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STUDENT ACHIEVEMENT IN NORTHERN IRELAND: RESULTS IN MATHEMATICS, SCIENCE AND READING AMONG 15-YEAR-OLDS FROM THE OECD PISA 2012 STUDY

The Programme for International Student Assessment (PISA) is a survey of educational achievement organised by the Organisation for Economic Cooperation and Development (OECD). PISA focuses on the ability of 15 year old pupils to use their knowledge and skills to meet real-life challenges. PISA 2012 also reports on school and pupil questionnaires to describe school and pupil attitudes.

Key Findings

- The 2012 Programme for International Student Assessment (PISA) results provide international benchmarks in mathematics, reading and science literacy.
- Mathematics was a major subject in PISA 2012 which means that all pupils' mathematical literacy skills were assessed. This was the first time mathematics was repeated as a main domain since 2003[1]. In mathematics, NI's pupils achieved a mean score of 487, which was significantly[2] lower than the OECD mean of 494.

1 It is not possible to compare the findings from PISA 2012 with those from 2003 because in 2003 the UK did not meet the data requirements and therefore OECD does not make comparisons before 2006.
2 Throughout this briefing, the term 'significant' refers to statistical significance.

Northern Ireland Statistics & Research Agency

- Twenty-five countries significantly outperformed NI in terms of mathematics. Ten countries performed at a similar level and 29 countries performed significantly below.
- In terms of the difference between low and high achieving pupils, 23 countries have a larger spread between pupil scores. There was no significant gender gap in NI.
- Reading was a minor domain subject in 2012. The mean score of 498 is not significantly different to the OECD average of 496. Nineteen countries had significantly higher scores while a further 12 were similar to NI. Thirty-three countries mean scores were significantly lower.
- NI has a similar pattern to the OECD in terms of the difference between high and low achieving pupils, although almost two-thirds of the OECD countries had a smaller difference between the highest and lowest percentiles than NI. As with all countries, girls significantly outperformed boys in reading.
- Science was a minor domain subject in PISA 2012. Pupils achieved a mean score of 507, which is not statistically different to the OECD average of 501. Seventeen countries outperformed NI, while the mean scores for a further ten countries were not significantly different. The remaining 37 countries mean scores were significantly lower.
- There was a wide spread in attainment between the lowest and highest scoring pupils in science, with only eight countries having a wider distribution. There was no statistically significant difference between boys and girls scores.

INTRODUCTION

1. The Programme for International Student Assessment (PISA) is a survey of educational achievement organised by the Organisation for Economic Cooperation and Development (OECD). PISA focuses on the ability of 15 year old pupils to use their knowledge and skills to meet real-life challenges. PISA 2012 also reports on school and pupil questionnaires to describe school and pupil attitudes.

2. The survey is carried out on a three-year cycle, with each cycle focusing on one of three areas of 'literacy', which refers to the capacity of pupils to apply knowledge and skills in the three subject areas reading, mathematics and science.

3. Sixty-five countries participated in the fifth cycle in 2012, including all 34 OECD countries and 27 EU member states. Twenty-one of the EU member states are also members of the OECD.

LITERACY IN PISA 2012

4. The literacy concept is central in each of the PISA cycles. The assessment focuses on one key literacy concept during each cycle, mathematics in 2012, while science and reading are two minor subjects for this cycle. The 2012 cycle was the second time that mathematics had been a major subject, the first being in 2003.

5. Literacy focuses on what pupils have learned and whether they are able to extrapolate and apply their learning in a real-life setting and solve problems in a variety of situations. Literacy is measured as a continuum and not in terms of pupils possessing it or not. The development of literacy takes place inside and outside the formal space of a classroom. For more information on Literacy see *"PISA 2012 Assessment and Analytical Framework - Mathematics, Reading, Science, Problem Solving and Financial Literacy"* on **www.oecd.pisa.org**.

