OECD**	**Northern Ireland**	**OECD**
Chatting online	91	88	79	73
Searching for information online to learn about a particular topic	63	68	54	52
Reading news online	58	58	44	46
Searching for practical information online	47	56	31	36
Reading emails	30	37	67	64
Taking part in online group discussions or forums	29	23	17	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, pupils were asked about how useful they thought various strategies were in 3 different reading tasks. These were to:

1. understand and remember text

2. write a summary of a 2-page text

3. 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

Underlining and summarising were the most useful strategies for pupils in Northern Ireland and OECD to understand and remember text

I concentrate on the parts of the text that are easy to understand — Northern Ireland ● OECD

I quickly read through the text twice — OECD ● ● Northern Ireland

After reading the text, I discuss its content with other people — Northern Ireland ●● OECD

I underline important parts of the text — OECD ● ● Northern Ireland

I summarise the text in my own words — Northern Ireland ● ● OECD

I read the text aloud to another person — Northern Ireland ●● OECD

1   2   3   4   5   6

■ 1: Not useful at all 6: Very useful

Source: PISA 2018 database, Student Questionnaire, question ST164

This question was asked in 2009 and a rating system developed to categorise responses into useful and less useful strategies: discussing the content with other people, underlining important parts of the text, and summarising 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.

Underlining important parts of the text was seen as the most useful strategy by pupils in Northern Ireland and the OECD. Pupils across the OECD countries also thought that summarising the text in their own words was important, but pupils in Northern Ireland did not value this strategy as highly. Pupils in Northern Ireland 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
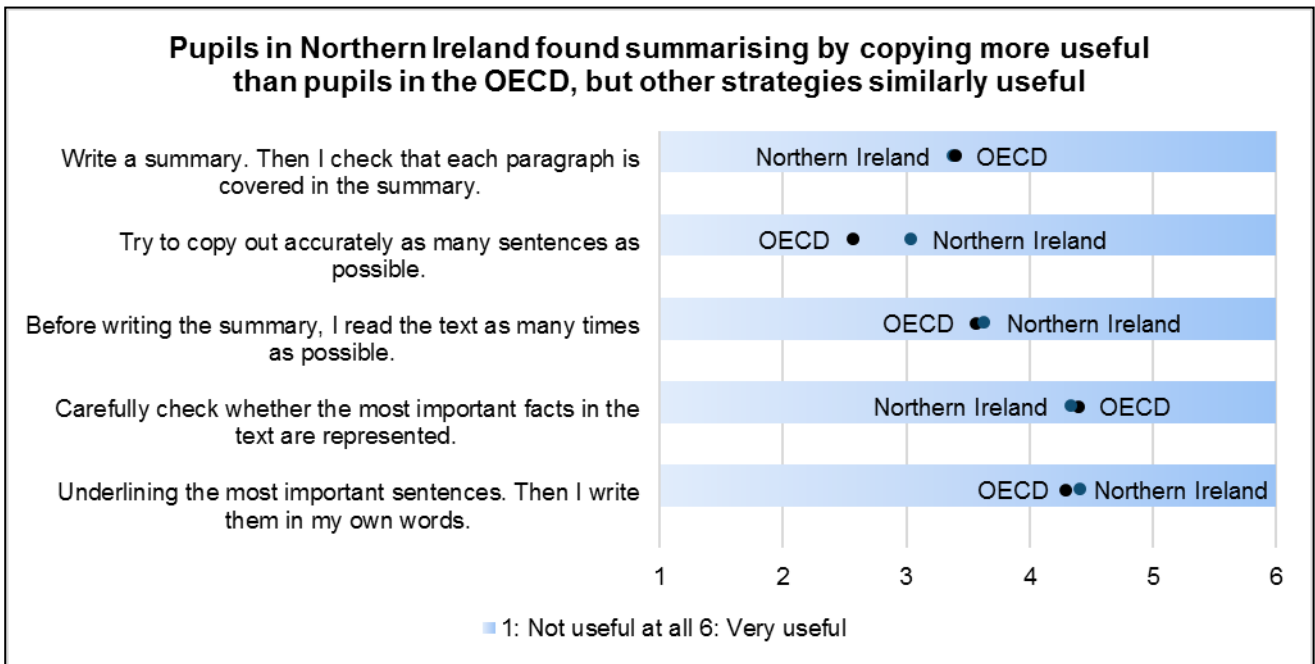
Pupils in Northern Ireland found summarising by copying more useful than pupils in the OECD, but other strategies similarly useful

This question 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 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.

Trying to copy out accurately as many sentences as possible was seen as the least useful strategy by pupils in the OECD countries and Northern Ireland in 2018. However, pupils in the OECD found it a comparatively less useful strategy. 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
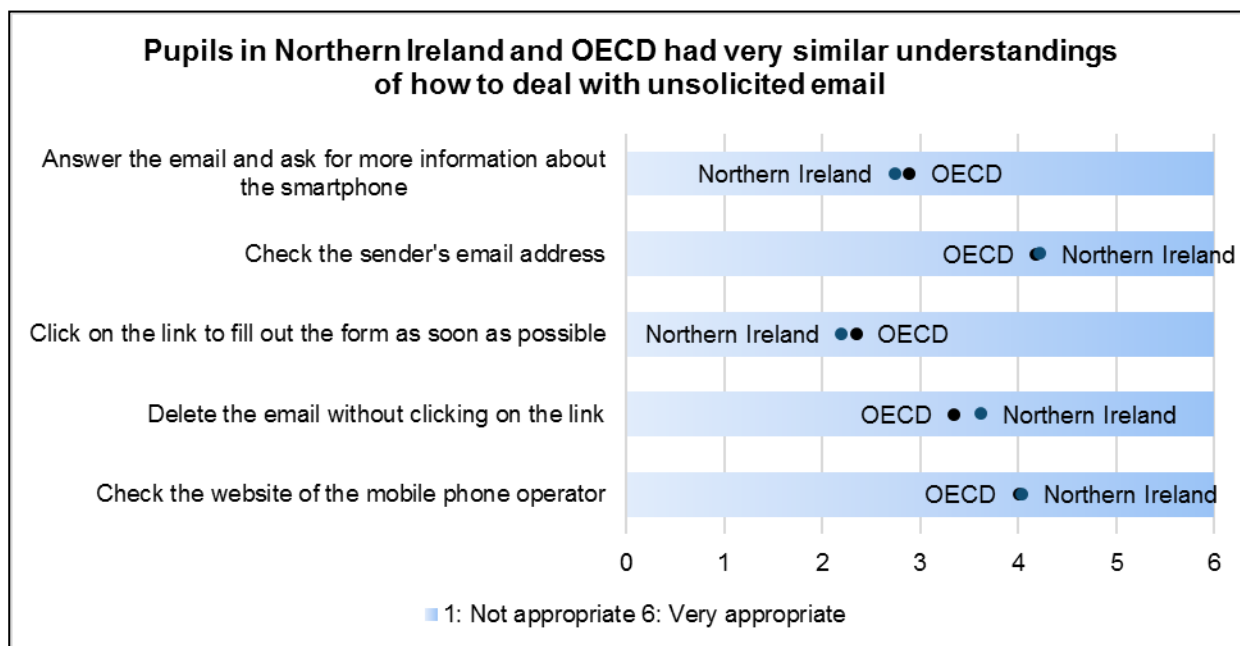
Source: PISA 2018 database, Student Questionnaire, question ST166

Although the OECD has not yet released the 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[33]. 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 by pupils in Northern Ireland and the OECD countries. 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 Northern Ireland responded in a similar manner to those across the OECD.

3.3.4 Pupil wellbeing

The pupil questionnaire collects information about pupils' wellbeing – their satisfaction with their life, to what extent their life has meaning or purpose, their subjective wellbeing, and 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 their wellbeing and can also be more difficult for young people with poor wellbeing.

'Personal Development and Mutual Understanding' at primary level and 'Learning for Life and Work', including personal development, at post-primary level, are mandatory aspects

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[33] https://www.ncsc.gov.uk/guidance/suspicious-email-actions

of the Northern Ireland Curriculum. At Key Stage 4 (ages 14-16), a requirement of Learning for Life and Work is that:

> *pupils should be enabled to: develop an understanding of how to maximise and sustain their own health and well-being; and reflect on, and respond to, their developing concept of self, including managing emotions and reactions to on-going life experiences.*[34]

The findings from PISA 2018 are relevant to the Northern Ireland Curriculum and also provide comparisons with pupils in other countries. Further analysis may enable understanding of how wellbeing relates to achievement, allowing policy makers to better understand interventions to support pupils' wellbeing.

Pupils were asked, via the pupil questionnaire, to rate how satisfied they were with their life as a whole (minimum score 0, maximum score 10). Pupils in Northern Ireland were slightly less satisfied with their lives than pupils across the OECD countries; the average score was 6.6 in Northern Ireland, compared with 7.0 across the OECD countries.

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

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[34] http://ccea.org.uk/sites/default/files/docs/curriculum/area_of_learning/Wellbeing%20and%20the%20Northern%20Ireland%20Curriculum.pdf

Figure 3.5   Percentage of pupils agreeing and disagreeing with questions about to what extent their life had meaning
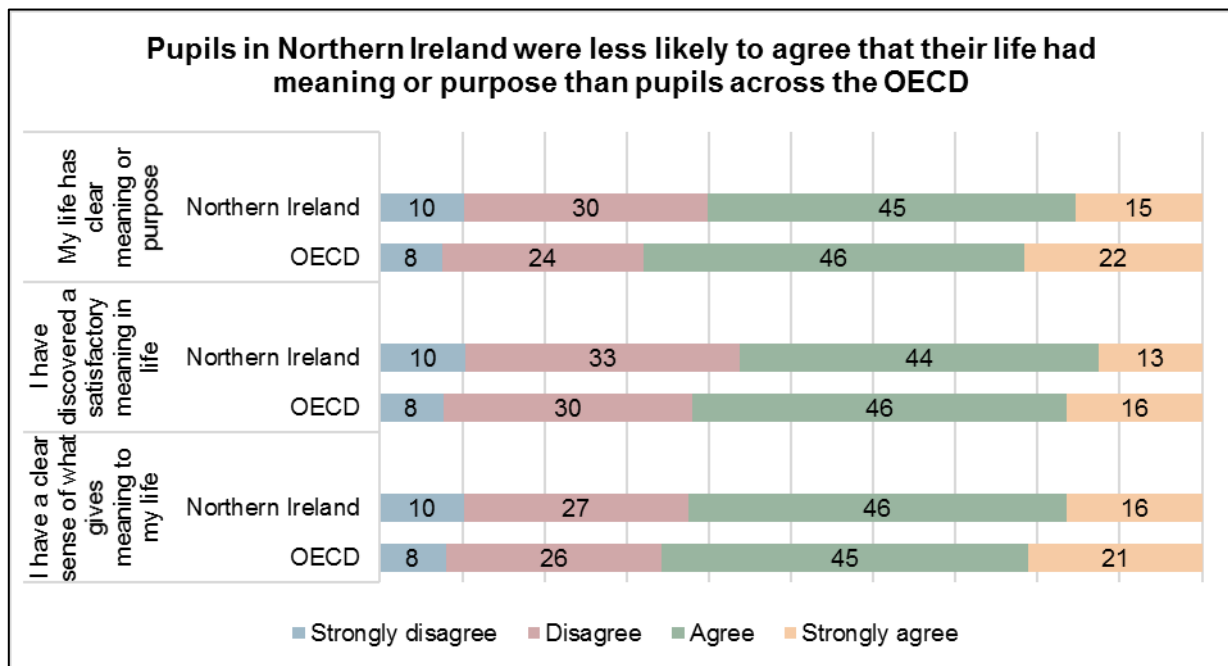
Pupils in Northern Ireland were less likely to at least agree that their life has a clear meaning or purpose (60% Northern Ireland, 68% OECD), or that they had discovered a satisfactory meaning in life (56%[35] Northern Ireland, 62% OECD) (moderate differences). Similar proportions of pupils in Northern Ireland and OECD agreed that they have a clear sense of what gives meaning to their life.

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

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[35] after taking into account rounding of figures

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

Similar proportions of pupils in Northern Ireland and the OECD always felt happy and lively. They were less likely to always feel proud, joyful and cheerful

		Never	Rarely	Sometimes	Always
Happy	Northern Ireland	1	6	52	41
	OECD	2	8	50	41
Lively	Northern Ireland	2	11	54	32
	OECD	3	14	49	33
Cheerful	Northern Ireland	2	13	56	29
	OECD	2	10	47	41
Joyful	Northern Ireland	2	13	61	25
	OECD	2	9	48	41
Proud	Northern Ireland	5	26	57	13
	OECD	5	23	52	19

■ Never ■ Rarely ■ Sometimes ■ Always

Source: PISA 2018 database, Student Questionnaire, question ST186

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Figure 3.7   Percentage of pupils who reported never, rarely, sometimes and always for each negative feeling
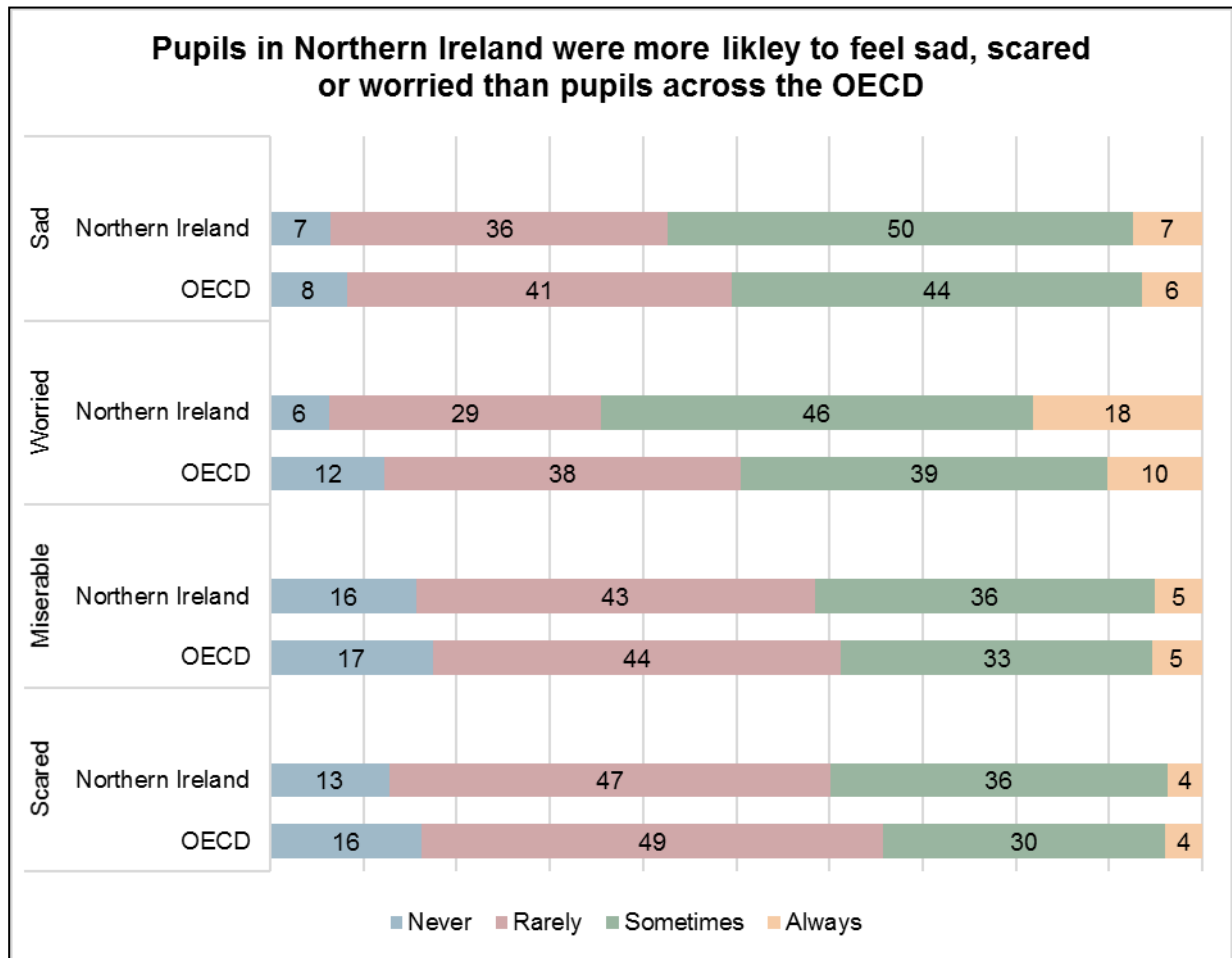
Source: PISA 2018 database, Student Questionnaire, question ST186

Ninety-three per cent of pupils felt happy sometimes or always in Northern Ireland, and 91% in the OECD countries. Pupils in Northern Ireland were more likely to sometimes or always feel sad (57% in Northern Ireland, 51%[36] in the OECD countries), scared (40% in Northern Ireland, 34% in the OECD countries), or worried (65%[37] in Northern Ireland, 50%[38] in the OECD countries) than pupils across the OECD.

It should be expected that pupils have concerns and worries about their lives, but pupils' responses in Northern Ireland about the extent to which their lives have meaning and how often they experience negative feelings raise concerns when compared with pupils across the OECD.

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[36] after taking into account rounding of figures
[37] after taking into account rounding of figures
[38] after taking into account rounding of figures

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. Pupils in Northern Ireland had lower expectations of their highest level of qualification than pupils across the OECD countries. They were less likely to expect to complete a university degree-level qualification, and more likely to expect to leave education with GCSE-level qualifications than pupils across the OECD; these were moderate differences.

Table 3.11   Pupil expectations of their highest qualification level

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

	Northern Ireland	OECD	Percentage point difference Northern Ireland-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	16	7	9
A-level (A2), AS, Vocational Qualification level 3, Advanced Apprenticeship, International Baccalaureate	14	13	1
A qualification for adults who want to go to university but don't have the necessary qualifications already, (e.g. access course)	4	6	-2
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)	51	58	-6

Source: PISA 2018 database, Student Questionnaire, question ST225

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

Pupils were 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-88) [39].
Table 3.12 presents their career aspirations in 10 major groups.

Table 3.12   Pupil expectations of future careers

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

	Northern Ireland	OECD	Percentage point difference Northern Ireland-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)	3	3	-1
Professionals (e.g. lawyer, accountant, teacher, computer programmer, doctor, engineer, scientist, nurse)	50	44	6
Technicians and Associate Professionals (e.g. dental assistant, nursing assistant, insurance agent, police inspector, web technician, estate agent)	9	11	-2
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)	7	8	0
Skilled Agricultural, Forestry and Fishery Workers (e.g. farmer, fisherman, gardener, animal producer)	1	1	1
Craft and Related Trades Workers (e.g. carpenter, mechanic, tailor, butcher, electrician)	8	6	2

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[39] 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.

	Northern Ireland	OECD	Percentage point difference Northern Ireland-OECD
Plant and Machine Operators and Assemblers (e.g. miner, machine operator, bus/taxi/lorry driver)	1	1	0
Elementary Occupations (e.g. unskilled worker or labourer, cleaner or helper, packer in a factory)	1	0	0
Not working (e.g. student, stay at home parent, retiree)	0	0	0
Do not know or vague response	5	10	-5
Blank or did not answer question	14	15	0

Source: PISA 2018 database, Student Questionnaire, question ST114

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

In general, pupils' expectations of their future careers were similar in Northern Ireland and the OECD countries. There was a small difference in the proportion of pupils who expected to have a professional occupation (50% in Northern Ireland compared with 44% across the OECD).This is interesting given the differences in expectations of highest qualification between pupils in Northern Ireland and the OECD countries. It is unlikely that similar proportions of pupils in Northern Ireland and the OECD countries will go on to have occupations classified as managers and professionals if there is a gap in degree-level qualifications, as highlighted by the responses in Table 3.11. The PISA international report (OECD, 2019c) finds, however, that 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.

4 Science

Chapter outline

This chapter reports the science attainment of pupils in Northern Ireland. It draws on findings outlined in the PISA International report (OECD, 2019b) and places outcomes for Northern Ireland 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 major domain for the study; in 2018, it was a minor domain.

Key findings

Overall science performance

- Northern Ireland's mean score in science was 491. This was not significantly different to its overall mean score in 2015 (500).
- Northern Ireland's overall mean score in science in PISA 2018 was also not significantly different from the OECD average of 489.
- Although Northern Ireland's mean science score has not changed significantly from the 2015 PISA study, this is the third consecutive study in which the score has decreased, representing a statistically significant decrease compared with 2012.

Science performance in relation to other countries

- Sixteen countries had mean scores in science in PISA 2018 that were significantly higher than that in Northern Ireland. Fourteen countries had mean scores that were not statistically different and Northern Ireland significantly outperformed the 46 remaining participating countries.
- Northern Ireland's relative position is comparable to that in 2015, when 16 countries also scored significantly higher and 11 had scores that were not significantly different.

Gender gap

- Girls performed significantly better than boys in science in Northern Ireland, representing one of the largest gender gaps amongst participating countries in PISA 2018.
- The gender gap has shifted from 2015 when there was no statistically significant difference in science scores by gender.
- The performance of boys has fallen significantly from 2015.

> **Attainment gap between highest and lowest achievers**
> - In Northern Ireland, there were no significant changes in the performance of high and low achievers in science.
> - The percentages of high and low achievers in Northern Ireland had not changed significantly from 2015.
>
> **Proficiency levels**
> - The percentages of pupils performing above PISA proficiency Level 5 (high performers) and below proficiency Level 2 (low performers) were not significantly different from the OECD average.

In PISA 2018, science was a minor domain as reading was the major domain for this cycle. Science was the major domain in the previous PISA cycle in 2015. Therefore, the science content reflects the framework that was developed by the OECD in 2015 and has remained unchanged since then.

4.1 Northern Ireland's performance in science

Pupils in Northern Ireland achieved a mean score of 491 for science in PISA 2018. This is a decrease from 2015 (500), but this change is not statistically significant[40]. However, as this represents the third successive PISA study in which the mean science score in Northern Ireland has fallen, the cumulative effect over the period shows a statistically significant decrease between 2012 (507) and 2018 (491).