6. Proficiency level 2 represents a baseline level of mathematics proficiency on the PISA scale at which students begin to demonstrate the kind of skills that enable them to use mathematics in ways that are considered fundamental for their future development.

FINDINGS

7. Note: In the following text and tables, the comparison group comprises 50 countries who meet at least one of the following criteria (and non-OECD member names are shown in italics in tables):

   - OECD member
   - EU member (shown with an asterisk after name in tables)
   - Achieved a mean score of at least 430

8. Outcomes for NI are derived from the international analysis carried out at 'sub-national' level (ie for the constituent countries within the UK) by the NFER as well as from additional analysis conducted using the international dataset.

MATHEMATICS

Achievement in relation to other countries

9. Mathematics was the major subject for the 2012 PISA study.

10. The items in PISA 2012 cover four mathematical content areas: quantity; uncertainty and data; change and relationships; and space and shape. In addition, three mathematical processes are assessed: the ability to formulate situations mathematically, to employ mathematical concepts, facts procedures and reasoning and to interpret, apply and evaluate mathematical outcomes.

11. PISA defines mathematical literacy as an individual's capacity to formulate, employ and interpret mathematics in a variety of contexts. In the PISA assessment, mathematical literacy is demonstrated in pupils' ability to analyse, reason and communicate effectively as they pose, solve and interpret mathematical problems that involve quantitative, spatial, probabilistic or other mathematical concepts.

12. NI's pupils achieved a mean score of 487 in mathematics, which was significantly lower than the OECD mean of 494. Our performance was similar to that in England (495); however Scotland (498) and the Republic of

Ireland (501) were significantly higher than NI. The performance in Wales (468) was significantly lower than that of NI.

13. Internationally, the performance in mathematics in 25 of the other 64 participating countries was significantly higher than in NI, of which 18 are OECD members (see Table 1). Ten countries performed at a level that was not significantly different from that of NI, while the remaining 29 countries performed significantly less well.

14. Twelve of the countries that significantly outperformed NI are EU members (Netherlands, Estonia, Finland, Poland, Belgium, Germany, Austria, Republic of Ireland, Slovenia, Denmark, Czech Republic and France). Six EU countries did not perform significantly differently from NI and eight performed less well.

15. Of the 25 countries with mean scores in mathematics that are significantly higher than NI's, three are English speaking (Australia, Republic of Ireland and New Zealand) and one has a substantial number of English speakers (Canada).

16. Since 2006, the number of countries with mean scores significantly higher than NI has increased from 18 to 20 in 2009, to 25 in 2012. This increase is due in part to the high performance of countries participating for the first time, such as Shanghai-China and Singapore in 2009 and Vietnam in 2012, but it is also due to improved performance in other countries.

17. There was some movement amongst the group of countries outperforming NI, with the major changes being the movement of Iceland out of the group, and the movement of Poland, Vietnam (new participants in PISA), Austria, Republic of Ireland, the Czech Republic and France into it. Notably, Poland and the Republic of Ireland have had significant increases in mean score for mathematics between PISA 2009 and 2012.

18. Regarding the group of countries that perform similarly to NI, Latvia, Italy, Spain and the Russian Federation have moved into this group; in PISA 2009 these four countries performed significantly less well than NI. For two of these countries, Latvia and the Russian Federation, significant increases in mean score for mathematics between PISA 2009 and 2012 resulted in the move into this group.