The mean science score for Northern Ireland was above the OECD average[41] score of 489, but this difference was not statistically significant. The trend in the OECD average score for science has been one of decline over recent PISA cycles, from 498 in 2012 to 491 in 2015 and 489 in 2018. In 2009, the mean science score in Northern Ireland was 14 points[42] above the OECD average. The difference in scores has narrowed since then to only 3 score points[43] in 2018. This suggests that, while the change in Northern Ireland's performance over this period does map, to some extent, to an international trend, the rate of decline has been greater in Northern Ireland than for the OECD countries on average.

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[40] When statistical significance is reported, it indicates that the compared means are significantly different at the 5% level.
[41] The 2018 OECD average is based upon the AV37 results published in the OECD International Results Table 1.B1.12.
[42] after taking into account the rounding of figures
[43] after taking into account the rounding of figures

Key point

This is the third consecutive PISA study in which the mean science score for Northern Ireland has decreased, representing a statistically significant decrease compared with PISA 2012.

Figure 4.1   Trends over time in science scores Northern Ireland compared with the OECD average[44]
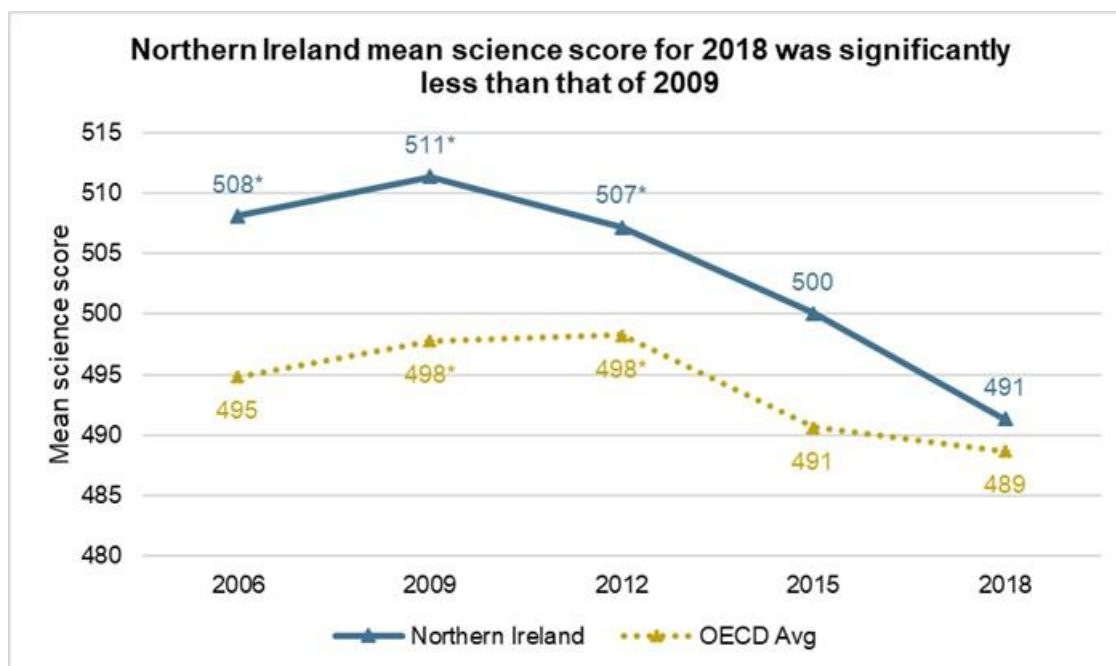
Northern Ireland mean science score for 2018 was significantly less than that of 2009

*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

4.2   International results

Results for 76 countries other than Northern Ireland were reported for science in PISA in 2018[45]. Of these, 16 countries scored significantly higher than Northern Ireland. These higher-performing countries divide into 3 groups: those from east and south-east Asia (B-S-J-Z (China), Singapore, Macao (China), Japan, Korea, Hong Kong (China) and Chinese Taipei); those from Europe (Estonia, Finland, Poland, Slovenia, Netherlands and

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[44] Note: the OECD average for 2018, 2015, 2012 and 2006 is based upon the 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, based upon AV36b results (excluding Austria), is also presented in the OECD International results Table 1.B1.12.
[45] 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.

Germany); and other English-speaking countries, or countries with a significant proportion of English-speakers (Canada, New Zealand and Australia).

Fourteen countries performed at a level that was not significantly different from that of Northern Ireland, all but one of which (the United States) were countries in Europe. Northern Ireland's performance in science significantly exceeded that of the remaining 46 countries, the majority of the participants.

Among the 37 countries that are members of the OECD (and whose performance contributes to the OECD average), 11 countries performed significantly better than Northern Ireland and all of the 14 countries whose performance was comparable to Northern Ireland are OECD members. Of the OECD members in the study, 12 experienced a significant drop in mean science score from 2015 to 2018, compared with only 2 (Poland and Turkey) that had a significant increase. This is reflected in the (non-significant) fall of the OECD average score from 491 to 489 over this period, and continues the significant downward trend in the OECD average from 2012 (Figure 4.1). All of these results are presented in Table 4.1.

> **Key point**
>
> Sixteen countries scored significantly higher than Northern Ireland in science in PISA 2018. This number was the same in 2015. Northern Ireland's relative position has remained stable.

Table 4.1   PISA International results for science

Participants with significantly HIGHER science scores than Northern Ireland

Country	Scale score		Country	Scale score	
B-S-J-Z (China)	590		*Hong Kong (China)*	517	
Singapore	551		*Chinese Taipei*	516	∨
Macao (China)	544	∧	Poland	511	∧
Estonia	530		New Zealand	508	
Japan	529	∨	Slovenia	507	∨
Finland	522	∨	Netherlands	503	
Korea	519		Germany	503	
Canada	518	∨	Australia	503	∨

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

Country	Scale score		Country	Scale score	
United States	502		Portugal	492	∨
Sweden	499		**Northern Ireland**	**491**	
Belgium	499		Norway	490	∨
Czech Republic	497		Austria	490	
Republic of Ireland	496		**OECD Average**	**489**	
Switzerland	495	∨	Latvia	487	
France	493		Spain	483	∨
Denmark	493	∨	Lithuania	482	

Participants with significantly LOWER science scores than Northern Ireland

Country	Scale score		Country	Scale score	
Hungary	481		Italy	468	∨
Russian Federation	*478*		Slovak Republic	464	
Luxembourg	477	∨	Israel	462	
Iceland	475		*Malta*	*457*	∨
Croatia	472		Greece	452	
Belarus	471		Chile	444	
Ukraine	469		Mexico	419	
Turkey	468	∧	Colombia	413	
			plus 30 non-OECD countries scoring <450		

∧∨ Indicates a statistically significant change since PISA 2015.
OECD countries (not italicised)
Countries not in OECD (italicised)
* B-S-J-Z (China) different provinces from 2015

PISA 2018 Results (Volume I); PISA 2018 database

Figure 4.2 illustrates the trends in performance for Northern Ireland since 2006, alongside those for 4 other countries. These countries have been selected from the group of countries whose mean science score was not significantly different from that of Northern Ireland in 2009 (Bradshaw *et al.,* 2010). This allows comparison of how these countries' performances have developed over the past 3 cycles from a similar starting point. The

2009 study was also the first PISA study since the introduction of the revised national curriculum for Northern Ireland from 2007.

In 2009, 11 countries had mean scores in science that were not significantly different from that of Northern Ireland (Bradshaw *et al.,* 2010)[46]. Tracking the mean science scores of these countries to 2018, there is evidence that Northern Ireland's performance has fallen relative to this group. Six of the countries, the majority of the group, performed significantly better then Northern Ireland in 2018 (Netherlands, Chinese Taipei, Germany, Slovenia, Macao (China) and Poland), while 4 had mean science scores that were not significantly different from that of Northern Ireland in 2018 (Switzerland, the Republic of Ireland, Belgium and the United States). Only one country, Hungary, performed significantly lower than Northern Ireland in 2018.

The mean science score in Macao (China) increased steadily from 2009 and it ranked in the top 3 high performers in 2018. This represents the fastest improvement of any of the countries from this group. Slovenia, by comparison, maintained its score at approximately the same level in 2012 and 2015, with a slight fall from 2015 to 2018. This compared with the fall in the mean score in Northern Ireland since 2009 such that, by 2018, Slovenia's mean science score was significantly higher than that in Northern Ireland. The performance of the Republic of Ireland has been more volatile. It demonstrated a similar increase in mean score to that in Macao (China) between 2009 and 2012, before a steep drop from 2012 to 2015. In 2018, the mean science score in the Republic of Ireland was close to that in Northern Ireland. Mean science scores in Hungary showed increasing drops in 2012 and 2015 before recovering somewhat in 2018. Despite this, Hungary's performance was significantly below that of Northern Ireland in 2018, and its mean scores have consistently been the lowest of the 2009 comparator group.

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[46] Not including Liechtenstein, which did not participate in PISA 2018.

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

Trends in science performance for Northern Ireland compared to countries with similar scores in 2009

	2006	2009	2012	2015	2018
Northern Ireland	508*	511*	507*	500	491
Republic of Ireland	508*	508*	522*	503	496
Hungary	504*	503*	494*	477	481
Slovenia	519*	512	514	513*	507
Macao	511*	511*	521*	529*	544
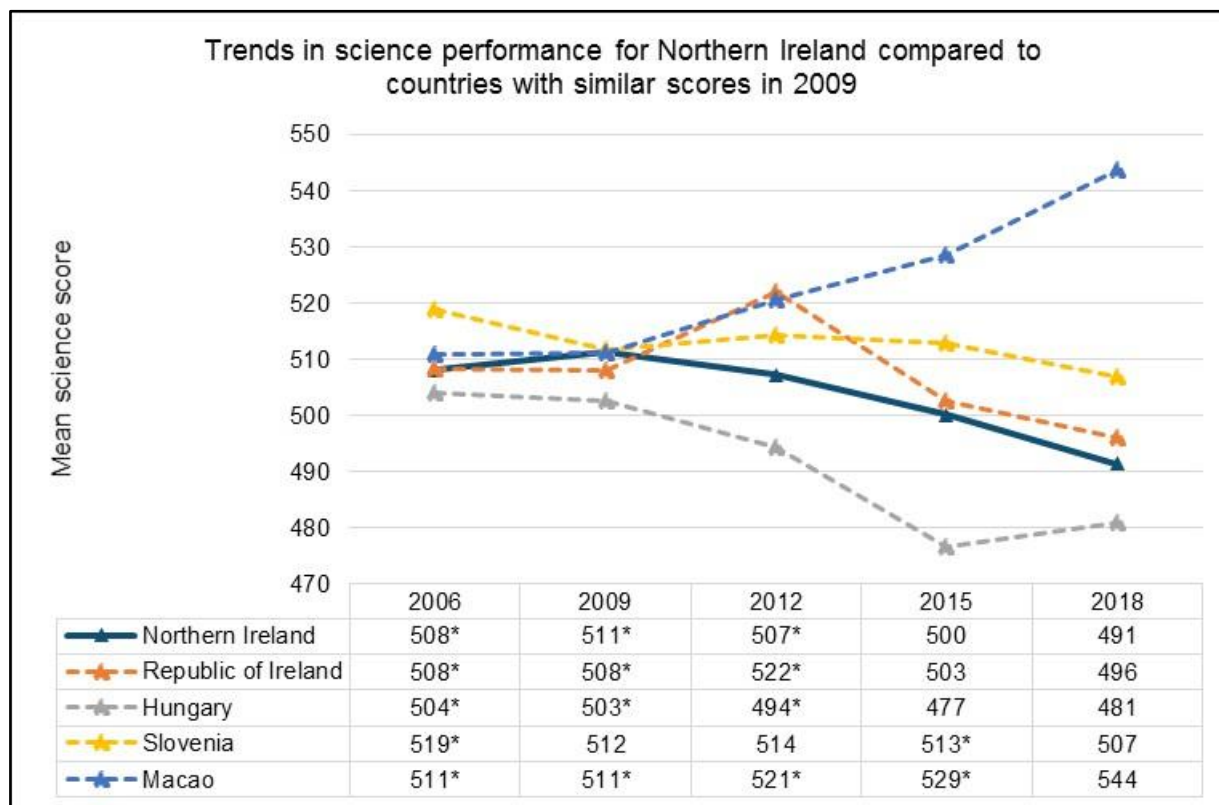
* Indicates a score that is statistically significantly different from the given country's 2018 score

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

It is also informative to look at the long-term trends of countries that performed significantly better or worse than Northern Ireland in 2009. There were 10 countries that significantly outperformed Northern Ireland in science in 2009 (Bradshaw *et al.,* 2010). All 10 of these countries also significantly outperformed Northern Ireland in 2018[47]. Together with the 6 countries that had scores not significantly different from Northern Ireland in 2009, but which had mean science scores that were significantly higher than Northern Ireland in 2018, these make up the 16 countries that performed significantly higher than Northern Ireland in 2018.

Looking at the countries that had mean science scores that were significantly lower than Northern Ireland in 2009, 10 of these (the Czech Republic, Norway, Denmark, France, Sweden, Austria, Latvia, Portugal, Lithuania and Spain) had scores not significantly

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[47] Note that Shanghai (China) participated in 2009, but additional regions participated as B-S-J-Z (China) in 2018. In both cases they performed significantly better than Northern Ireland.

different to that of Northern Ireland in 2018. This is in contrast to only one country (Hungary) that had moved in the opposite direction.

These comparisons indicate that, as a long-term trend, the position of Northern Ireland relative to other countries in PISA science has declined since 2009. However, there is evidence that this decline may be slowing, as the same number of countries significantly outperformed Northern Ireland in 2018 as in 2015[48].

The data for all 4 constituent countries of the UK are included in Appendix C and comparisons between them are provided in Chapter 7.

4.3   Differences between highest and lowest performing pupils

In addition to knowing how well pupils in Northern Ireland 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% lay, while the 90th percentile is the score above which that the highest performing 10% of pupils 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.

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[48] These were the same countries except for Poland (not significantly different in 2015, significantly better in 2018) and Vietnam (performed significantly better in 2015, but results are not included in 2018).

Figure 4.3   Attainment gap in science scores in Northern Ireland and the OECD

The gap between high and low achieving pupils in Northern Ireland was very similar to the OECD average

Northern Ireland   239

OECD Avg.   244
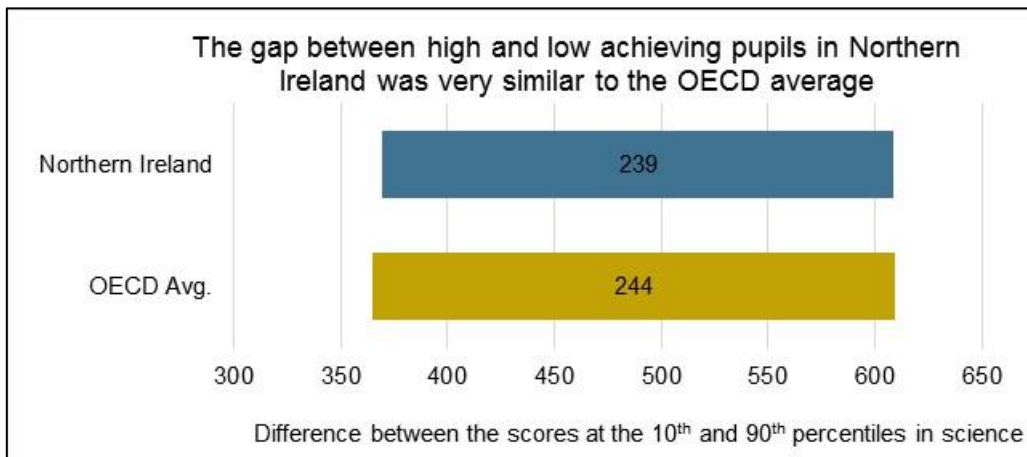
Difference between the scores at the 10th and 90th percentiles in science

The gap between the highest and lowest achieving pupils in Northern Ireland was 239 score points, smaller than, but not significantly different to, the OECD average gap of 244 score points (Figure 4.3). Lower achieving pupils in Northern Ireland, i.e. those at the 10th percentile, had a mean score of 370, while the mean score of those at the 90th percentile was 609. The OECD mean score at the 10th percentile was slightly lower at 365 and that at the 90th percentile was the same at 609. Therefore, compared with the OECD average, Northern Ireland had slightly better performance at the lower ability range.

In Northern Ireland, the scores at both the 10th and the 90th percentile scores have fallen since 2015, but this change is not significant.

Figure 4.4 presents a scatterplot that shows the mean score for each country plotted against its attainment gap, as measured by the difference between the score at the 10th percentile and the score at the 90th percentile. Countries can be separated into 4 categories in relation to the OECD average[49]: 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. Northern Ireland falls into the fourth category with a mean score above the OECD average (although this difference is not significant), and an attainment gap below the OECD average.

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[49] Note: statistical significance, in relation to the OECD, is not accounted for in this graph.

Figure 4.4   Attainment gap in science scores across PISA 2018 countries
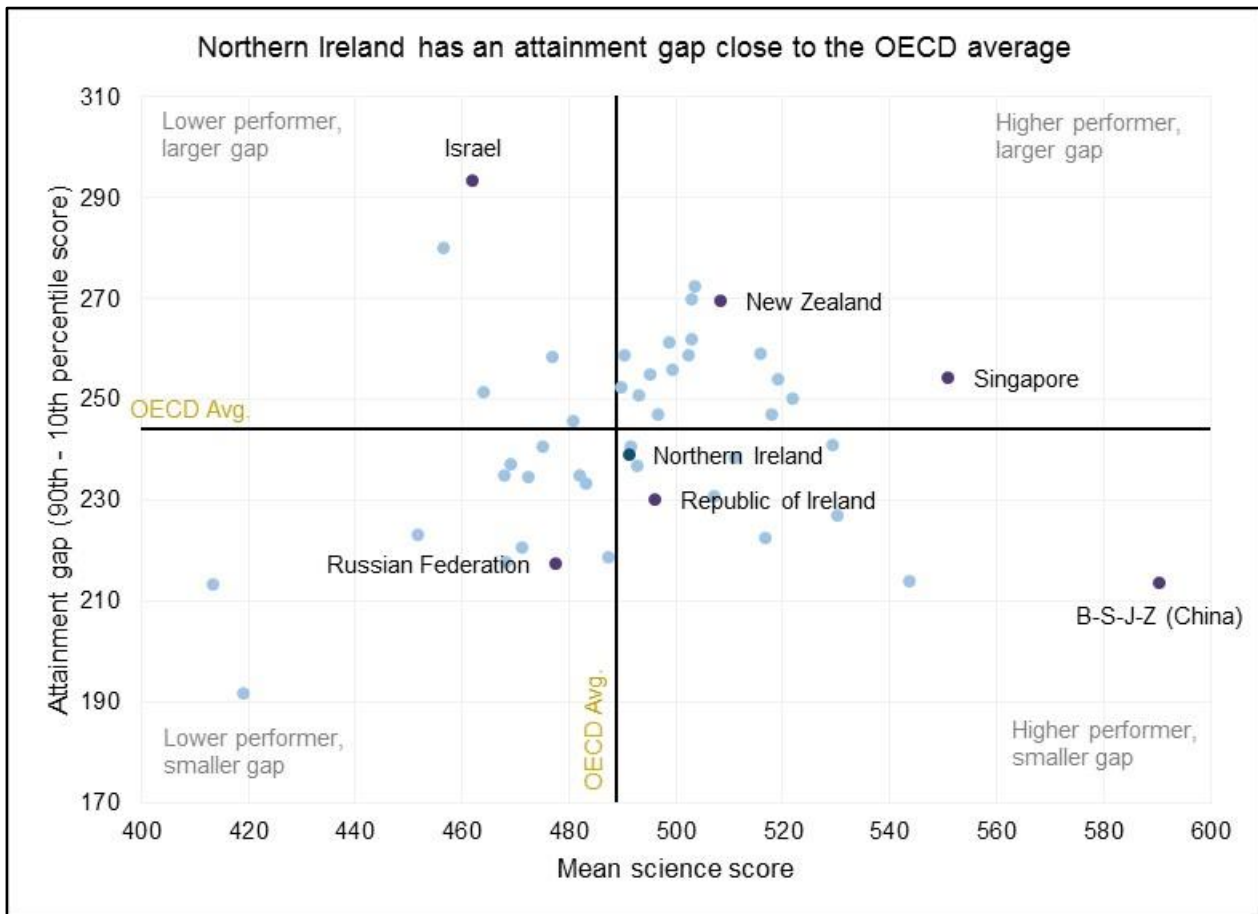
Note: This scatterplot contains all countries either in the OECD or with a score above 450

PISA 2018 Results (Volume I); PISA 2018 database

Most countries cluster around the OECD average, although some differ noticeably and there is no clear relationship between 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. The Russian Federation, which scored significantly below Northern Ireland, has a low attainment gap comparable to B-S-J-Z (China), while Israel, which also scored significantly below Northern Ireland, had the highest attainment gap of the countries in this comparison.

In further considering Northern Ireland'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 the 90th percentile compared with Northern Ireland (these countries are also marked on Figure 4.4).