Table 1 Country scores in Mathematics (significant differences)

Mean scores significantly above NI		Mean scores not significantly different from NI		Mean scores significantly below NI	
Shanghai-China	*613*	England*	495	*Lithuania**	*479*
Singapore	*573*	Iceland	493	Sweden*	478
Hong Kong-China	*561*	*Latvia**	*491*	Hungary*	477
Chinese Taipei	*560*	Luxembourg*	490	*Croatia**	*471*
Korea	554	Norway	489	Wales*	468
Macao-China	*538*	Portugal*	487	Israel	466
Japan	536	**Northern Ireland***	**487**	Greece*	453
Liechtenstein	*535*	Italy*	485	*Serbia*	*449*
Switzerland	531	Spain*	484	Turkey	448
Netherlands*	523	*Russian Federation*	*482*	*Romania**	*445*
Estonia*	521	Slovak Republic*	482	*Cyprus**	*440*
Finland*	519	United States	481	*Bulgaria**	*439*
Canada	518			*United Arab Emirates*	*434*
Poland*	518			*Kazakhstan*	*432*
Belgium*	515			Chile	423
Germany*	514			Mexico	413
Vietnam	*511*				
Austria*	506				
Australia	504				
Republic of Ireland*	501				
Slovenia*	501				
Denmark*	500				
New Zealand	500				
Czech Republic*	499				
Scotland*	498				
France*	495				
OECD average	494				

In the national report prepared for NI by the NFER, the scores for NI are compared with 64 other countries, excluding the UK. Hence, in the text above this table, the number of countries quoted as performing better/similar/below NI do not include England, Wales or Scotland.

Non-OECD members are in Italics

* Marks EU member states

14 countries with scores below 430 omitted

Distribution of performance in mathematics

19. Within the four mathematical content areas that were assessed, NI's highest score was attained in the *uncertainty and data* competency (496), nine score points higher than the overall mean for mathematics. In *quantity*, NI scored 491, four score points about the overall mean, and in *change and relationships*, NI scored 486, one score point below the overall mean. NI's lowest score was attained in *space and shape* (463), 23 score points lower than the overall mean. The level of variation differed between countries and there was not always a clear pattern of performance across the high performing countries in each of the content areas. None of the countries which significantly outperformed NI demonstrated consistent performance across the four content categories.

20. The score at the 5th percentile is that achieved by the lowest scoring five per cent of pupils. The score at the 95th percentile is that which was exceeded by the highest scoring top five per cent of pupils. The difference between the highest and lowest attainers (at the 5th and 95th percentiles) is a better measure of the spread of scores for comparing countries than using the lowest and highest pupils. Such a comparison may be affected by a small number of pupils in a country with unusually high or low scores.

21. The mean score of pupils in NI at the 5th percentile was 332, while the score of those at the 95th percentile was 638, a difference of 305 scale points. This is larger than the difference seen in Scotland, Wales and the Republic of Ireland (282, 281 and 280 respectively). The difference in NI was smaller than that in England (316).

22. By comparison, the average difference across the OECD countries was 301 scale points, indicating that NI has a similar distribution of scores. Twenty-three comparison group countries exceeded NI's spread of attainment. These were 15 OECD countries and eight non OECD countries.

23. NI had 24.1 per cent of pupils at Level 1 or below, compared with an OECD average of 23.0 per cent. However, 30 comparison countries had fewer pupils at or below Level 1 than NI. NI has a relatively long tail of underachievement compared with the highest scoring countries. In Shanghai-China, Singapore and Hong Kong-China, for example, fewer than ten per cent of pupils were at Level 1 or below.

24. The attainment of pupils in NI at proficiency level 5 and above is again below the OECD average with 10.3 per cent compared to an OECD average of 12.6 per cent. The number of pupils scoring at these high levels does not compare well with the higher performing countries. In fact with the exception of Denmark all the countries that outperformed NI in mathematics had a higher percentage of pupils at Level 5 or above. For example, Shanghai-China had 55.4 per cent of pupils in the top two levels and Belgium and the Netherlands had over 19 per cent of pupils at Level 5 or above.