Figure 4.5   Attainment gap in countries with similar mean scores to Northern Ireland at either the 10th or the 90th percentiles
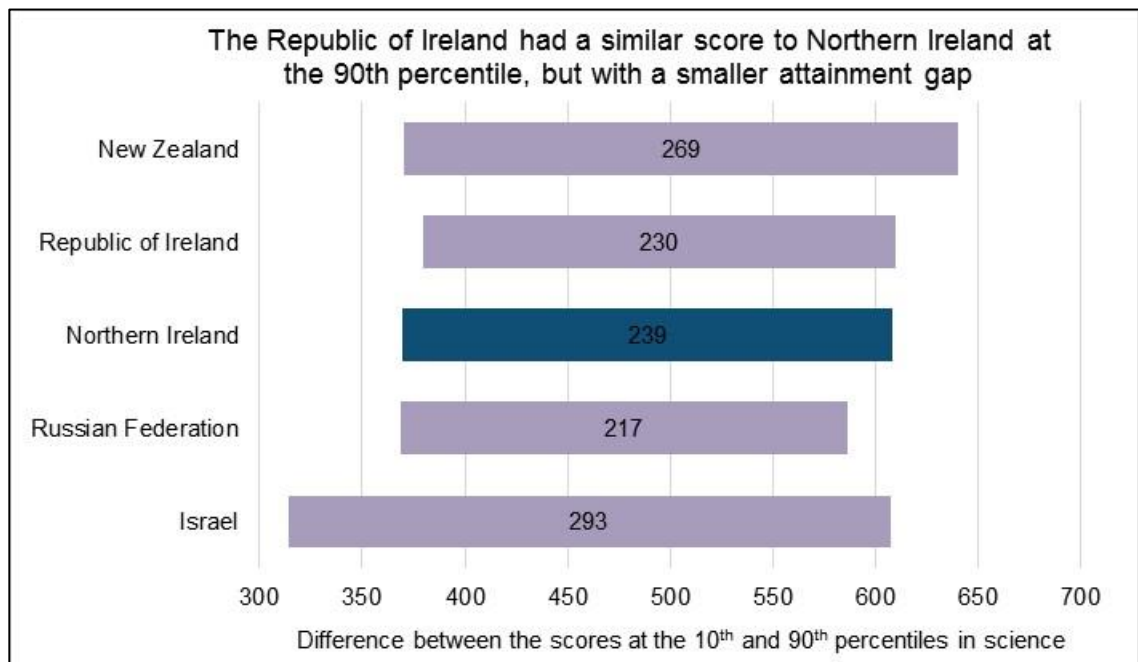
In New Zealand, pupils achieved a mean science score that was significantly higher than in Northern Ireland. Note that at the 10th percentile, pupils in New Zealand and Northern Ireland scored similarly, but New Zealand had a much higher attainment gap, with pupils at the 90th percentile scoring 31 points higher than those in Northern Ireland, driving the higher overall mean score. In comparison, the Russian Federation is a country that achieved a mean science score that was significantly lower than that of Northern Ireland. Pupils at the 10th percentile in the Russian Federation also scored similarly to Northern Ireland, but the Russian Federation had a much lower attainment gap than Northern Ireland with pupils at the 90th percentile scoring 23 points lower than those in Northern Ireland and, therefore, the overall mean score for the Russian Federation was lower.

In contrast, pupils in the Republic of Ireland had similar scores to Northern Ireland at the 90th percentile but, at the 10th percentile, pupils in the Republic of Ireland scored 10 points higher resulting in a smaller attainment gap than Northern Ireland and a slightly higher (although not significantly different) overall mean score. Pupils at the 90th percentile in Israel also had similar scores to Northern Ireland, but with a much larger attainment gap than Northern Ireland, Israel's overall mean score was significantly lower.

These comparisons serve 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 Northern Ireland'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.

Figure 4.6 presents the performance of Northern Ireland at the 7 proficiency levels for science compared with the OECD average. Pupils who score below Level 2 (L2) are considered low performers and those that perform at Level 5 (L5) or above (L6) are considered top performers (OECD, 2019b). Looking at the top performers, there was no significant difference between the proportion of pupils achieving above level 5 in Northern Ireland (5%) and the OECD average (7%). Likewise, there was also no significant difference between the proportions of pupils performing below Level 2 (19%[50]) in Northern Ireland compared with the OECD average (22%). The proportion of top performers and low performers in Northern Ireland did not change significantly between the PISA studies of 2015 and 2018.

Figure 4.6   Science proficiency levels in Northern Ireland and OECD average

In Northern Ireland, more pupils achieve at level 3 or above compared to the OECD average

	Below L1B	L1B	L1A	L2	L3	L4	L5	L6
Northern Ireland	1%	4%	15%	26%	29%	19%	5%	0%
OECD Avg.	1%	5%	16%	26%	27%	18%	6%	1%
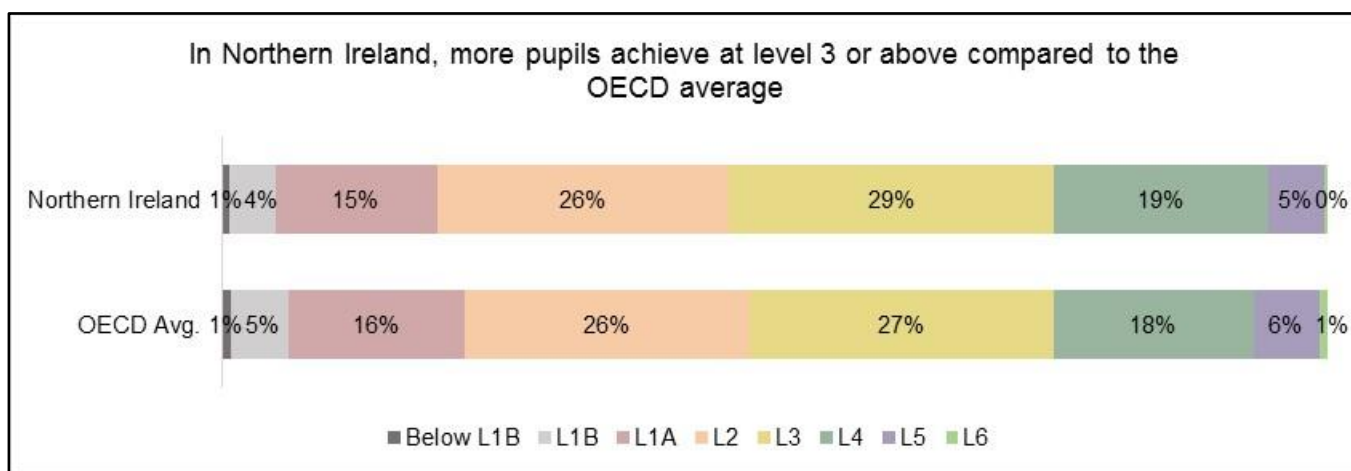
4.4   Differences between boys and girls

In Northern Ireland, girls performed significantly better than boys in science by an average of 17 score points; girls achieved a mean score of 500 while boys achieved a mean score of 483. This gender gap is larger than the OECD average difference for science which is

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[50] taking into account rounding differences

an average difference of 2 score points in favour of girls. This indicates a significant change in favour of girls in science in Northern Ireland from previous PISA results, when there was a small but non-significant gap in favour of boys. Since 2015, girls' mean science score has not changed significantly (from 499 to 500), but boys' mean score has fallen significantly from 501 to 483.

Figure 4.7   Gender differences in science scores in Northern Ireland compared with the OECD average

	Overall science score	Mean score girls	Mean score boys	Difference girls - boys
Northern Ireland	491	500	483	+17*
OECD Avg.	489	490	488	+2*

*The difference is statistically significant

Girls performed significantly higher than boys in Northern Ireland

Range between boys' score and mean   Range between girls' score and mean
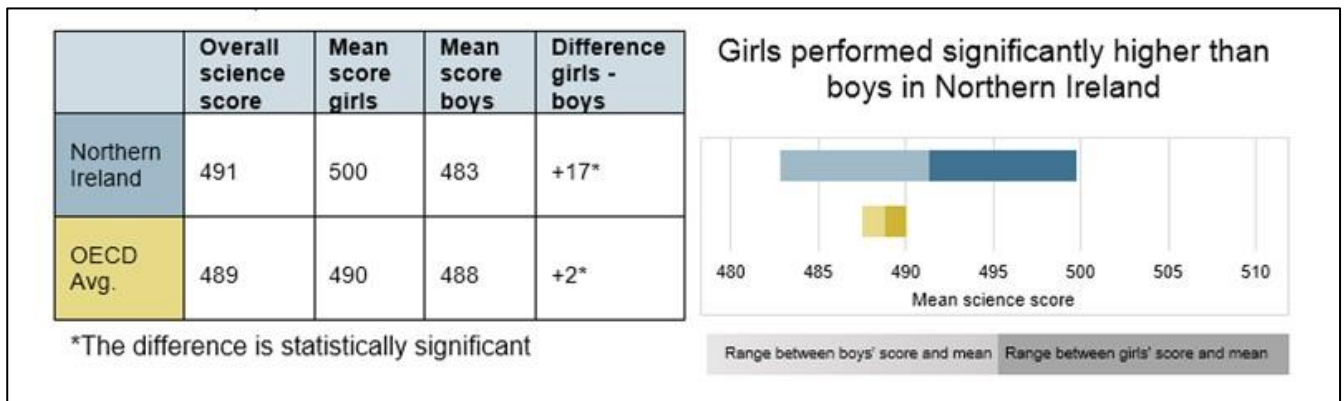
Figure 4.8 shows a scatterplot of the mean score for girls against the mean score for boys. For science, countries are scattered either side of the line of equality, with girls overall performing very slightly better than boys as shown by the position of the OECD average.

Most countries displayed minimal gender gaps in science. 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. Northern Ireland had the second highest gender gap favouring girls behind that of Finland (+24).

Key point

The gender gap for Northern Ireland significantly favours girls and was one of the largest in PISA 2018. Since 2015, the performance of boys has fallen significantly, whereas the performance of girls is unchanged.

Figure 4.8   Gender differences in science scores across PISA 2018 countries[51]

The gender difference in science score for Northern Ireland was larger than that for most other countries
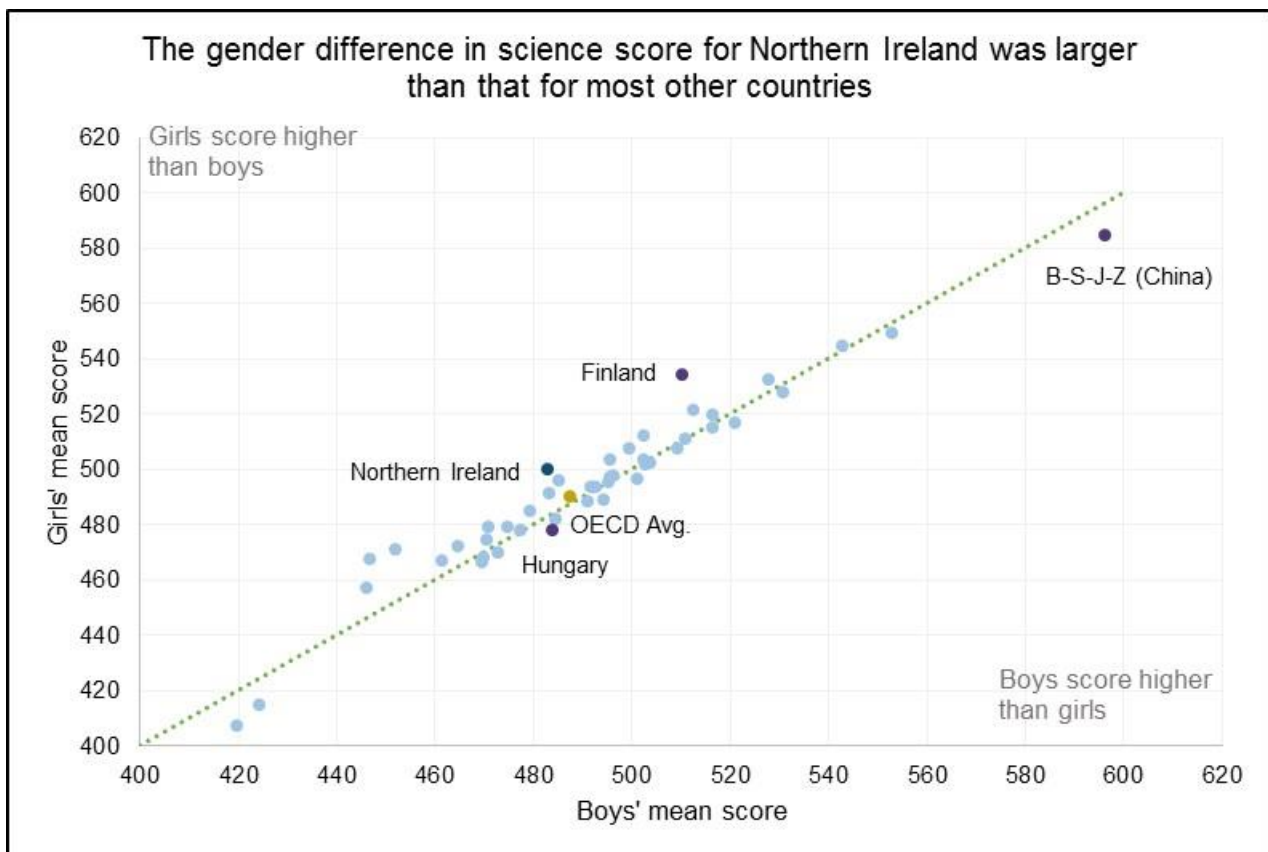
Source: PISA 2018 database

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[51] The scatterplot includes all OECD countries, plus other countries with mean science scores above 450.

5   Mathematics

Chapter outline

This chapter reports on the mathematics attainment of pupils in Northern Ireland. It draws on findings outlined in the PISA International report (OECD, 2019b) and places outcomes for Northern Ireland 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

- Northern Ireland achieved a mean score of 492 in 2018 which was not significantly different from the OECD average of 489.
- Northern Ireland's performance in mathematics has remained stable and similar to the OECD average since 2006.
- Northern Ireland scored significantly higher than 45 other countries.
- Northern Ireland was outperformed by a similar number of countries as in 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

- Northern Ireland has a similar attainment gap to the OECD average. The average performance of high achievers has improved, since 2015, while low achievers' performance has declined. However, neither of these changes were statistically significant.

Proficiency levels

- The percentage of pupils in Northern Ireland achieving below proficiency Level 2 was 20% while the percentage of pupils reaching proficiency Levels 5 or 6 was 8%. These figures are not significantly different to 2015, when they were 19% and 7%, respectively.

Gender gap

- The gender gap in mathematics remains non-significant but girls scored slightly higher than boys in 2018.

5.1 Northern Ireland'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 Northern Ireland has remained stable since 2006. The mean score achieved in 2018, of 492 score points, was not statistically significantly different[52] from the mean score achieved in any previous cycles.

> **Key point**
>
> Northern Ireland's performance in mathematics has remained stable and similar to the OECD average since 2006.

The mean score in Northern Ireland was similar to the OECD average[53]. Northern Ireland has performed similarly to the OECD average in all PISA cycles since 2006.

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[52] When statistical significance is reported, it indicates that the compared means are significantly different at the 5% level.
[53] The 2018 OECD average is based upon the AV37 results published in the OECD International results Table 1.B1.11.

Figure 5.1   Trends over time in mathematics scores in Northern Ireland and the OECD [54]
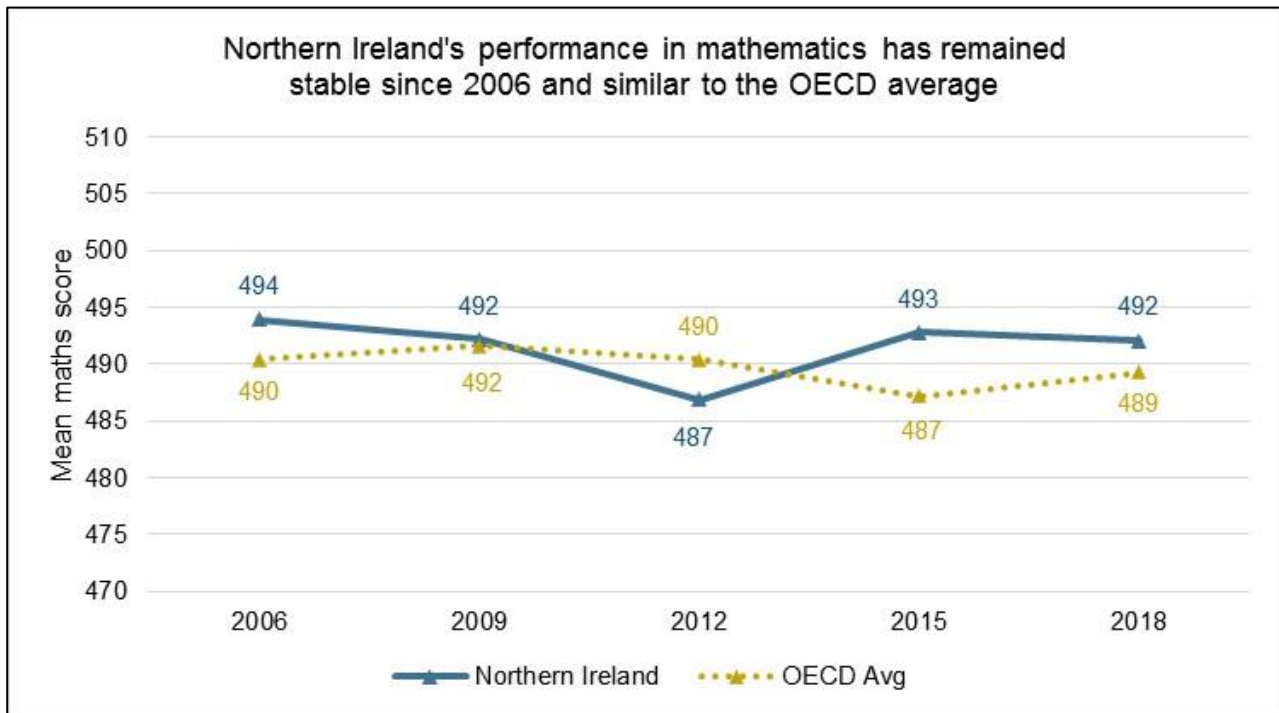
Source: PISA 2018 database; Bradshaw *et al.*, 2007; Bradshaw *et al.*, 2010; Wheater *et al.*, 2014; Jerrim *et al.*, 2016

5.2   International results

Of the 76[55] other reported participating countries in PISA 2018, only 17 scored significantly higher than Northern Ireland and, as in previous cycles, most of the top-performing countries are from east and south-east Asia. Fourteen countries performed at a level that was not significantly different from that of Northern Ireland, while the majority of participants (45 countries) performed significantly less well. These results are shown in Table 5.1. Only 6 countries in Table 5.1 made significant improvements in their mathematics performance since 2015: 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.

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[54] The OECD average for 2006, 2012, 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.

[55] 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

Northern Ireland scored significantly higher than 45 of the 76 reported countries and the top performers remain largely composed of countries from east Asia.

Among the OECD countries, 12 outperformed Northern Ireland, 13 performed similarly and 11 performed less well. Five OECD countries showed significant improvement in mathematics since 2015 (Poland, Latvia, Iceland, Turkey and Slovak Republic) while no OECD countries' scores declined significantly.

Table 5.1   PISA International results for mathematics

Participants with significantly HIGHER mathematics scores than Northern Ireland

Country	Scale score		Country	Scale score	
B-S-J-Z (China)	591		Poland	516	^
Singapore	569		Switzerland	515	
Macao (China)	558	^	Canada	512	
Hong Kong (China)	551		Denmark	509	
Chinese Taipei	531	v	Slovenia	509	
Japan	527		Belgium	508	
Korea	526		Finland	507	
Estonia	523		Sweden	502	
Netherlands	519				

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

Country	Scale score		Country	Scale score	
Norway	501		New Zealand	494	
Germany	500		Portugal	492	
Republic of Ireland	500		**Northern Ireland**	**492**	
Czech Republic	499		Australia	491	
Austria	499		**OECD Average**	**489**	
Latvia	496	^	*Russian Federation*	488	
France	495		Italy	487	
Iceland	495	^	Slovak Republic	486	^

Participants with significantly LOWER mathematics scores than Northern Ireland

Country	Scale score		Country	Scale score	
Luxembourg	483		Israel	463	
Spain	481		Turkey	454	∧
Lithuania	481		*Ukraine*	453	
Hungary	481		Greece	451	
United States	478		Chile	417	
Belarus	472		Mexico	409	
Malta	472	∨	Colombia	391	
Croatia	464		plus 30 other countries scoring <450		

∧∨ Indicates a statistically significant change in mathematics since PISA 2015
OECD countries (not italicised)
Countries not in OECD (italicised)
* 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.

In 2009, 12 countries performed similarly to Northern Ireland (Bradshaw *et al.,* 2010). Seven of these countries performed similarly to Northern Ireland in 2018 (Norway, France, the Slovak Republic, Austria, Czech Republic, the Republic of Ireland and Portugal), 3 performed significantly below (Hungary, Luxembourg and the United States), and 2 scored significantly above Northern Ireland (Poland and Sweden). Three of these countries, with different profiles of performance between 2009 and 2018, are illustrated in Figure 5.2: Poland, the Republic of Ireland and the United States.

Poland performed similarly to Northern Ireland in 2009 but significantly outperformed Northern Ireland in all 3 cycles since 2009, with the sharpest increase in performance occurring in 2012. Poland's performance dipped in 2015 but rose again in 2018, so although performance has not been stable, it has followed an overall upward trend.

The Republic of Ireland scored similarly to Northern Ireland in 2009, but in 2012 performance increased to significantly above that of Northern Ireland. The Republic of Ireland maintained a significantly higher score in 2015, but in 2018, following a slight dip in performance, performed similarly to Northern Ireland again.

The United States has shown a mostly downward trend in performance since 2009 and scored significantly below Northern Ireland in 2015 and 2018.

Figure 5.2   Trends in mathematics scores for countries that performed similarly to Northern Ireland in 2009
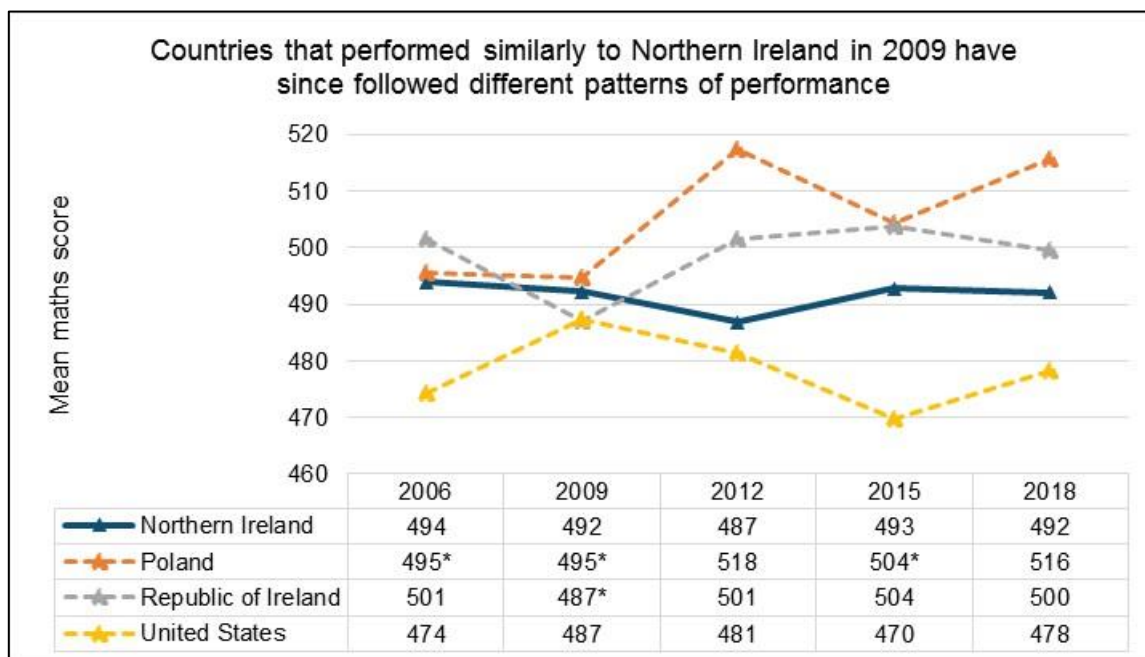
Countries that performed similarly to Northern Ireland in 2009 have since followed different patterns of performance

	2006	2009	2012	2015	2018
Northern Ireland	494	492	487	493	492
Poland	495*	495*	518	504*	516
Republic of Ireland	501	487*	501	504	500
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 Northern Ireland (Bradshaw *et al.,* 2010). In 2018, Northern Ireland performed similarly to 4 of these 20 countries. Fifteen of these 20 countries still outperformed Northern Ireland in 2018 (in addition to Poland and Sweden which had not been significantly different to Northern Ireland in 2009) and one country did not participate in 2018 (Liechtenstein). Furthermore, in 2009, 32 countries performed significantly below Northern Ireland. By 2018, 3 of these countries performed similarly to Northern Ireland but none performed significantly better than Northern Ireland. This demonstrates that Northern Ireland's performance has remained relatively stable in comparison to other countries.

Looking at more recent changes in performance, in 2018 there was one country fewer in the group who scored significantly higher than Northern Ireland, than in 2015 (Jerrim *et al.,* 2016). Both Germany and the Republic of Ireland no longer scored significantly higher than Northern Ireland, while Sweden moved from having a similar performance to a significantly higher performance than Northern Ireland.

5.3   Differences between highest and lowest achievers

In addition to knowing how well pupils in Northern Ireland 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 high achievers but may also have fewer underachievers.

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.

Key point

The attainment gap in Northern Ireland was not significantly different from the OECD average.

Pupils at the 10th percentile in Northern Ireland had a score of 377, while those at the 90th percentile had a score of 600, a difference of 223 score points. The difference in performance in Northern Ireland was not significantly different from the OECD average, of 235 score points, as shown in Figure 5.3.

Figure 5.3   Attainment gap in mathematics scores in Northern Ireland and the OECD

The attainment gap in Northern Ireland was similar to the OECD average

Northern Ireland	223
OECD Avg.	235

Difference between the scores at the 10th and 90th percentiles in maths
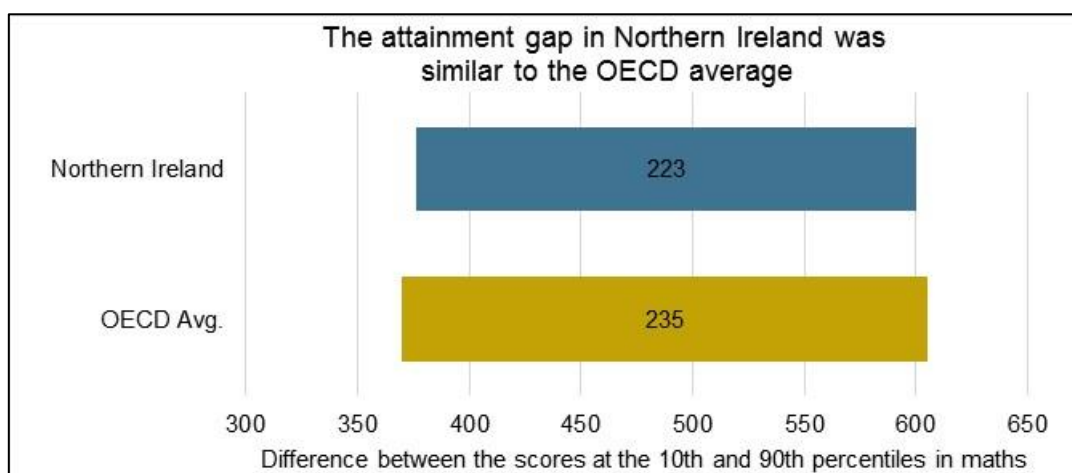
Source: PISA 2018 database

This difference in attainment between the highest and lowest achievers in Northern Ireland is slightly larger than in 2015, when it was 204 score points (Jerrim *et al.,* 2016). Pupils at the 90th percentile achieved slightly higher in 2018 than in 2015, while pupils at the 10th

percentile achieved slightly lower, but neither of these changes were statistically significant.

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[56]: 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. Northern Ireland falls into the fourth category as it has a slightly (but not significantly) higher score than the OECD average and a slightly smaller attainment gap. Most countries cluster around the OECD average; however, 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 Northern Ireland 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
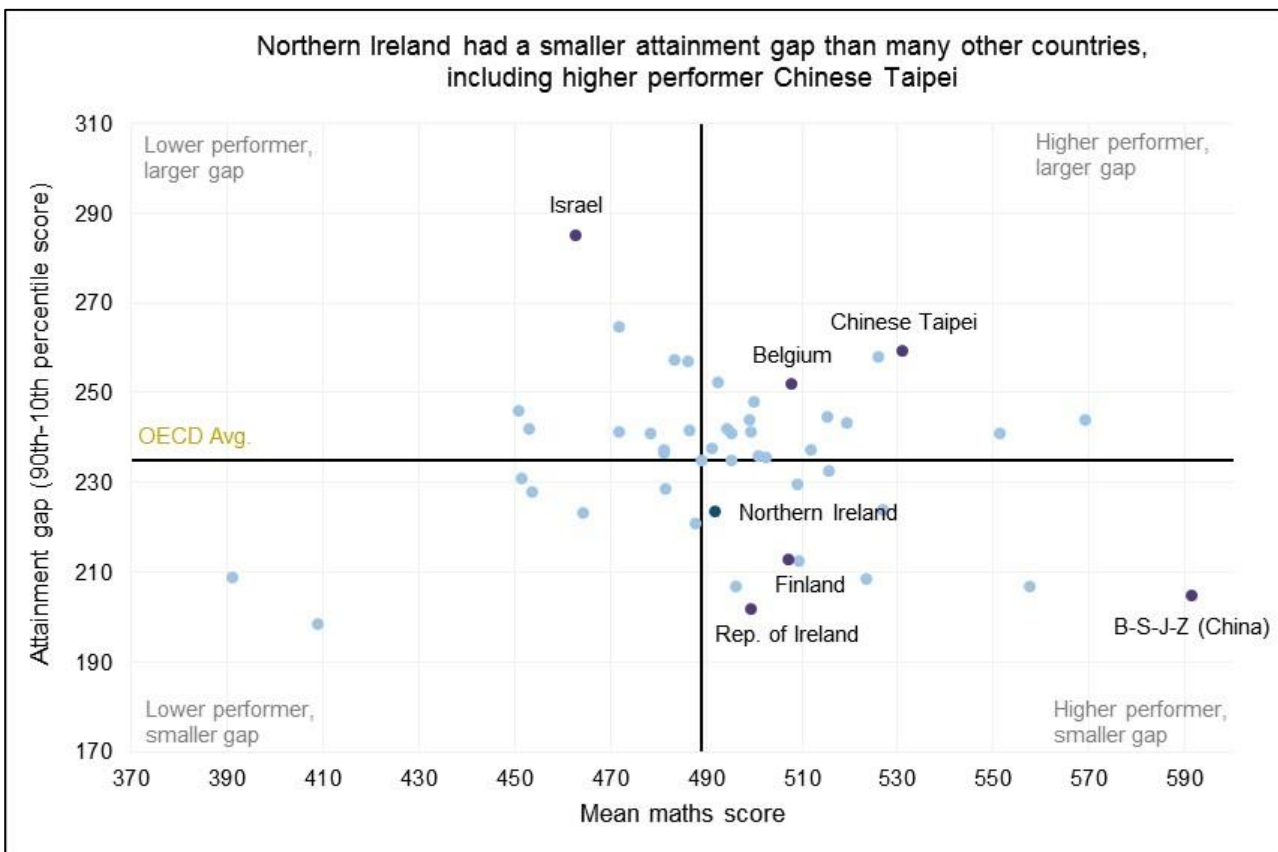
Note: This scatterplot contains all countries either in the OECD or with a mean score above 450

Source: PISA 2018 database

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[56] Note: statistical significance, in relation to the OECD, is not accounted for in this graph.

To further consider Northern Ireland'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 Northern Ireland at either the 10th or 90th percentile. In Belgium, pupils achieved a mean mathematics score of 508 which was significantly higher than in Northern Ireland. At the 10th percentile pupils in Belgium and Northern Ireland scored similarly, but Belgium had a much larger attainment gap with pupils at the 90th percentile scoring 28 points higher than those in Northern Ireland, driving their higher overall mean score. In contrast, pupils in the Republic of Ireland had similar scores to Northern Ireland at the 90th percentile but higher scores at the 10th percentile, meaning their attainment gap was smaller, while their mean score was similar to that of Northern Ireland.

Of the countries that had significantly higher mean mathematics scores than Northern Ireland, Finland had the most similar score at the 90th percentile (12 score points higher than in Northern Ireland). However, Finland's performance at the 10th percentile was 22 score points higher than in Northern Ireland and their overall gap was smaller, at 213 score points.

These comparisons serve to illustrate the potential trade-offs to be made between policy that seeks to improve average performance by targeting low performers (which would give Northern Ireland a profile more like Finland or the Republic of Ireland), or higher performers (which would give Northern Ireland a profile more like Belgium).

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

Countries with similar performance to Northern Ireland at either the 10th or 90th percentile had varying attainment gaps

Country	Value
Northern Ireland	223
Belgium	252
Republic of Ireland	202
Finland	213

Difference between the scores at the 10th and 90th percentiles in maths
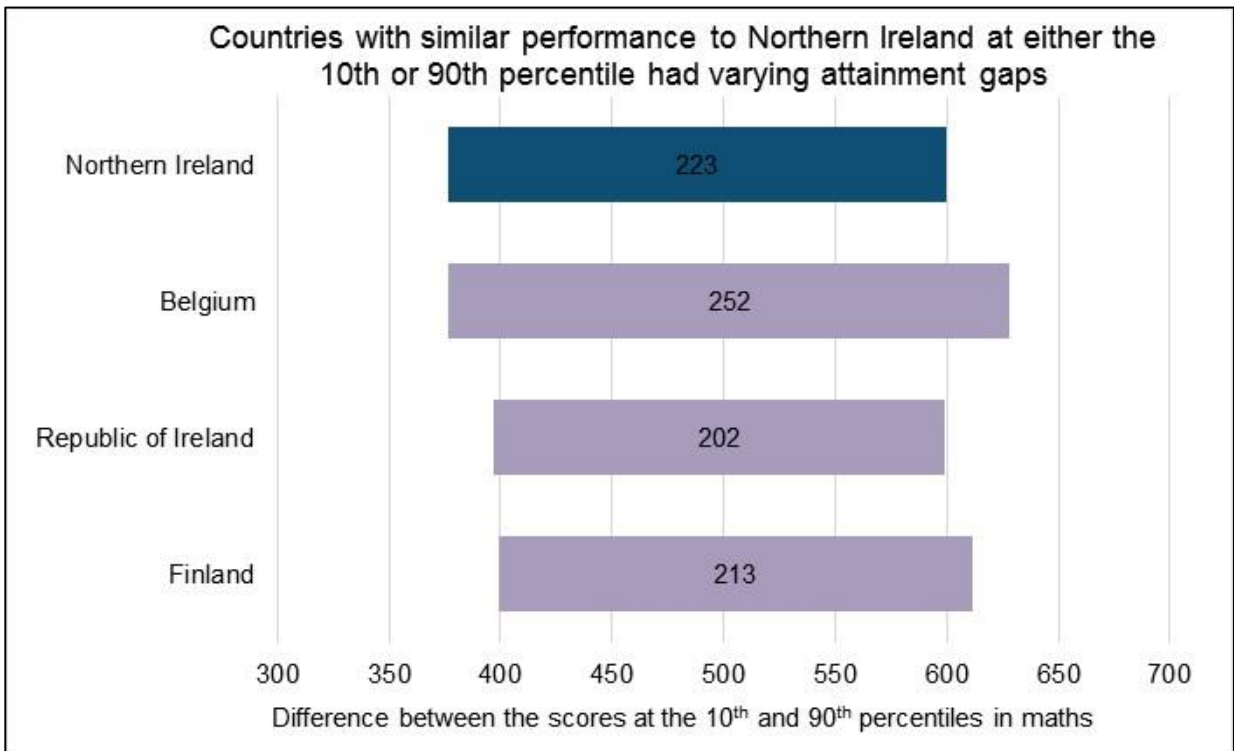
5.3.2 Performance across PISA proficiency levels

Proficiency levels for mathematics

The second way of examining the spread of attainment is by examining Northern Ireland'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 proficiency levels are outlined in Appendix A3.

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). Compared with the OECD average, Northern Ireland had a significantly smaller proportion of pupils performing below Level 2, as well as a significantly smaller proportion working at Level 5 or above.

Figure 5.6   Mathematics proficiency levels in Northern Ireland and the OECD

The proportion of pupils reaching each mathematics proficiency level in Northern Ireland was similar to the OECD average

	Below L1	L1	L2	L3	L4	L5	L6
Northern Ireland	7%	13%	24%	28%	20%	7%	1%
OECD Avg.	9%	15%	22%	24%	19%	9%	2%
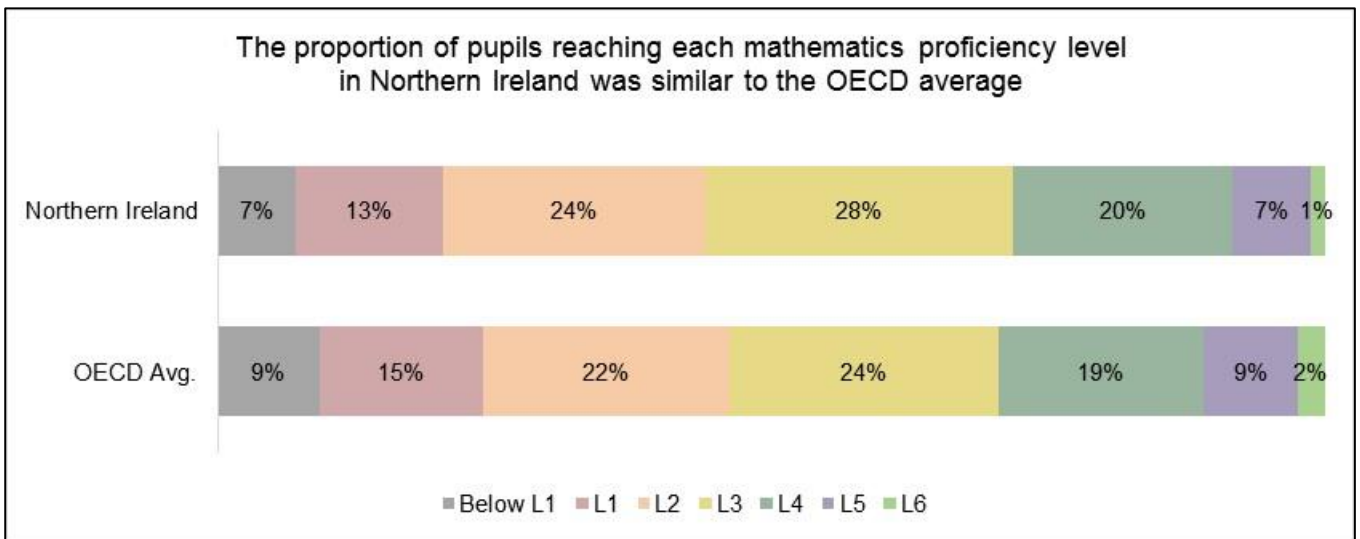
Since 2015, the proportions of pupils in Northern Ireland working at the highest proficiency levels (Levels 5 and 6) and the lowest proficiency levels (below Level 2) have both increased marginally, but not significantly, by 2[57] percentage points.

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[57] after taking into account the rounding of figures

5.4   Differences between boys and girls

In Northern Ireland, girls achieved a mean score of 495 while boys achieved a mean score of 489. The gap of 7 score points (after rounding) in favour of girls was not statistically significant.

Figure 5.7 shows that the OECD average had a significant difference of 5 score points, favouring boys.

Figure 5.7   Gender differences in mathematics scores in Northern Ireland and the OECD

	Overall maths score	Mean score girls	Mean score boys	Difference girls - boys
Northern Ireland	492	495	489	+7
OECD Avg.	489	487	492	-5*

*The difference is statistically significant
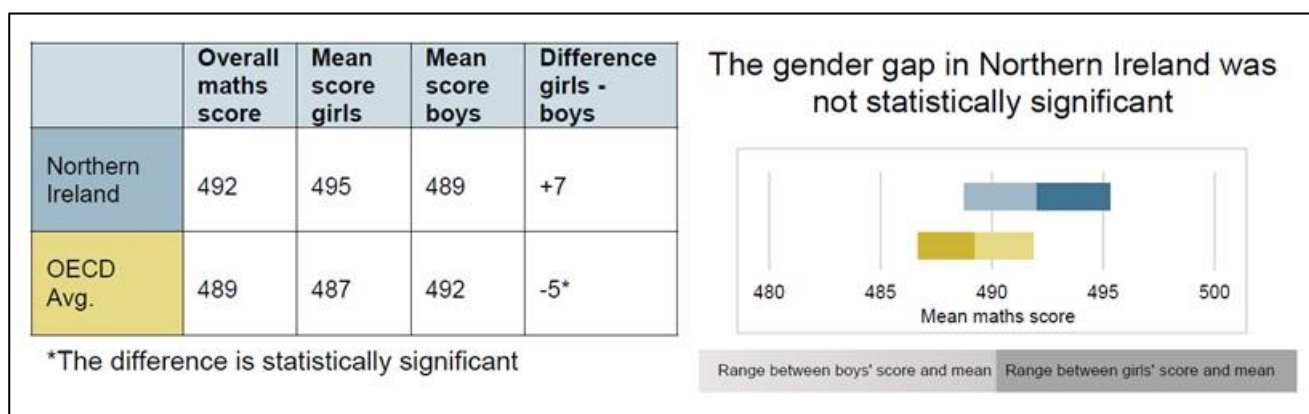
Northern Ireland's gender gap in 2015 was also not significant (Jerrim *et al.,* 2016). The scores achieved by both boys and girls have not changed significantly since 2015.

Key point

There was no significant difference in mathematics performance between girls and boys.

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 countries. 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 highest performing countries did not have significant gender differences.

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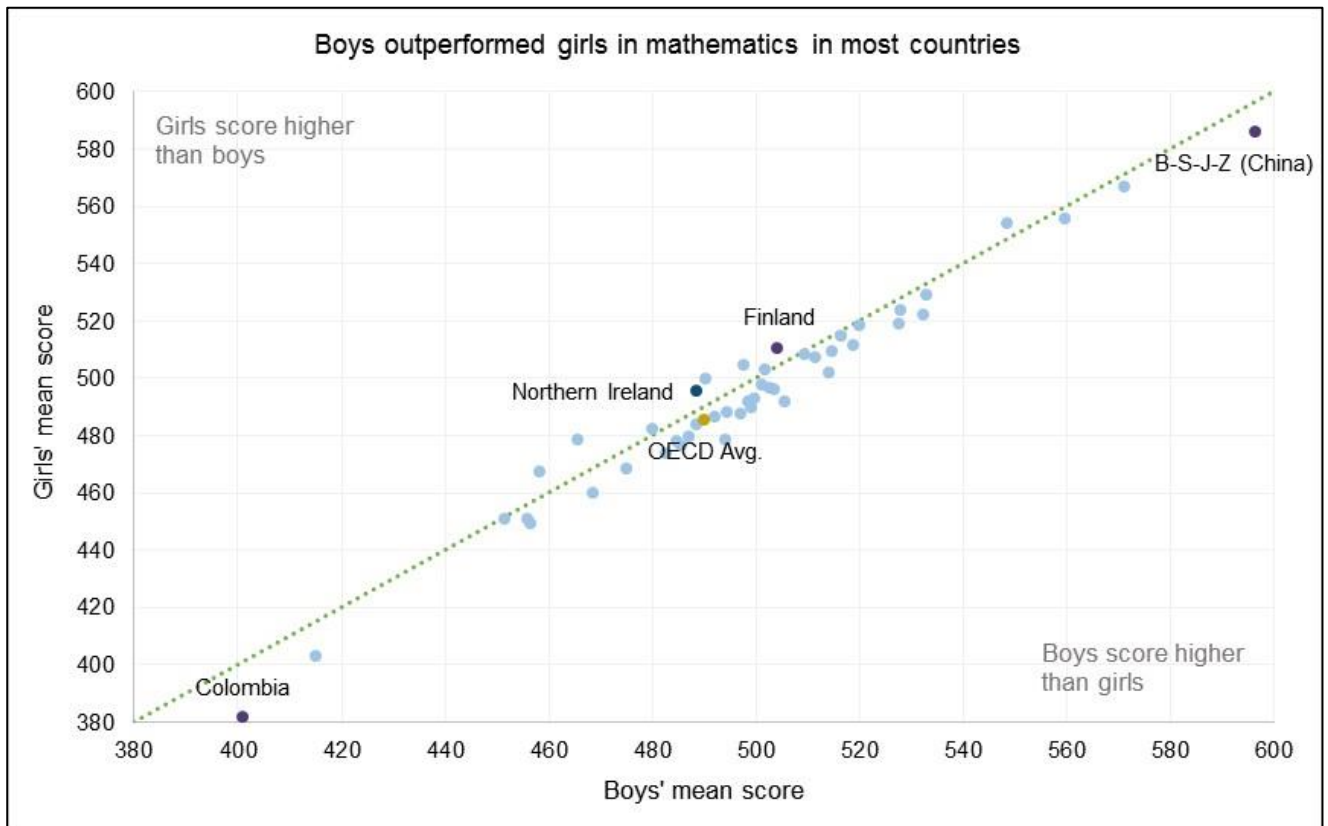
Note: This scatterplot contains all countries either in the OECD or with a mean score above 450

Source: PISA 2018 database

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

6 Schools

Chapter outline

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

Key findings

Variation in reading performance

- Pupils at grammar schools, on average, had significantly higher reading scores than those at non-grammar schools. However, this analysis did not take into account differences such as pupils' prior attainment or socio-economic status.
- In Northern Ireland, there was more variation in pupils' reading scores between schools but less variation within schools compared with the OECD average: reading achievement varied more from school to school in Northern Ireland than across the OECD on average. This may be due to the academic selection of pupils to post-primary schools in Northern Ireland.