25. Within the UK and Ireland, the Republic of Ireland and Scotland had 16.9 and 18.3 per cent respectively working at the lowest proficiency levels in mathematics; NI had 24.1 per cent, England 21.6 per cent and Wales 29.0 per cent. When the top two levels are combined, further differences emerge. England's proportion of high achievers (12.4 per cent) was comparable with the OECD average at Levels 5 and 6, which is 12.6 per cent. Scotland, the Republic of Ireland and NI were slightly below, with 10.8, 10.7 and 10.3 per cent respectively. Wales has 5.3 per cent of pupils working at the highest levels of proficiency in mathematics, a lower proportion than the other parts of the UK or the OECD average.

Table 2 Mathematics attainment on the PISA proficiency scale for the UK and Ireland

Mathematics attainment	% Below Level 2	% Level 5 and above
Republic of Ireland	16.9	10.7
Scotland	18.3	10.8
England	21.6	12.4
NI	24.1	10.3
Wales	29.0	5.3
OECD	23.0	12.6

Gender differences

26. Unlike most participating countries, NI did not have a significant gender gap for mathematics.

27. Although the mean score for boys was higher, 492 points compared to 481, NI, along with 22 other countries showed no significant gender difference. Forty-one of the participating countries had a statistically significant difference in performance. In 36 countries, this favoured boys; in five it favoured girls (Jordan, Qatar, Thailand, Malaysia and Iceland).

28. In 2006 there was no significant difference between boys and girls in PISA. However, in 2009 there was a significant gender difference favouring boys, with a difference of 17 score points (one of the highest differences within the comparison countries). The 2012 survey brings the PISA results in line with other assessments in NI, for example GCSE and TIMSS, where there is no significant gender difference.

READING

Achievement in relation to other countries

29. Reading was a minor domain in 2009. This means that approximately 70 per cent of pupils were assessed in this subject and the questions did not cover the subject as fully as in mathematics (the major domain).

30. Reading in PISA focuses on the ability of pupils to use information from texts in situations which they encounter in their life. It is defined as, 'understanding, using, reflecting on and engaging with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society.'

31. NI's pupils achieved a mean score of 498 in reading, which was slightly above but not significantly different from the OECD mean of 496. Our performance was similar to that in England (500) and Scotland (506); however, the Republic of Ireland (523) was significantly higher than NI. The performance in Wales (480) was significantly lower than that of NI.

32. As the table below shows, internationally, the performance in reading in 19 of the other 64 participating countries was at a significantly higher level than in NI, of which 13 are OECD members. Twelve countries performed at a level that was not significantly different from that of NI, while the remaining 33 countries performed significantly less well.

33. Seven of the countries that significantly outperformed NI are EU members (Finland, Republic of Ireland, Poland, Estonia, Netherlands and Belgium and Germany). Eight EU countries did not perform significantly differently from NI and 11 performed less well.

34. Of the 19 countries with mean scores in reading that are significantly higher than NI's, three are English speaking (Republic of Ireland, New Zealand and Australia) and one has a substantial number of English speakers (Canada).

35. In 2012, the number of countries with mean scores significantly above NI's has increased from nine to 19 since 2009. In 2006 this number was only seven; however a number of high performing countries joined the survey for the first time in 2009.

36. In 2012, nine countries that were performing at a similar level to NI in 2009 are now significantly outperforming NI at reading; these are the Republic of Ireland, Chinese Taipei, Poland, Estonia, Liechtenstein, the Netherlands, Belgium, Switzerland and Germany - all but Belgium and the Netherlands have significantly improved their performance since 2009.

37. One country (Macao-China) which scored significantly lower than NI in 2009 scored significantly better than NI in 2012, and two countries which were similar to NI in PISA 2009 now perform at a significantly lower level (Sweden and Iceland). Six countries which were significantly below NI in 2009 are now performing at a similar level (Czech Republic, Italy, Austria, Latvia, Portugal and Israel).

38. This suggests that there have been significant improvements in reading in some other countries while NI's performance has remained stable.

Table 3 Country scores for Reading (significant differences)

Mean scores significantly above NI		Mean scores not significantly different from NI		Mean scores significantly below NI	
Shanghai-China	*570*	*Vietnam*	*508*	Spain*	488
Hong Kong-China	*545*	Scotland*	506	Luxembourg*	488
Singapore	*542*	France*	505	*Croatia**	*485*
Japan	538	Norway	504	Sweden*	483
Korea	536	England*	500	Iceland	483
Finland*	524	**Northern Ireland***	**498**	Slovenia*	481
Republic of Ireland*	523	United States	498	Wales*	480
Canada	523	OECD average	496	*Lithuania**	*477*
Chinese Taipei	*523*	Denmark*	496	Greece*	477
Poland*	518	Czech Republic*	493	Turkey	475
Estonia*	516	Italy*	490	*Russian Federation*	*475*
Liechtenstein	*516*	Austria*	490	Slovak Republic*	463
New Zealand	512	*Latvia**	*489*	*Cyprus**	*449*
Australia	512	Hungary*	488	*Serbia*	*446*
Netherlands*	511	Portugal*	488	*United Arab Emirates*	*442*
Belgium*	509	Israel	486	Chile	441
Switzerland	509			*Thailand*	*441*
Macao-China	*509*			*Costa Rica*	*441*
Germany*	508			*Romania**	*438*
				*Bulgaria**	*436*
				Mexico	424

In the national report prepared for NI by the NFER, the scores for NI are compared with 64 other countries, excluding the UK. Hence, in the text above this table, the number of countries quoted as performing better/similar/below NI do not include England, Wales or Scotland.

Non-OECD members are in Italics

* Marks EU member states

13 countries with scores below 430 omitted

Distribution of performance in reading

39. In NI, the mean score at the 5th percentile was 333 in reading, while for those at the 95th percentile it was 646. This is a difference of 313 points, making

the difference between the 5th and 95th percentiles here larger than in the Republic of Ireland, Scotland and Wales (286, 288 and 299 respectively). The difference in NI was smaller than that in England (324).

40. Almost two-thirds of the OECD countries had a smaller difference between the highest and lowest percentiles than NI. The average difference for the OECD countries was 310 scale points.

41. NI has pupils represented at all proficiency levels. Almost 17 per cent of the pupils did not achieve level 2 proficiency in reading; this is lower than the OECD average of 18 per cent. Looking at the top two levels combined (Levels 5 and 6), NI was very similar to the OECD average with 8.3 per cent of pupils achieving this level in reading, compared with an OECD average of 8.4 per cent.

42. Twenty-two of the comparison countries had a higher proportion of pupils at Level 5 or above. These included all of the countries outperforming NI in PISA 2012 except Macao-China. All 20 comparison countries that had significantly lower scores than NI also had a higher proportion of pupils at Level 1 or below.

43. Within the UK and Ireland, the widest spread of achievement was in England and NI, both of which had a slightly higher proportion than Scotland at the top two levels, but also a higher proportion below Level 2. The Republic of Ireland had the lowest percentage at Level 1 or below and the highest percentage at Levels 5 and 6, while Wales had the lowest percentage at Levels 5 and 6. See table 4 below.

Table 4 Reading attainment on the PISA proficiency scale for the UK and Ireland

Reading attainment	% Below Level 2	% Level 5 and above
Republic of Ireland	9.7	11.4
Scotland	12.5	7.8
England	16.7	9.1
NI	16.7	8.3
Wales	20.6	4.7
OECD	18.0	8.4

Gender differences

44. In reading girls outperform boys by a statistically significant margin in NI. Boys attain a mean score of 484 and girls attain a mean score of 512. This picture is repeated throughout the survey countries, with girls outperforming boys in every country in reading.

45. In NI, there was a difference of 27 score points between girls and boys compared to an OECD average of 38 score points. This was one of the lowest score point differences among the comparison countries, with over four-fifths having a greater difference than NI. Among OECD countries, Finland had the largest difference (with girls outperforming boys by 62 score points) and among the non-OECD comparison countries the largest difference was a 70 point difference in Bulgaria.