Grouping by ability

- Most principals in Northern Ireland reported that their schools grouped pupils by ability into different classes for some subjects, and grouped pupils by ability within classes for some subjects.
- Across the OECD countries, it was more common for schools not to group pupils by ability for any subject than it was in Northern Ireland.

Use of assessments

- Almost all schools in Northern Ireland used assessments of pupils in Years 11 and 12 to inform parents, guide learning, adapt teaching, identify areas of teaching to be improved, and monitor school progress.
- Achievement data was more important as a measure of public accountability to schools in Northern Ireland than in the OECD countries on average. Just under two-fifths of schools (38%) across the OECD reported that achievement data was reported publicly compared with 80% of schools in Northern Ireland.

Pupils' behaviour at school

- Barriers to learning caused by the behaviour of pupils or teachers were less commonly reported by principals in Northern Ireland than in the OECD on average. The most commonly reported barrier to pupils' learning in Northern Ireland was pupils not paying attention, which was more common in the OECD countries than in Northern Ireland.
- Rates of incidence of bullying reported by pupils in Northern Ireland were similar to those reported on average across the OECD. The most commonly reported bullying behaviour (being made fun of by other pupils) was reported to have happened to 17% of pupils in Northern Ireland at least monthly over the past year. The proportion on average across the OECD countries was similar, at 14%.
- Pupils in Northern Ireland expressed a higher degree of disapproval of bullying behaviours than pupils across the OECD countries.
- Pupils in Northern Ireland were slightly more likely to report that their fellow pupils were competitive than cooperative. The reverse was the case for the OECD average. Pupils in Northern Ireland expressed a higher degree of competition among pupils than those across the OECD on average. The level of cooperation reported by pupils in Northern Ireland was similar to the level reported across the OECD on average.

Schools' resources

- On average, schools in Northern Ireland had fewer pupils in Year 12 than the OECD average for the comparable grade.
- In Northern Ireland, 98% of principals reported that their school had a scheme in place to prepare pupils for responsible internet behaviour, compared with 60% of schools across OECD countries.
- Schools in Northern Ireland were better resourced with ICT equipment than schools on average across the OECD countries. However, principals in Northern Ireland generally reported that their schools were less prepared to enhance learning and teaching using digital devices than principals across the OECD. They reported, for example, that teachers in Northern Ireland were less likely to have sufficient time to prepare lessons that integrate digital devices, and insufficient numbers of digital devices for teaching.
- Lack of physical infrastructure and the inadequacy or poor quality of existing physical infrastructure were the most common barriers to teaching in Northern Ireland, reported by 45% and 43% of principals respectively. One-third (33%) of principals across the OECD reported each of these issues as barriers to learning.

Extra-curricular activities

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

6.1 Difference in reading scores by school type

When determining the sample of schools to represent Northern Ireland in PISA 2018, school type was taken into account. This allowed for the information gathered by PISA to be representative of schools in Northern Ireland. However, because only a comparatively small number of pupils at each school were tested, and those pupils might not be representative of the pupils at their school, the following comparison of average scores by school type should be interpreted with caution. Furthermore, these comparisons do not take account of other differences between the different types of school, such as the prior attainment or socio-economic status of pupils.

Reading was the main domain assessed in PISA 2018. As reported in Chapter 2, Northern Ireland's pupils achieved a mean score of 501 in reading which was statistically significantly[58] above the OECD average[59] of 487. Table 6.1 shows the mean reading scores for 2 different school types in Northern Ireland, compared with the OECD average. Pupils at non-grammar schools achieved, on average, a score of 454 which was lower than the OECD average of 487. Pupils at grammar schools scored significantly higher, on average, than pupils at non-grammar schools, with a mean score of 559.

Table 6.1   Mean scores in reading by school type

School type	Reading score	OECD average	Score point difference Northern Ireland-OECD	
Non-grammar	454	487		-33
Grammar	559	487		72

Source: PISA 2018 database

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

6.2 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 is 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 academic selection.

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, and the remaining 71% of the variation was due to within-school differences. In Northern Ireland, the amount of between-school variation was greater at 34% of the OECD total, but lower within schools at 63% of the OECD total[60]. This indicates that reading achievement varied more from school to school in Northern Ireland than across the OECD on average.

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[60] For each participating country, the OECD reported the variation in reading performance as a percentage of the total variation in performance across OECD countries. For Northern Ireland, the total variation in reading performance as a percentage of the average across the OECD was 98% when rounded to the nearest percentage. The total variation in Northern Ireland is similar to, but lower than, the OECD average, and is made up of 34% between-school variation and 63% within-school variation (rounded to the nearest percentages). For the OECD average, the sum of the between-school variation (29%) and within-school variation (71%) equals 100%.

> **Comparison with the OECD average**
>
> This chapter reports on the responses of principals to the school questionnaire and pupils to the pupil questionnaire. These are compared with the average responses from principals or pupils from across the OECD[61].
>
> In the remainder of this chapter, we do not report whether differences are statistically significant because, due to the sample sizes, small differences can be statistically significant. Instead, we report on the size of differences. Throughout the chapter, differences of 3 percentage points or less are described as similar.

6.3 School management and policies

6.3.1 Admission policies

Principals were asked which factors were taken into consideration when admitting pupils to their schools. The results are shown in Table 6.2. The most commonly reported criterion for admission to schools in Northern Ireland was pupils' academic performance or entrance exams, which nearly half of principals (48%) reported were always used by their school as a factor in deciding admissions. The OECD average was lower at 33%. The next mostly commonly reported criterion for admission to schools in Northern Ireland was family members who were current or former pupils at the school (40% in Northern Ireland compared with 20% across the OECD on average). Residence in a particular area was the factor most commonly taken into account across the OECD countries (always considered by 41% of schools); in Northern Ireland, the proportion was lower at 27%.

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[61] For analyses of questions from the questionnaires, the 2018 OECD average is based upon the AVG results published in the OECD International results.

Table 6.2   School admissions

How often are the following factors considered when students are admitted to your school?

	Always		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[62]**
Student's record of academic performance (including 11-plus and entrance exams)	48%	33%	15
Preference given to family members of current or former students	40%	20%	19
Residence in a particular area	27%	41%	-13
Recommendation of feeder schools	17%	14%	3
Parents' endorsement of the instructional or religious philosophy of the school	12%	16%	-4
Whether the student requires or is interested in a special programme	3%	22%	-19
Other	16%	11%	5

Source: PISA 2018 database; School Questionnaire, question SC012

6.3.2 Grouping policies

Principals were asked how common it was for pupils to be grouped *into different classes* or *within classes* at their schools. As shown in Table 6.3, in Northern Ireland, grouping *into different classes* for some subjects was more common than grouping for all subjects or not grouping for any subject. Just over four-fifths of principals in Northern Ireland (82%) 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 Northern Ireland, with just under half of principals (46%) in the OECD reporting that this was the case in their schools. Among the highest-performing countries, it was less common than in Northern Ireland for principals to report grouping into different classes for some subjects (e.g. Macao (China) 44%, Northern Ireland 82%), and more common to report not grouping into different classes for any subject (e.g. Macao (China) 48%, Northern Ireland 10%). There was a more mixed picture

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[62] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

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 Northern Ireland (8%) (e.g. Hong Kong (China) 13%) and others less so (e.g. Estonia 1%).

Grouping *within classes* for some subjects was more common in Northern Ireland than grouping within classes for all subjects or not grouping for any subject within classes. Just under three-quarters of principals (72%) in Northern Ireland 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 principals (51%) reported grouping by ability within classes for some subjects.

When compared with Northern Ireland, the highest-performing countries were less likely to group within classes for some subjects (e.g. Estonia 55%, Northern Ireland 72%). In most high-performing countries, less than 10% of principals reported that their schools grouped pupils by ability for all subjects; this was also the case in Northern Ireland (4%). The exception was B-S-J-Z (China), where 32% of principals reported grouping within classes for all subjects. There was a more mixed picture among the highest-performing countries when considering how many schools did not group pupils within classes by ability for any subject; some countries reported this more frequently than Northern Ireland (24%) (e.g. Korea 42%), and others less frequently (e.g. Singapore 21%).

The evidence provided in this section suggests that grouping by ability is more common in Northern Ireland than across the OECD countries on average, and more common in Northern Ireland than in the majority of high-performing countries.

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 post-primary education.

Table 6.3   Grouping of pupils by ability

How often are the following factors considered when students are admitted to your school?

	For all subjects		For some subjects		Not for any subjects	
	Northern Ireland	**OECD average**	**Northern Ireland**	**OECD average**	**Northern Ireland**	**OECD average**
Students are grouped by ability into different classes.	8%	9%	82%	46%	10%	45%
Students are grouped by ability within their classes.	4%	6%	72%	51%	24%	43%

Source: PISA 2018 database; School Questionnaire, question SC042

6.3.3 Equity-oriented policies

Principals 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 6.4, nearly two-thirds of principals in Northern Ireland (65%) indicated that pupils with a 'heritage' language other than English attended mainstream classes and received additional periods of instruction aimed at developing their English language skills. This was the most common provision for such pupils, both in Northern Ireland and on average across the OECD countries (where the proportion of principals reporting this practice was 58%). The second most common provision for schools in Northern Ireland (41% of principals) was for classroom assistants to provide support to pupils in mainstream classes.

Table 6.4   Pupils with English as an additional language

Does your school offer any of the following options to students whose heritage language is not English? Please answer for students in Years 11 and 12. *('Heritage language' is a language learnt at home that a student acquired as a mother tongue before learning English, or alongside English.)*

	Yes		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[63]**
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.	65%	58%	6
These students are given support by classroom assistants in mainstream classes.	41%	n/a[64]	
Class size is reduced to cater to the special needs of these students.	16%	17%	-1
Before transferring to mainstream classes, these students receive some instruction in school subjects in their heritage language.	15%	9%	5
These students receive significant amounts of instruction in their heritage language aimed at developing proficiency in both languages.	14%	7%	6
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.	10%	25%	-15

Source: PISA 2018 database; School Questionnaire, question SC150

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[63] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.
[64] No OECD average is available as this option was only included in the school questionnaire used in the UK.

6.3.4 Assessment and accountability

Principals were asked about the purposes of assessments taken by pupils in Years 11 and 12; the results are shown in Table 6.5. In Northern Ireland, for the 5 purposes of: guiding learning; informing parents; adapting teaching; identifying aspects of instruction or the curriculum that could be improved; and monitoring school progress, 98% or more of schools used Year 11 and 12 assessments. These were also common purposes used across OECD countries, but the proportions of schools using them were lower than in Northern Ireland (ranging from 5 to 21 percentage points lower, taking account of rounding).

At least two-thirds of schools in Northern Ireland (69% or more) used pupil assessments for all of the reasons given in the question and, in all cases, the use of the assessment was reported by a greater proportion of principals in Northern Ireland than across the OECD countries on average.

The uses of assessment listed in Table 6.5 can be divided into those linked to pedagogy (for example, guiding pupils' learning or grouping pupils) and those linked to accountability (for example, comparing schools or reporting to parents). Principals in Northern Ireland were equally likely to report that assessments were used for pedagogical reasons as for accountability reasons. Across the OECD, assessments were generally more commonly used for pedagogical reasons than for accountability. The greatest differences between Northern Ireland and the OECD average were seen for comparing the school with other schools (Northern Ireland 88%, OECD average 46%), and comparing the school to local or national performance (Northern Ireland 93%, OECD average 57%).

Table 6.5   Use of school assessments, reported by principals

In your school, are assessments of students in Years 11 and 12 used for any of the following purposes?

	Yes		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[65]**
To guide students' learning	100%	91%	9
To inform parents about their child's progress	100%	95%	5
To adapt teaching to the students' needs	100%	87%	13
To identify aspects of instruction or the curriculum that could be improved	100%	78%	21
To monitor the school's progress from year to year	98%	78%	20
To award certificates to students	95%	69%	26
To compare the school to local or national performance	93%	57%	35
To compare the school with other schools	88%	46%	43
To make decisions about students' retention or promotion	79%	72%	7
To group students for instructional purposes	75%	49%	26
To make judgements about teachers' effectiveness	69%	44%	26

Source: PISA 2018 database; School Questionnaire, question SC154

Principals were also asked how achievement data was used for accountability purposes in their school. As shown in Table 6.6, the largest difference between Northern Ireland and the average across schools in the OECD countries in terms of the use of achievement data, was the public posting of this data: four-fifths of principals in Northern Ireland (80%) said that this was done, compared with just under two-fifths of principals in the OECD

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[65] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

(38%). Of the principals in Northern Ireland, 91% said that achievement data was provided directly to parents; the OECD average was lower at 83%. In addition, 99% of schools in Northern Ireland also said that achievement data was tracked over time by an administrative authority; again, the OECD average was lower at 67%.

Table 6.6   Uses of achievement data, reported by principals

In your school, is achievement data used in any of the following accountability procedures? *Achievement data includes aggregated school or year-group test scores or grades, or rates of school completion.*

	Yes		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[66]**
Achievement data is tracked over time by an administrative authority.	99%	67%	31
Achievement data is provided directly to parents.	91%	83%	8
Achievement data is posted publicly (e.g. in the media).	80%	38%	42

Source: PISA 2018 database; School Questionnaire, question SC036

6.4   School climate

6.4.1 Teacher and pupil behaviour affecting school climate

Principals were asked to indicate the extent to which learning was hindered by the behaviour of pupils and the behaviour of teachers. The findings are shown in Table 6.7.

In Northern Ireland, for all but one of the 11 reasons given, principals were less likely than across the OECD countries to report that the issues listed hindered pupils' learning to some extent or a lot. For both Northern Ireland and the OECD, the main barrier to pupils' learning was pupils not paying attention; nearly three-fifths of principals reported this across the OECD countries (59%) compared with over a third in Northern Ireland (35%). Pupils lacking respect for teachers was the second most common pupil behaviour that

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[66] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

hindered learning in Northern Ireland, reported by around a fifth of principals both in Northern Ireland (19%) and across the OECD (22%). The second most common barrier reported across the OECD, pupil truancy, was much less of an issue in Northern Ireland (38% for the OECD compared with 8% in Northern Ireland).

Of the barriers to learning relating to staff behaviour rather than pupil behaviour, the most common cause in Northern Ireland, reported by 19% of principals, was teacher absenteeism; the OECD average was similar at 18%. Staff resisting change was reported by 29% of principals across the OECD as a barrier to learning to some extent or a lot. This compared with 14% in Northern Ireland.

Table 6.7   Pupil and teacher behaviour for learning, reported by principals

In your school, to what extent is the learning of students hindered by the following?

	To some extent / a lot		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD**[67]
Pupil behaviours			
Students not paying attention	35%	59%	-25
Students lacking respect for teachers	19%	22%	-2
Student truancy	8%	38%	-30
Students intimidating or bullying other students	8%	12%	-4
Students skipping classes	7%	34%	-27
Student use of alcohol or illegal drugs	3%	10%	-7
Teacher behaviours			
Teacher absenteeism	19%	18%	1
Teachers not meeting individual students' needs	14%	30%	-16
Staff resisting change	14%	29%	-15
Teachers not being well prepared for classes	3%	13%	-10
Teachers being too strict with students	0%	12%	-12

Source: PISA 2018 database; School Questionnaire, question SC061

[67] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

6.4.2 Parental engagement

Principals 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 6.8.

On average, principals reported that just over half of parents in Northern Ireland (51%) had discussed their child's progress with a teacher on the teacher's initiative during the last academic year. Across the OECD, the average percentage of parents was greater at 57%. Just over two-fifths of parents in Northern Ireland (41%) were reported to have discussed their child's progress on their own initiative, which was the same as the OECD average (41%). Principals in Northern Ireland were less likely than principals 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 3% in Northern Ireland.

Table 6.8   Parental engagement, reported by principals

During the last academic year, what proportion of students' parents (or guardians) have participated in the following school-related activities?

	Mean percentage		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[68]**
Discussed their child's progress on the initiative of one of their child's teachers	51%	57%	-6
Discussed their child's progress with a teacher on their own initiative	41%	41%	0
Volunteered in physical or extra-curricular activities (e.g. building maintenance, carpentry, gardening, school play, sports, field trip)	5%	12%	-8
Participated in local school governance, e.g. as a parent governor	3%	17%	-13

Source: PISA 2018 database; School Questionnaire, question SC064

6.4.3 Extra-curricular activities

Principals were asked to indicate which of a series of extra-curricular activities were available to pupils in Years 11 and 12. Generally, schools in Northern Ireland were more likely than schools across the OECD countries on average to offer the extra-curricular activities listed in Table 6.9 to the pupils in the PISA age group. More than 85% of principals in Northern Ireland reported that their schools offered sports activities, musical groups, volunteering, art clubs, and lectures as extra-curricular activities. These were also the most common activities across the OECD, but less common than in Northern Ireland.

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[68] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

Table 6.9   Extra-curricular activities

This academic year, which of the following activities does your school offer to students in Years 11 and 12?

	Yes		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[69]**
Band, orchestra, instrumental group or choir	100%	63%	37
Sports teams or sports activities	100%	91%	9
Volunteering or service activities, e.g. a local community volunteering programme, Duke of Edinburgh's Award	90%	74%	16
Art club or art activities	87%	66%	21
Lectures and/or seminars (e.g. guest speakers such as writers or journalists)	86%	74%	12
School play or school musical	76%	60%	17
Debating club or debating activities	62%	40%	23
Book club	60%	37%	23
School clubs or school competitions for foreign languages	57%	n/a[70]	
School yearbook, newspaper or magazine	56%	50%	7
Collaboration with local newspapers	33%	27%	6
Collaboration with local libraries	32%	49%	-17

Source: PISA 2018 database; School Questionnaire, question SC053

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[69] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.
[70] No OECD average is available as each country selected its own final option for this question. Consequently, this option was only included in the school questionnaire used in the UK.

6.4.4 Disciplinary climate

Pupils were asked to indicate how often 5 disruptive events occurred in their English lessons. As shown in Table 6.10, overall there was little difference between the responses of pupils in Northern Ireland and pupils in the OECD countries on average. All of the disruptive events were reported to occur by at least 17% of pupils in Northern Ireland in all or most English lessons, compared with 19% across the OECD. The most commonly disruptive event reported by pupils, happening in most or every lesson, was noise and disorder. This was reported by over a third of pupils in Northern Ireland (35%), which was higher than the OECD average (31%).

Table 6.10   Disruption in English lessons, reported by pupils

How often do these things happen in your English lessons?

	Most lessons / every lesson		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[71]**
There is noise and disorder.	35%	31%	4
Students don't listen to what the teacher says.	33%	29%	3
The teacher has to wait a long time for students to settle down.	24%	26%	-3
Students don't start working for a long time after the lesson begins.	22%	24%	-2
Students cannot work well.	17%	19%	-1

Source: PISA 2018 database; Student Questionnaire, question ST097

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[71] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

6.4.5 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 6.11.

On average across OECD countries, 23% of pupils reported being bullied at least a few times a month. In Northern Ireland, the percentage was similar, at 25% (OECD, 2019d).

Of the 6 bullying behaviours listed in Table 6.11, at least 5% of pupils in Northern Ireland reported that they had experienced such behaviours at least a few times a month during the previous 12 months.

The behaviour most commonly reported in both Northern Ireland and the OECD countries was: *Other students made fun of me*; 17% of pupils in Northern Ireland reported that this had occurred a few times a month or once or more a week at school over the previous 12 months. The proportion on average across the OECD was similar at 14%.

An index of exposure to bullying was constructed by the OECD from pupils' responses to the statements in Table 6.11. 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 students were classified as being frequently bullied. In Northern Ireland, the proportion was similar, at 9% (OECD, 2019d).

Table 6.11   Experience of bullying, reported by pupils

During the past 12 months, how often have you had the following experiences at school?
(Some experiences can also happen electronically, e.g. on social media.)

	A few times a month / once a week or more		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[72]**
Other students made fun of me.	17%	14%	3
Other students spread nasty rumours about me.	10%	10%	-1
Other students left me out of things on purpose.	9%	9%	0
I got hit or pushed around by other students.	6%	7%	-1
I was threatened by other students.	6%	6%	0
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 attitude towards bullying. Table 6.12 shows that pupils in Northern Ireland and across the OECD on average expressed a high degree of disapproval of bullying behaviours. Around 9 out of 10 pupils in Northern Ireland agreed or strongly agreed with the 5 statements about bullying shown in Table 6.12. In each case, the percentage was around 6 percentage points greater than the OECD average.

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[72] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

Table 6.12   Attitude towards bullying, reported by pupils

To what extent do you agree with the following statements?

	Agree / strongly agree		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD**[73]
I like it when someone stands up for other students who are being bullied.	95%	90%	6
It is wrong to take part in bullying.	94%	88%	7
I feel bad when I see other students being bullied.	94%	87%	7
It is a good thing to help students who can't defend themselves.	93%	88%	5
It irritates me when nobody defends students who are being bullied.	87%	81%	6

Source: PISA 2018 database; Student Questionnaire, question ST207

Key point

Pupils in Northern Ireland reported experiencing bullying at school to a similar extent to pupils across the OECD on average. Pupils in Northern Ireland expressed a higher degree of disapproval of bullying behaviours than pupils across the OECD countries.

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[73] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

6.4.6 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 6.13 and 6.14.

Generally, pupils in Northern Ireland 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 countries. For example, 59% of pupils in Northern Ireland felt it was true that *Students seem to value competition*, compared with 48% across the OECD.

For the statements about cooperation, the responses of pupils in Northern Ireland were generally similar to those of pupils across the OECD on average. For example, 53% of pupils in Northern Ireland felt it was true that *Students seem to value cooperation*, compared with 57% across the OECD.

In Northern Ireland, there was generally a small difference between the matched statements about competition and cooperation. Overall, pupils in Northern Ireland indicated that the statements about competition between pupils were more representative of their schools than the statements about cooperation among pupils. For example, two-thirds of pupils (66%) in Northern Ireland reported that *It seems that students compete with each other*, compared with three-fifths (60%) who said that *It seems that students cooperate with each other*. The statement that was supported by the highest proportion of pupils in Northern Ireland for their school was *Students feel that they are being compared with others*. Just over two-thirds of pupils in Northern Ireland (70%) 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 Northern Ireland who felt that this was true was 60%.

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*.

Table 6.13   Competition amongst pupils, reported by pupils

Thinking about your school, how true are the following statements?

	Very true / extremely true		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD**
Students seem to value competition.	59%	48%	11
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.	70%	55%	15

Source: PISA 2018 database; Student Questionnaire, question ST205

Table 6.14   Cooperation between pupils, reported by pupils

Thinking about your school, how true are the following statements?

	Very true / extremely true		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD**
Students seem to value cooperation.	53%	57%	-4
It seems that students cooperate with each other.	60%	62%	-2
Students seem to share the feeling that cooperating with each other is important.	55%	60%	-5
Students feel that they are encouraged to cooperate with others.	60%	60%	0

Source: PISA 2018 database; Student Questionnaire, question ST206

6.5 Resources

6.5.1 ICT

Principals were asked about the number of pupils and the ICT resources in their schools. The results are shown in Table 6.15.

On average, schools in Northern Ireland participating in PISA had fewer pupils in the PISA-age grade[74] than the OECD average for the comparable grade, with an average of 135 pupils per school compared with 157 for the OECD average.

Schools in Northern Ireland, on average, reported a greater availability of ICT resources than schools across the OECD. For example, for every group of 30 Year 12 pupils in Northern Ireland, there were on average 37 computers available for their 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. The picture was similar for the number of computers with internet connection available for teachers; there were 14 such computers available for each group of 10 full-time or part-time teachers at schools in Northern Ireland on average. This compared with 8 computers with internet connection for each group of 10 teachers at schools across the OECD on average.

Nearly all computers in schools that were available to pupils to use for educational purposes had internet access; on average, only 4% in Northern Ireland and 2% across the OECD were not connected to the internet. A quarter of the computers in Northern Ireland (25%) were laptop or tablet computers. Across the OECD, this average was greater at just under half (49%). These figures indicate that schools in Northern Ireland, in general, were better resourced with ICT equipment than schools on average across the OECD countries.

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[74] The PISA-age grade is the modal grade for 15-year-old pupils in each participating country. In Northern Ireland, this is Year 12.

However, in terms of teachers having sufficient time to enhance learning and teaching using digital devices, principals across the OECD generally reported a greater level of preparedness than principals in Northern Ireland. This was shown by the responses to a related but separate question, in which principals 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 6.16.

With respect to equipment, just under half of principals in Northern Ireland (44%) reported that the number of digital devices for teaching was sufficient. The OECD average was higher, at 59%. When considered alongside the findings discussed above, this may indicate that schools in Northern Ireland make greater use of ICT for teaching or have greater demand for equipment than schools across the OECD. Principals in Northern Ireland also reported less agreement than principals across the OECD on statements concerning the adequacy of computers' capacity and the number of computers connected to the internet.

For the set of statements in this question related to staff, the biggest differences between Northern Ireland and the OECD average were seen for 2 statements. The first was *The school has sufficient qualified technical assistant staff*, which 68% of principals in Northern Ireland agreed with compared with 54% for the OECD average. The second statement concerned the provision of incentives to teachers to integrate digital devices in their teaching; 57% of principals across the OECD indicated that this was the case compared with 32% in Northern Ireland. This difference may have been due to teachers in Northern Ireland having already integrated digital devices into teaching or because incentives were not necessary.

Principals in Northern Ireland were slightly more likely than principals across the OECD countries to report that resources for teachers to learn how to use digital devices were available (Northern Ireland 71%, OECD 65%). On the remaining statements concerning ICT and staff, the proportions agreeing or strongly agreeing were similar in Northern Ireland to the OECD average.

Table 6.15   ICT equipment in school, reported by principals

The goal of the following set of questions is to gather information about the student-computer ratio for students in Year 12 at your school.
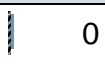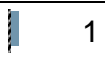
	Mean number		
	Northern Ireland	**OECD average**	**Difference Northern Ireland-OECD**
At your school, what is the total number of students in Year 12?	135	157	-22
Number of computers available to these pupils for educational purposes, for each group of 30 Year 12 pupils	37	21	16
Number of these computers connected to the internet, for each group of 30 Year 12 pupils	35	20	15
Number of these computers that are portable (e.g. laptop, tablet), for each group of 30 Year 12 pupils	9	10	-1
Number of computers with internet connection available for teachers in your school for each group of 10 full-time and part-time teachers[75]	14	8	6

Source: PISA 2018 database; School Questionnaire, question SC004

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[75] Calculated using the number of teachers reported in Table 6.19 (question SC018).

Table 6.16   Preparedness for using ICT, reported by principals

To what extent do you agree with the following statements about your school's capacity to enhance learning and teaching using digital devices? *(Please think of different kinds of digital devices, for example, desktop computers, laptops, tablet computers or interactive whiteboards.)*

	Agree / strongly agree		
	Northern Ireland	OECD average	Percentage point difference Northern Ireland-OECD[76]
The availability of adequate software is sufficient.	72%	71%	0
Effective professional resources for teachers to learn how to use digital devices are available.	71%	65%	6
The school's internet bandwidth or speed is sufficient.	69%	68%	1
The school has sufficient qualified technical assistant staff.	68%	54%	14
Teachers have the necessary technical and pedagogical skills to integrate digital devices into teaching.	63%	65%	-1
An effective online learning support platform is available.	59%	54%	5
The number of digital devices connected to the internet is sufficient.	59%	67%	-8
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).	55%	68%	-14
Teachers have sufficient time to prepare lessons that integrate digital devices.	51%	61%	-10
The number of digital devices for teaching is sufficient.	44%	59%	-15

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[76] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

	Agree / strongly agree		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[76]**
Teachers are provided with incentives to integrate digital devices in their teaching.	32%	57%	-24

Principals were also asked about the existence of policies and procedures supporting the use of digital devices at their schools. As shown in Table 6.17, more schools in Northern Ireland had in place policies and procedures supporting the use of digital devices than schools on average across the OECD. The largest differences related to e-safety, with 98% of principals in Northern Ireland reporting that their school had a scheme in place to prepare pupils for responsible internet behaviour, and 85% having a specific policy about the use of social networks. This compares to 60% and 52% respectively for the OECD countries on average.

Table 6.17   ICT policies and procedures, reported by principals

Does your school have any of the following?

	Yes		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD[77]**
A specific scheme to prepare students for responsible internet behaviour	98%	60%	38
Its own written statement about the use of digital devices	97%	62%	34
A specific policy about using social networks (e.g. Facebook) in teaching and learning	85%	52%	34
Regular discussions with teaching staff about the use of digital devices for pedagogical purposes	79%	63%	16
Its own written statement specifically about the use of digital devices for pedagogical purposes	73%	46%	27
A scheme to use digital devices for teaching and learning in specific subjects	57%	48%	9
Scheduled time for teachers to meet to share, evaluate or develop teaching materials and approaches that employ digital devices	52%	44%	9
A specific scheme to promote collaboration on the use of digital devices among teachers	42%	36%	6

Source: PISA 2018 database; School Questionnaire, question SC156

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[77] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

6.5.2 Problems due to resource shortages

Principals were asked about the extent to which teaching was hindered by a number of factors related to physical resources or staffing. The results are shown in Table 6.18.

Generally, principals in Northern Ireland were more likely than principals across the OECD countries to report insufficient or poor physical infrastructure. The most commonly reported issue in Northern Ireland was a lack of physical infrastructure; this was reported to hinder teaching at least to some extent by 45% of principals in Northern Ireland (and matches the findings from PISA 2015). The average proportion across the OECD countries was 33%.

Principals in Northern Ireland were generally less likely than those across the OECD countries to report that issues relating to staffing hindered learning. Nearly a quarter of principals in Northern Ireland (24%) reported that a lack of teaching staff hindered learning; the OECD average was similar, at 27%. A lack of support staff was also reported to hinder learning by 24% of principals in Northern Ireland; this was a greater problem across the OECD on average, with 33% of principals reporting that this was the case.

Table 6.18   Resource shortages, reported by principals

Is your school's capacity to provide teaching hindered by any of the following issues?

	To some extent / a lot		
	Northern Ireland	**OECD average**	**Percentage point difference Northern Ireland-OECD**[78]
A lack of physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems)	45%	33%	12
Inadequate or poor quality physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems)	43%	33%	10
A lack of educational material (e.g. textbooks, IT equipment, library or laboratory material)	32%	28%	3
Inadequate of poor quality educational material (e.g. textbooks, IT equipment, library or laboratory material)	25%	25%	-1
A lack of support staff	24%	33%	-9
A lack of teaching staff	24%	27%	-3
Inadequate or poorly qualified support staff	10%	17%	-7
Inadequate or poorly qualified teaching staff	5%	15%	-10

Source: PISA 2018 database; School Questionnaire, question SC017

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[78] The sum of the difference and the OECD average may not equal the percentage for Northern Ireland due to rounding.

6.6 Teachers

6.6.1 Teacher qualifications

Principals 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 6.19.

In Northern Ireland, the average number of full-time teachers in post-primary schools was 48. For part-time teachers, the figure was 8. On average, across the OECD countries, schools had more teachers (55 full-time and 14 part-time). Teachers across the OECD countries were more likely to have a Master's degree qualification than teachers in Northern Ireland, which may reflect system-level differences in requirements for teaching.

In the schools in Northern Ireland participating in PISA 2018, nearly three-fifths of teachers (59%) had attended a programme of professional development in the previous 3 months. This was slightly greater than the OECD average (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 6.19 Teacher qualifications, reported by principals

How many of the following teachers are on the staff of your school? *Include 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.

	Mean number[79]			
	Full-time		Part-time	
	Northern Ireland	OECD average	Northern Ireland	OECD average
Teachers in TOTAL	48	55	8	14
Teachers deemed eligible to teach by the Department of Education	47	50	9	11
Teachers with a university Bachelor's degree (e.g. BA, BSc, BEd) qualification	44	33	8	7
Teachers with a university Master's degree (e.g. MA, MSc, MBA) qualification	12	24	1	6
Teachers with a doctorate or higher degree (e.g. MPhil, PhD) qualification	2	2	0	0

Source: PISA 2018 database; School Questionnaire, question SC018

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[79] Columns may not sum to the total number of teachers. This tables reports the rounded weighted averages reported by principals 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 principals in 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 (e.g. textbooks, IT equipment etc.) than principals and headteachers 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 with 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 UK countries reported that they were less satisfied with their lives than the OECD average.
- While pupils in Northern Ireland were similar to the OECD average in their satisfaction with their lives, those in England, Wales and Scotland were less satisfied 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[80] (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[81] 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

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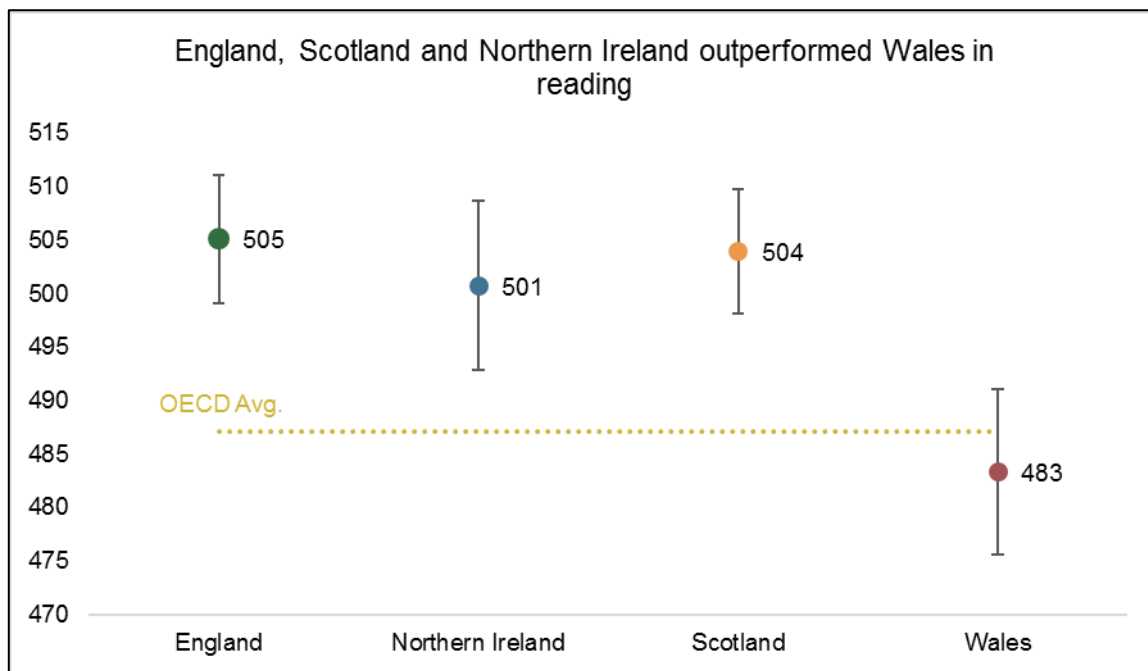
[80] When statistical significance is reported, it indicates that the compared means are significantly different at the 5% level.
[81] The 2018 OECD average is based upon the AV36a results published in the OECD International results Table 1.B1.10.

Table 7.1   Mean scores for reading

	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

	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

Table 7.3   Mean scores on the 'understanding' scale

	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

Table 7.4   Mean scores on the 'evaluating and reflecting' scale

	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

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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 for 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
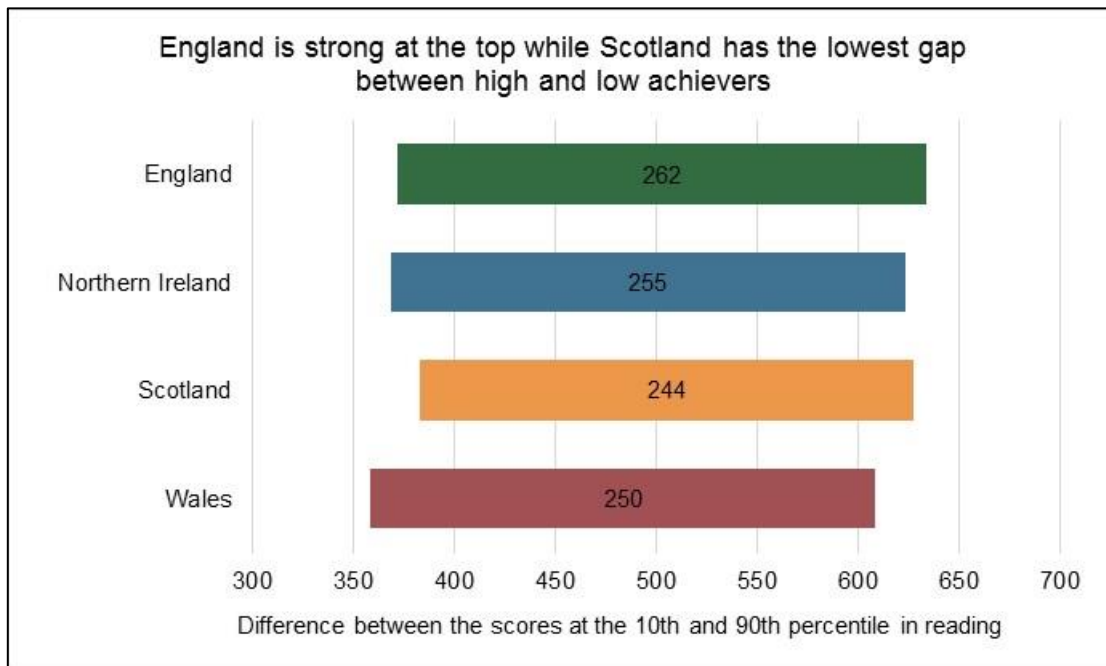
Source: PISA 2018 database

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

Country	Lowest (10th Percentile)		Highest (90th Percentile)		
	Reading score	Standard error	Reading score	Standard error	Difference
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[82]
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 Figure

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[82] after taking into account the rounding of figures

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%[83]. In England and Northern Ireland, the proportion of pupils working at the lowest proficiency levels in reading was 17% and 18%[84] 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 with 9%[85] across the OECD). The proportions at these levels in Scotland and Northern Ireland were similar to the OECD (10%[86] and 9% respectively) and Wales was significantly smaller (7%).

Figure 7.3   Percentage of pupils reaching each reading level in the UK
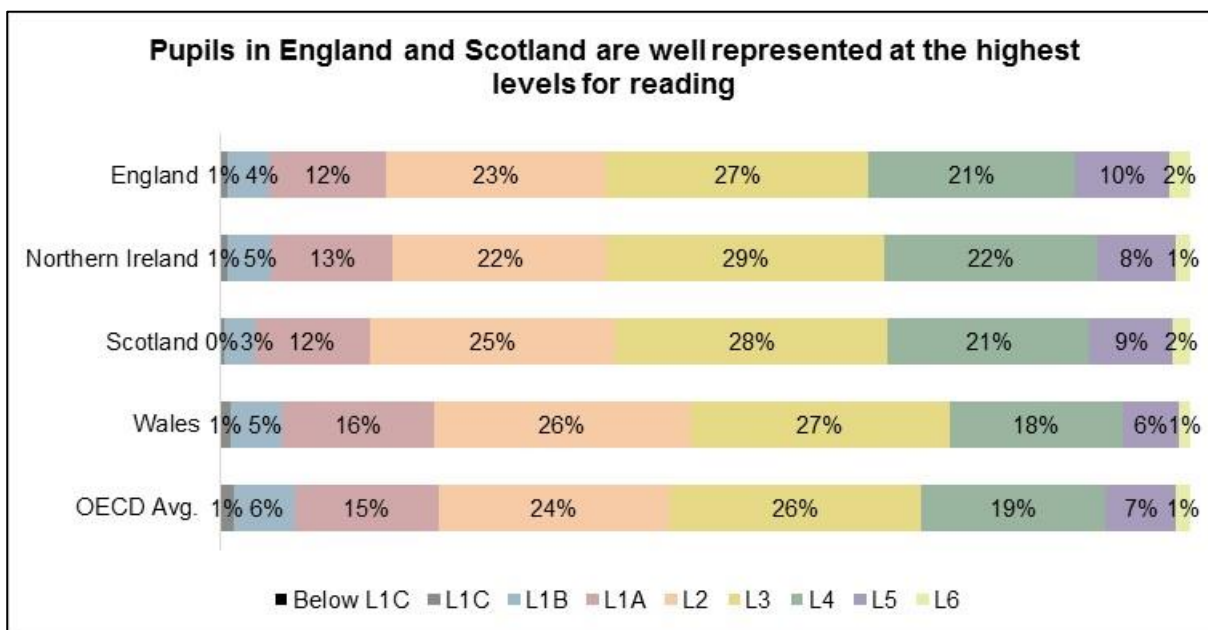
Full details of the expected skills and performance at each of the PISA reading proficiency levels are provided in Appendix A3. It should be noted that the PISA levels are not the same as levels used in any of the educational systems of the UK.

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[83] after taking into account the rounding of figures
[84] after taking into account the rounding of figures
[85] after taking into account the rounding of figures
[86] after taking into account the rounding of figures

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
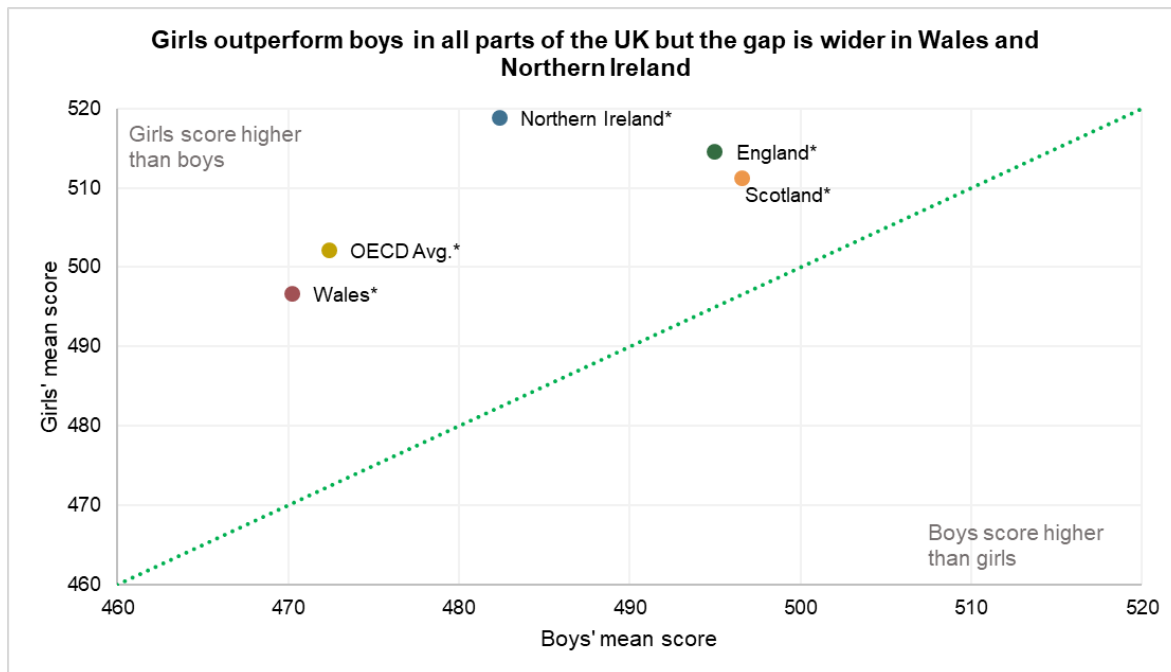
*The difference between girls and boys score is statistically significant

Table 7.6   Gender differences in reading in the UK

	Overall score	Mean score girls	Mean score boys	Difference girls-boys[87]
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

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[87] after taking into account the rounding of figures

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 with 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[88]. There was less difference between Scotland, Wales and Northern Ireland, with none being significantly different from each other or the OECD average of 489.