46. The higher attainment in reading of girls is a common pattern in other measurements of attainment. The PISA results confirm these findings. However, it is encouraging that the difference in NI in PISA 2012, while significant, is smaller than that in many other countries.

SCIENCE

Achievement in relation to other countries

47. Science was a minor domain in 2012. This means that approximately 70 per cent of pupils were assessed in this subject and the questions did not cover the subject as fully as in reading (the major domain).

48. PISA defines science literacy as an individual's scientific knowledge, and use of that knowledge, to identify questions, acquire new knowledge, explain scientific phenomena and draw evidence-based conclusions about science-related issues; their understanding of the characteristic features of science as a form of human knowledge and enquiry; their awareness of how science and technology shape our material, intellectual and cultural environments; and their willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.

49. NI's pupils achieved a mean score of 507 in science, which was slightly above but not significantly different from the OECD mean of 501. Our performance was not statistically different to that in England (516) and

Scotland (513); however, the Republic of Ireland (522) was significantly higher than NI. The performance in Wales (491) was significantly lower than that of NI.

50. As the table below shows, internationally, the performance in science in 17 of the other 64 participating countries was at a significantly higher level than in NI, of which ten are OECD members and six are EU members. Ten countries performed at a level that was not significantly different from that of NI, while the remaining 37 countries (including 14 OECD members and 13 EU members) performed significantly less well.

51. Of the 17 countries with mean scores in science that are significantly higher than NI's, two are English speaking (Republic of Ireland and Australia) and one has a substantial number of English speakers (Canada).

52. NI's mean score in science and the OECD average score have both been stable since 2006. NI's mean score has varied by only four score points.

53. The number of countries with mean scores significantly above NI increased from nine to ten between the 2006 and 2009 cycles, but has increased to 17 in PISA 2012.

54. In 2012, seven countries that were not significantly different to NI in 2009 are now significantly outperforming NI at reading; these are Poland, Liechtenstein, Germany, Chinese Taipei, the Netherlands, the Republic of Ireland and Macao-China. Poland and the Republic of Ireland have shown particularly strong improvements and show significant increases in performance since 2009.

55. Five countries that previously were significantly below NI are now not statistically different (Czech Republic, Austria, Latvia, France and Denmark). One country, New Zealand, which previously outperformed NI, is now not significantly different, while another country, Hungary, was not significantly different in 2009, but now is significantly below.

56. This suggests that there have been significant improvements in reading in some other countries while NI's performance has remained stable.

Table 5 Country scores for Science (significant differences)

Mean scores significantly above NI		Mean scores not significantly different from NI		Mean scores significantly below NI	
Shanghai-China	*580*	England*	516	Spain*	496
Hong Kong-China	*555*	New Zealand	516	*Lithuania**	*496*
Singapore	*551*	Switzerland	515	Norway	495
Japan	547	Slovenia*	514	Hungary*	494
Finland*	545	Scotland*	513	Italy*	494
Estonia*	541	Czech Republic*	508	*Croatia**	*491*
Korea	538	**Northern Ireland***	**507**	Luxembourg*	491
Vietnam	*528*	Austria*	506	Wales*	491
Poland*	526	Belgium*	505	Portugal*	489
Canada	525	*Latvia**	*502*	*Russian Federation*	*486*
Liechtenstein	*525*	OECD average	501	Sweden*	485
Germany*	524	France*	499	Iceland	478
Chinese Taipei	*523*	Denmark*	498	Slovak Republic*	471
Netherlands*	522	United States	497	Israel	470
Republic of Ireland*	522			Greece*	467
Australia	521			Turkey	463
Macao-China	*521*			*United Arab Emirates*	*448*
				*Bulgaria**	*446*
				Chile	445
				Serbia	*445*
				Thailand	*444*
				*Romania**	*439*
				*Cyprus**	*438*
				Mexico	415

In the national report prepared for NI by the NFER, the scores for NI are compared with 64 other countries, excluding the UK. Hence, in the text above this table, the number of countries quoted as performing better/similar/below NI do not include England, Wales or Scotland.