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[88] 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
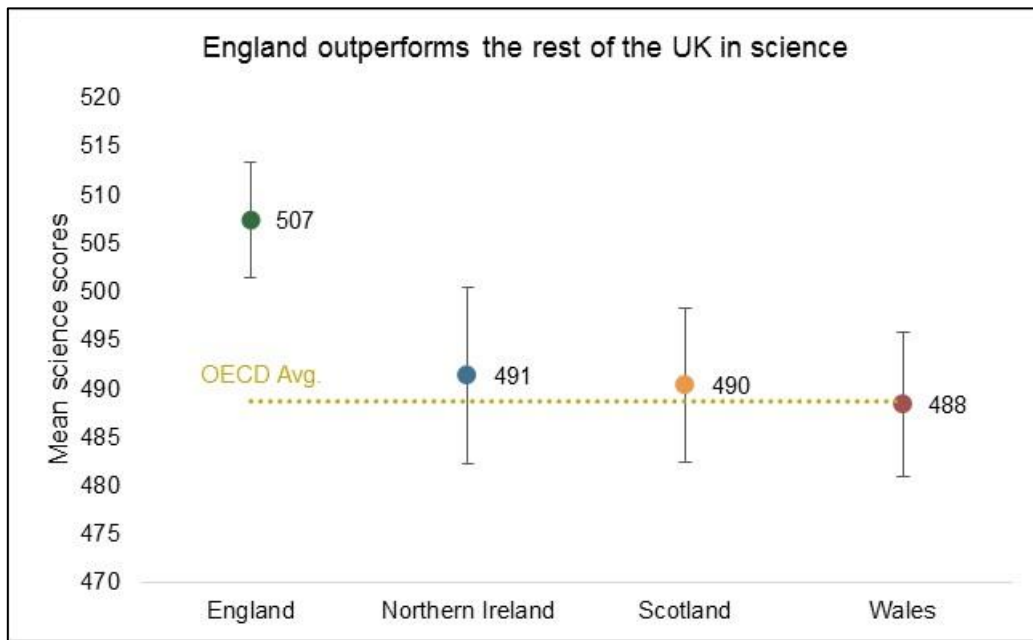
Table 7.7   Mean scores for science

	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

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
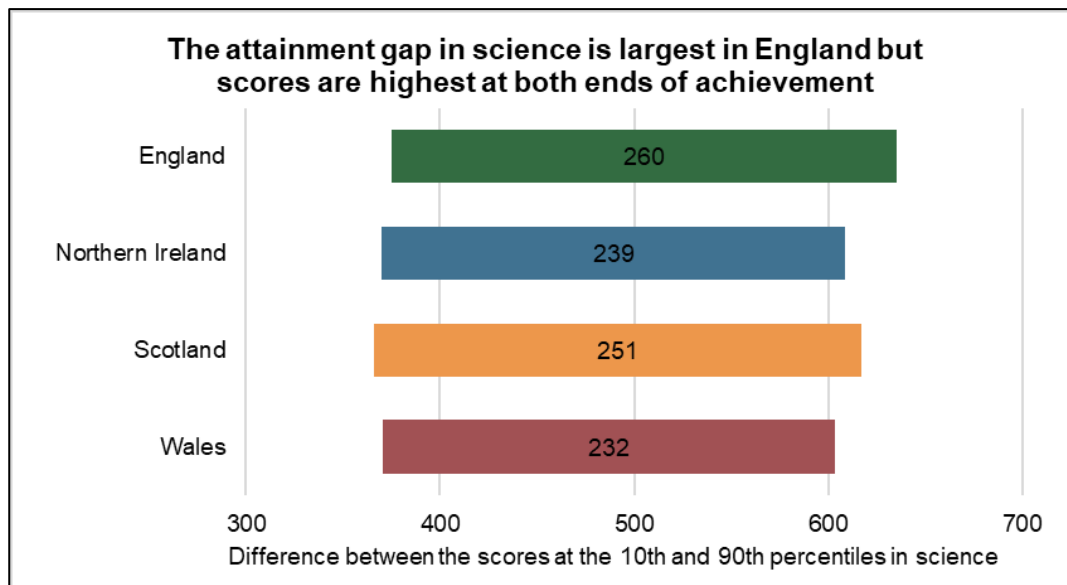
Source: PISA 2018 database

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

Country	10th Percentile		90th Percentile		
	Science score	Standard error	Science score	Standard error	difference
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

Source: PISA 2018 database

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%[89]) 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%[90]). 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%[91], Scotland 21%, Wales 20%[92], OECD 22%), except for England, where the percentage was significantly lower (17%).

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[89] after taking into account the rounding of figures
[90] after taking into account the rounding of figures
[91] after taking into account the rounding of figures
[92] after taking into account the rounding of figures

Figure 7.7   Percentage of pupils reaching each science level in the UK
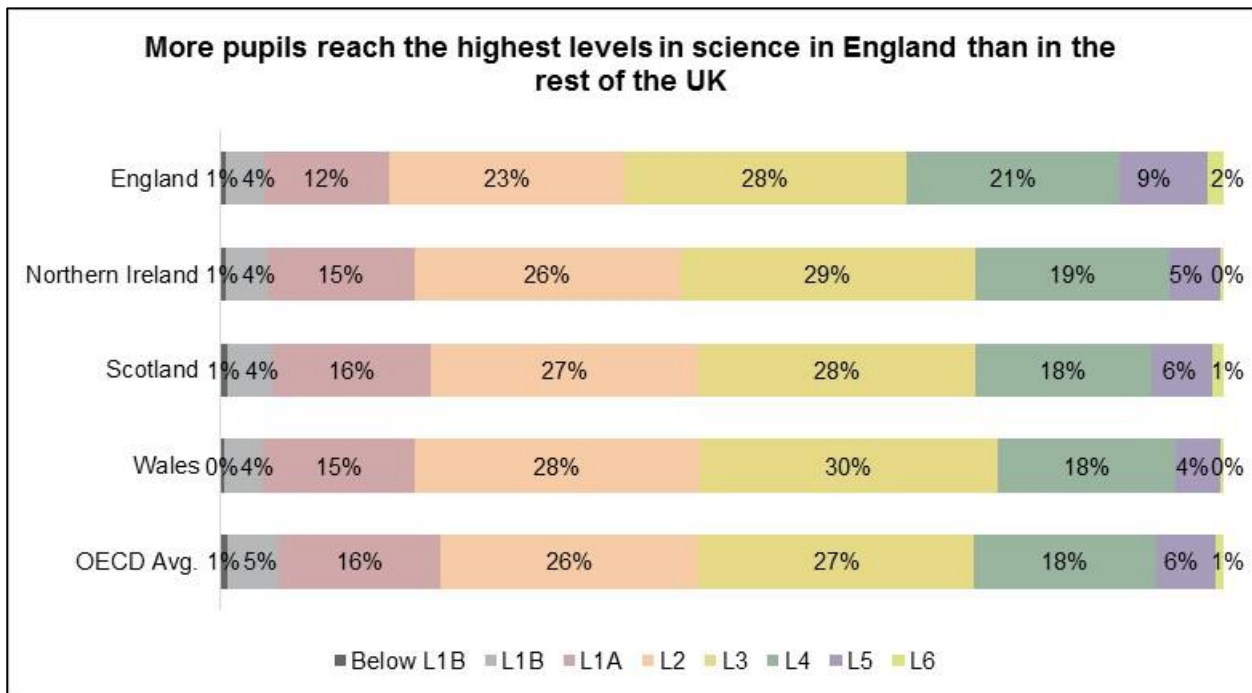
Source: PISA 2018 database

Full details of the expected skills and performance at each of the PISA science 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.

7.2.4 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
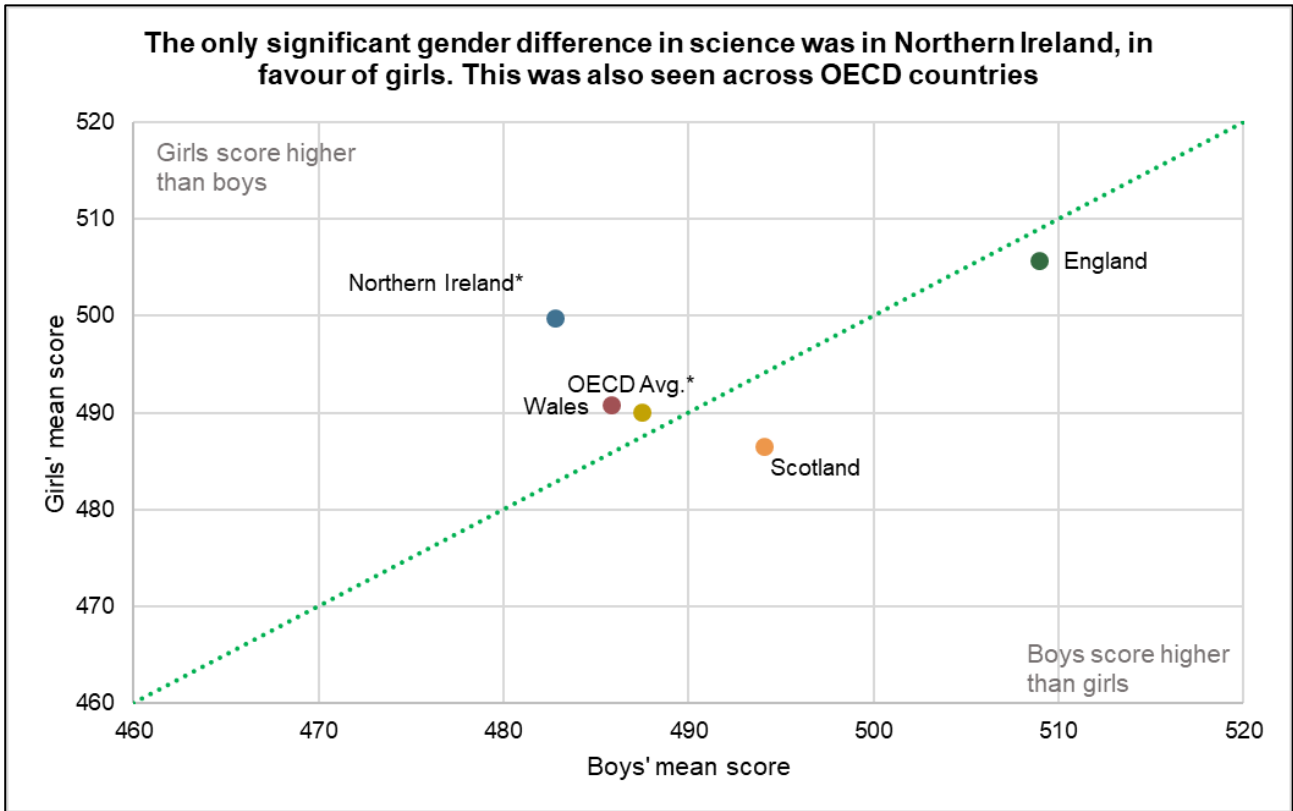
The only significant gender difference in science was in Northern Ireland, in favour of girls. This was also seen across OECD countries

*The difference between girls and boys score is statistically significant

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

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[93]. Scotland, Wales and Northern Ireland were not significantly different from each other or from the OECD average of 489.

Figure 7.9   Mean mathematics scores across the UK

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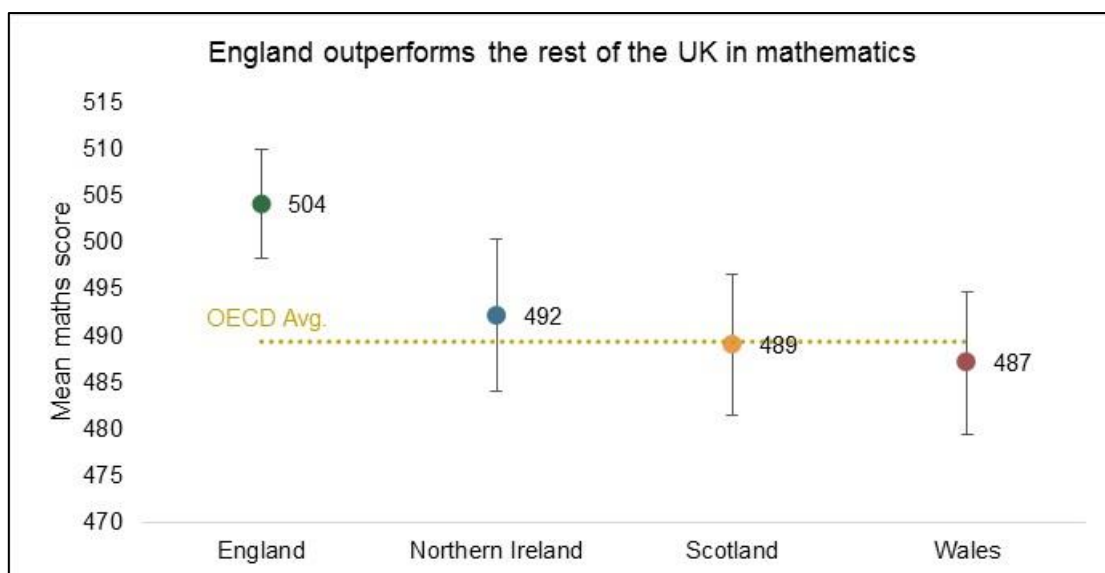
[93] The 2018 OECD average is based upon the AV37 results published in the OECD International results Table 1.B1.11.

Table 7.10 Mean scores for mathematics

	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

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

Scotland and England have the largest gaps between high and low achievers in mathematics
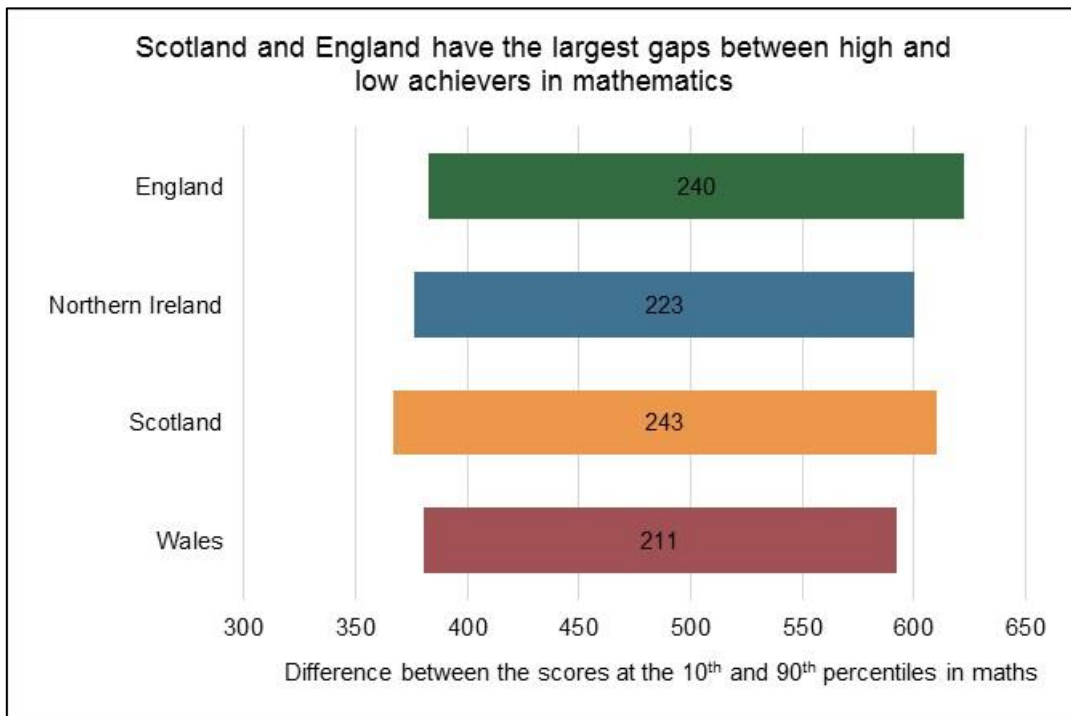
Table 7.11   Mean scores of highest and lowest performing pupils in mathematics

	10th Percentile		90th Percentile		
Country	Maths score	Standard error	Maths score	Standard error	difference
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

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%[94]) at the 2 highest levels of attainment (Levels 5 and 6), significantly higher than the OECD (11%). Scotland followed with 11%[95], 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%[96] in England. The OECD average below Level 2 was 24%, significantly different from Wales, Northern Ireland and England.

Figure 7.11   Percentage of pupils reaching each mathematics level in the UK
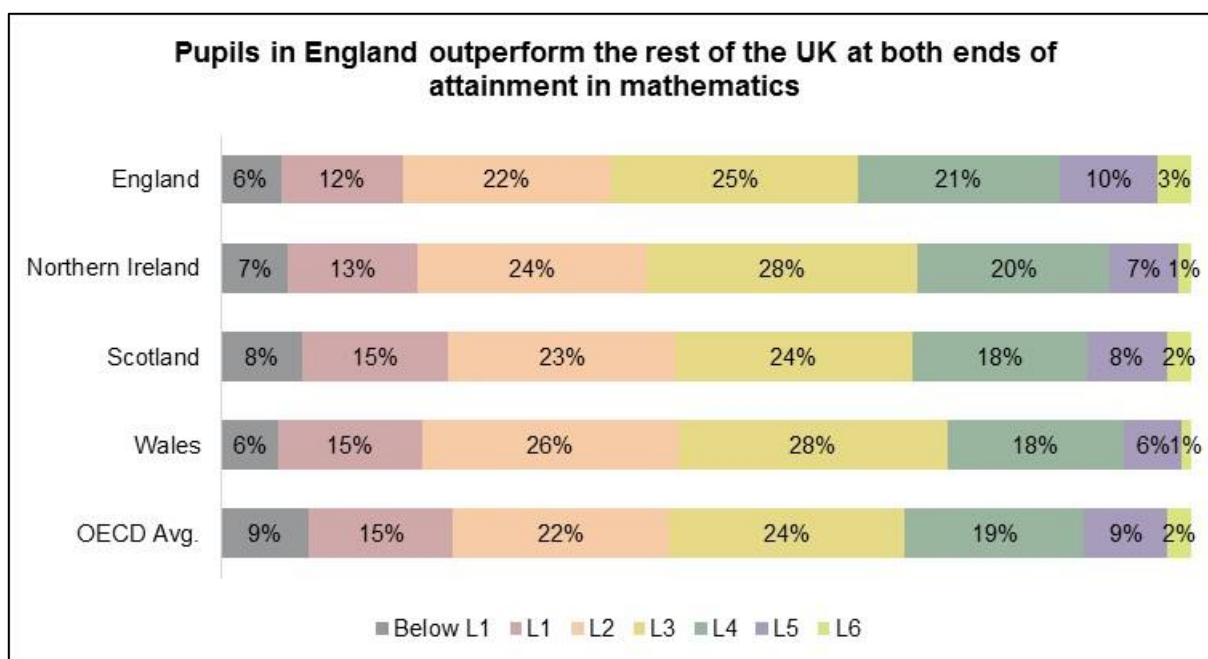
Full details of the expected skills and performance at each of the PISA mathematics proficiency levels are provided in Appendix A3.

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

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[94] after taking into account the rounding of figures
[95] after taking into account the rounding of figures
[96] after taking into account the rounding of figures

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
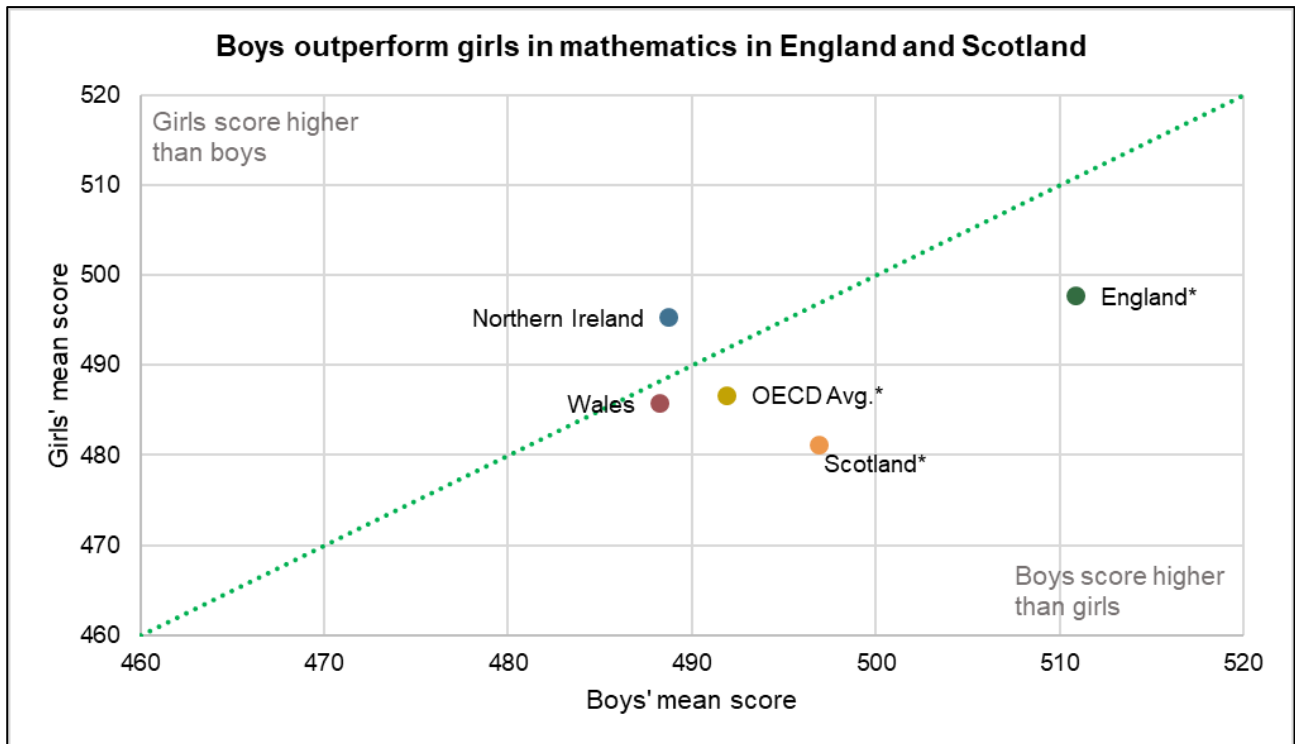
*The difference between girls and boys score is statistically significant

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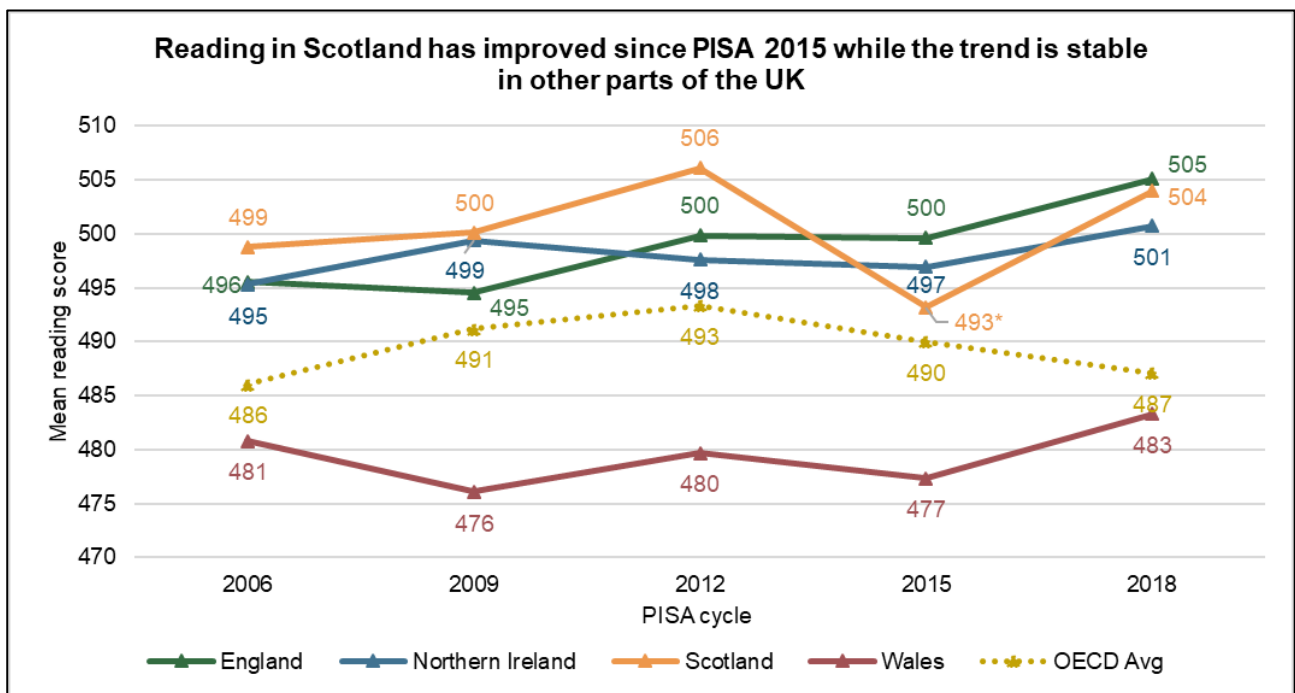
*The mean score of that year is statistically different from the mean score in 2018

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
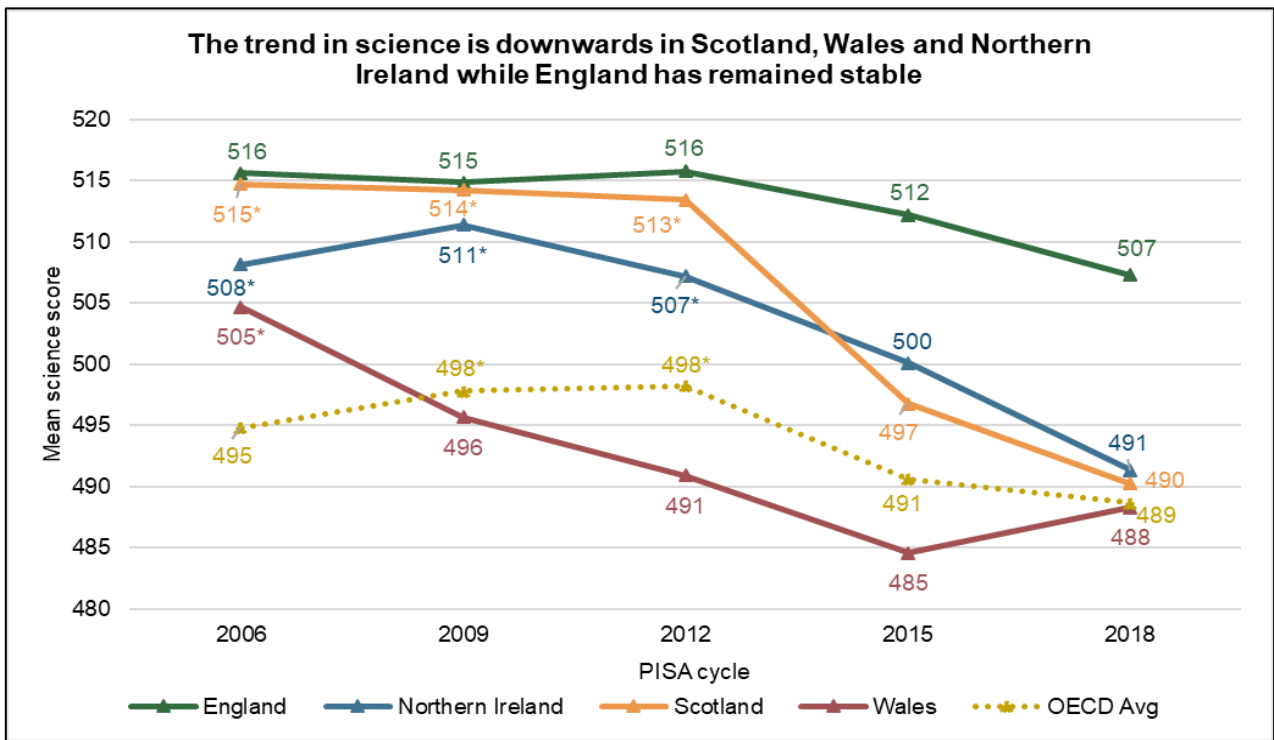
The trend in science is downwards in Scotland, Wales and Northern Ireland while England has remained stable

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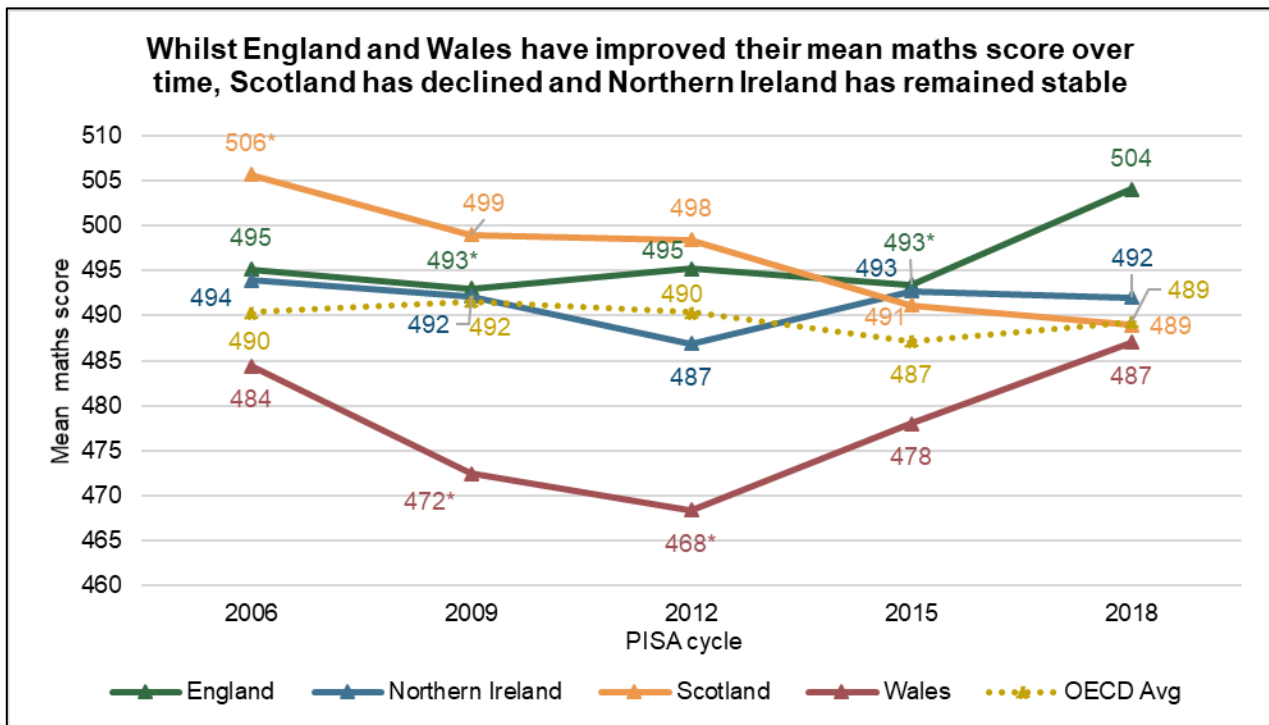
*The mean score of that year is statistically different from the mean score in 2018

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 principals 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 principals and headteachers 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 principals in Northern Ireland (24%). In England, very few headteachers (19%) reported lack of support staff as a hindrance, compared with 47% in Scotland and 33% in Wales and 24% of principals in Northern Ireland.

Table 7.13   Resource shortages reported by headteachers and principals

Is your school's capacity to provide teaching hindered by any of the following issues?

	To some extent / A lot			
	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, question SC017

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 by headteachers in the rest of the UK.

Table 7.14   Hindrances to learning reported by headteachers and principals

In your school, to what extent is the learning of students hindered by the following?

	To some extent / A lot			
	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, SC061

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 with 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
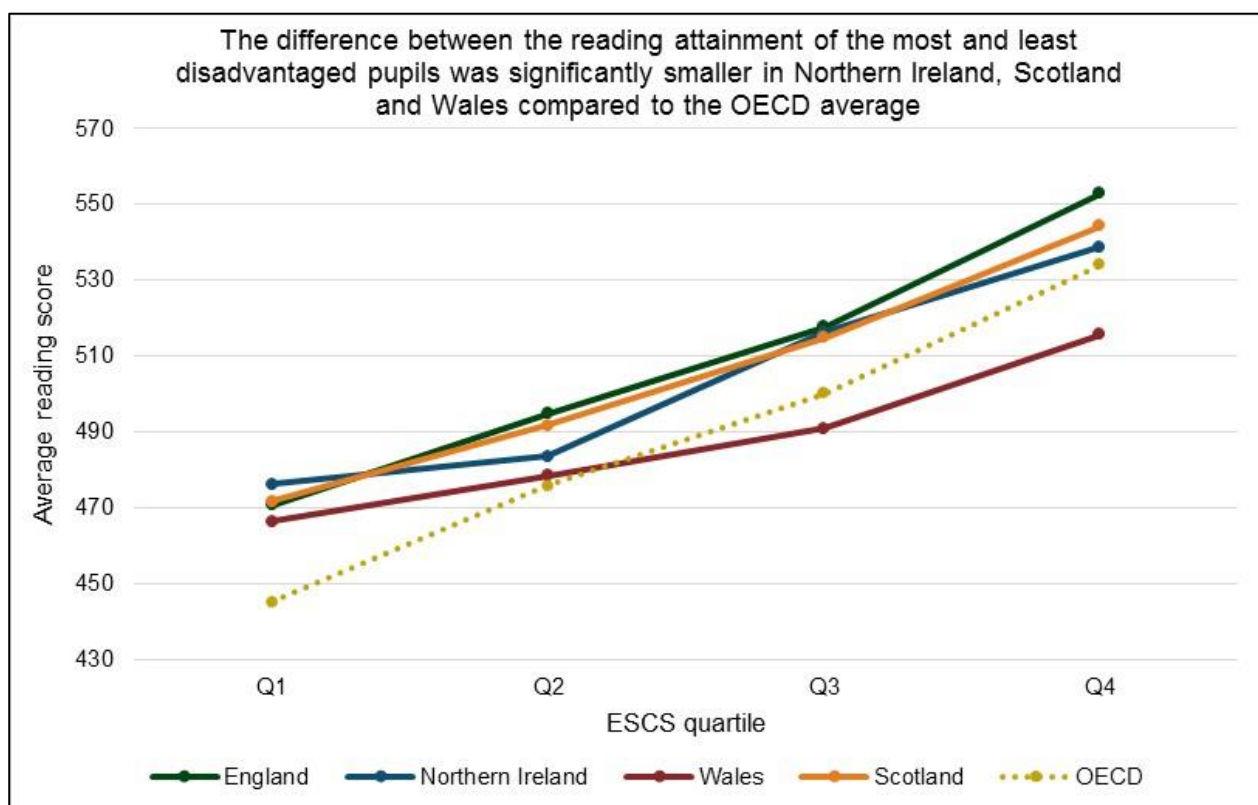
The difference between the reading attainment of the most and least disadvantaged pupils was significantly smaller in Northern Ireland, Scotland and Wales compared to the OECD average

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[97] for free school meals scored significantly below pupils not eligible (FSM data were not available for Scotland).

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[97] '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 agree or strongly agree with each 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

	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 <u>and</u> 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 agree or strongly agree with each 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[98]. 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.

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[98] 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?"

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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) [99], were agreed internationally by the PISA Governing Board, which comprises representatives from each participating country. 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. 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 methodological innovations introduced for

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[99] https://www.oecd-ilibrary.org/education/pisa-2018-assessment-and-analytical-framework_b25efab8-en

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 improved 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.[100] 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: https://www.oecd.org/pisa/pisaproducts/PISA-2018-Technical-Standards.pdf.

All international OECD publications, as well as the international database, are available on the OECD PISA website at www.oecd.org/pisa.

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[101].

All PISA assessments are based on the *PISA 2018 Assessment and Analytical Framework*.[102] 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

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[100] Full technical details of the PISA 2018 Integrated Design can be found at https://www.oecd.org/pisa/pisaproducts/PISA-2018-INTEGRATED-DESIGN.pdf
[101] Some countries also took part in financial literacy and global competence assessments.
[102] OECD (2019), *PISA 2018 Assessment and Analytical Framework*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/b25efab8-en.

questionnaires distributed to pupils and principals 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.

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

Science literacy is defined as the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen. A scientifically literate person is willing to engage in reasoned discourse about science and technology, which requires the competencies to explain phenomena scientifically, evaluate and design scientific enquiry, and interpret data and evidence scientifically.   OECD 2019

Sample questions: Science

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.

Water is returned to the ocean.
Water enters the farm from the ocean.
Nutrients are added to this tank.
Filter
Microalgae
Filter
Water is cleaned in this tank.
Fish are harvested from this tank.

Filters that allow only microalgae to move through the farm in the flow of 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.

Common Sole | Ragworms | Shellfish | Marsh Grass

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.

Water is returned to the ocean.
Water enters the farm from the ocean.
Nutrients are added to this tank.
Filter
Filter
Water is cleaned in this tank.
Fish are harvested from this tank.

Filters that allow only microalgae to move through the farm in the flow of 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

Competency	Explain phenomena scientifically
Knowledge System	Content - Living
Context	Local/ National - Natural Resources
Difficulty	740 – Level 6

For *full* credit the student drags Ragworms and Common Sole into Tank 2 (bottom right) and drags Marsh Grass and Shellfish into Tank 3 (left).

This question requires students to understand a system and the role of several organisms within that system. In order to answer correctly, students must understand the goal of the fish farm, the function of each of the three tanks therein, and which organisms will best fulfill each function. Students must use information provided in the stimulus and the diagram, including a footnote under the diagram. An additional component that adds difficulty is the open-ended nature of the task. Any of the four organisms can be placed in any of the three tanks and there is no restriction on the number of organisms in each tank. As a result, there are multiple ways of getting this incorrect.

OK

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.

<div align="right">OECD 2019</div>

Sample questions: Mathematics[103]

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	Price: 200 000 zeds
Size:	60 square metres (m²)	
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	

Question 1: HOLIDAY APARTMENT

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.

....

....

....

....

....

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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.

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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

	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	What pupils can typically do at each level
6	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	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 source of

Level	What pupils can typically do at each level
	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	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	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 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	What pupils can typically do at each level
	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	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.
1a	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	What pupils can typically do at each level
	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	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	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	What pupils can typically do at each level
6	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	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	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	What pupils can typically do at each level
3	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	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	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	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	What pupils can typically do at each level
6	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	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	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 construct and communicate explanations and arguments based on their interpretations, arguments and actions.

Level	What pupils can typically do at each level
3	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	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	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[104], 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.

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[104] 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.

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 four 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 three months to 16 years and two 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[105]. Scotland also tested in November/December, for the first time, in 2018.

A5 The PISA sample in Northern Ireland

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.

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[105] A short 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 Northern Ireland for PISA 2018.

Table A1.5   Stratification variables

Explicit	Level Names
Country	Northern Ireland
School type*	- controlled grammar - controlled non-grammar - voluntary grammar - catholic and other maintained - integrated (controlled integrated and grant maintained integrated) - independent
Region	- Belfast - Western - North Eastern - South Eastern - Southern
Implicit	**Level Names**
Gender	- male - mixed - female

*Note: For data analysis, the school type stratifier was collapsed into grammar / non grammar

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.

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 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 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[106] 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.

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[106] Scotland participated in PISA as a separate adjudicated entity and met the sampling requirements.

Table A1.6   School and pupil response rates by 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 required a NRBA for England because England represents 84% of the UK weighted sample (Scotland 8%; Wales 5%; Northern Ireland 3%). As the response rate for NI was also below the OECD's requirements a further NRBA was carried out for NI, although not required by OECD. The results of both NRBAs were positive meaning that the samples for UK and NI were representative and not biased. The OECD's Technical Advisory Group examined the analyses and was satisfied that it 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%.

Table A1.7   Numbers of participating schools and pupils by 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

	Unweighted response rates for the school questionnaire
England	75%
Northern Ireland	83%
Wales	92%
Scotland	81%

Appendix B Reading Tables

Table B1.1 Mean score and variation in reading performance

	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)

	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)

	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.
Greece	457	(3.6)	97	(1.6)	326	(4.9)	460	(4.1)	583	(3.9)
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'

	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)

	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'

	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)

	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'

	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)

	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'

	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)

	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'

	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)

	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

	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)

	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)

	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)

	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

	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)

| | 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

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Table B1.9   Socio-economic status and reading performance

	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)
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)

	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.
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)
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)

	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.
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)
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)

	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.
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)
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)

	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.
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)
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)

	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.
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)

	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)
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)
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
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)

| | 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)
Northern Ireland	**-43**	(9.2)	**-28**	(7.6)	17.6	(3.4)

	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.
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)
Slovak Republic	**-53**	(13.7)	**-40**	(12.7)	12.6	(4.6)
Greece	**-51**	(5.3)	**-22**	(5.1)	12.1	(1.7)

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	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.
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

Table C1.1 Mean science scores and variations in science performance

	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)

	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.
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)
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)

	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	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

	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)

	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.
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)
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)

	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.
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
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)

	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.
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)
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

	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)

| | 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

Table D1.1   Mean scores and variation in mathematics performance

	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)

	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.
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)
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)

	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.
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

	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)

	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)

	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)

	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

	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)
Korea	528	(4.1)	524	(4.0)	-4	(5.3)

| | Boys | | Girls | | Gender differences (girls - boys) | |
| | Mean score | | Mean score | | Mean score | |
	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
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)

	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[107]. 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.
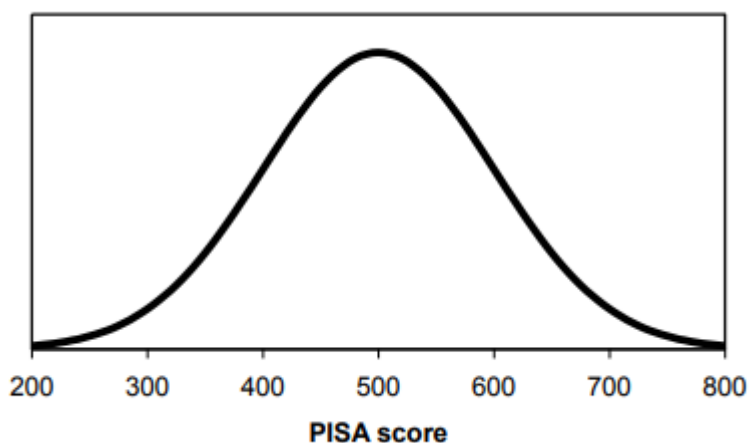
The OECD defines the population as follows:

1. The representative sample of pupils within each OECD country is selected;

2. Their results are weighted in such a way that each country[108] in the study has an equal importance (weight);

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[107] 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.
[108] PISA refers to the UK as a whole country and does not treat England, Scotland, Wales and Northern Ireland as separate entities.

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.

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)

	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
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
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

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