Non-OECD members are in Italics

* Marks EU member states

14 countries with scores below 430 omitted

Distribution of performance in science

57. In NI, the mean score at the 5th percentile was 338 in science, while for those at the 95th percentile it was 669. This is a difference of 331 points difference, making the difference between the 5th and 95th percentiles here larger than in Scotland, the Republic of Ireland and Wales (293, 300 and 305 respectively). The difference in NI was the same as that in England. Only seven comparison countries had a wider distribution than NI. The average difference for the OECD countries was 304 scale points.

58. The difference in score between the 5th and 95th percentiles in NI has remained similar to that in PISA 2009, when it was 335 scale points. In 2006 it was 367 scale points, a much larger difference.

59. NI has pupils represented at all proficiency levels. At 16.8 per cent, the proportion of pupils in NI that did not achieve level 2 proficiency in science is lower than the OECD average of 17.8 per cent. For the highest proficiency level (Level 6), the OECD average is 1.2 per cent, compared to 2.0 per cent in NI. Looking at the top two levels combined (Levels 5 and 6); NI is above the OECD average with 10.3 per cent of pupils achieving this level in science, compared with an OECD average of 8.4 per cent.

60. There are only six countries with a larger percentage of pupils at Level 6 than NI. These are Singapore, Shanghai-China, Japan, Finland, New Zealand and Australia. However, all countries that significantly outperformed NI, or were not significantly different from NI in their science achievement, have a smaller proportion of pupils at Level 1 or below, except for France, the United States and Belgium. That is, NI has a relatively large number of underachievers when compared with the highest scoring countries.

61. Within the UK and Ireland, England had the largest percentage (11.7) at the two highest levels of attainment (Levels 5 and 6), followed by the Republic of Ireland and NI (10.8 and 10.3 respectively), and all three are higher than the OECD average of 8.4 at these levels. Scotland's proportion at the higher levels (8.8) is similar to the OECD average, but in Wales the proportions of high achievers was lower at 5.7 per cent.

62. At the other end of the scale, the Republic of Ireland and Scotland had the lowest proportion, 11.1 and 12.1 per cent respectively, of low attaining pupils at Level 1 and below for science. England had 14.9 per cent of pupils working at the lowest levels of proficiency, NI 16.8 per cent and Wales 19.4 per cent.

Table 6 Science attainment on the PISA proficiency scale for the UK and Ireland

Science attainment	% Below Level 2	% Level 5 and above
Republic of Ireland	11.1	10.8
Scotland	12.1	8.8
England	14.9	11.7
NI	16.8	10.3
Wales	19.4	5.7
OECD	17.8	8.4

Gender differences

63. Of the other 64 participating countries, 27 had a statistically significant difference in gender performance on the science scale, 17 favouring girls and ten favouring boys. The OECD average shows a statistically significant gender difference in performance which favours boys by one score point.

64. Consistent with results in 2009 and 2006, there was no significant difference in performance between girls and boys in NI (however the score for boys is slightly higher; 510 compared to 504 for girls). This was also the case in almost all countries that either outperformed NI or were not significantly different. There were six exceptions and these were Finland (16 point difference in favour of girls), Latvia (15 point difference in favour of girls), Slovenia (nine point difference in favour of girls), Japan (11 point difference in favour of boys), Denmark (ten point difference in favour of boys) and Switzerland (six point difference in favour of boys).

SOCIO-ECONOMIC BACKGROUND

Socio-economic background in PISA is reported as the ESCS Index (Economic, Social and Cultural Status). The index is set to a mean of zero across OECD countries.

65. The mean scores for UK countries on the PISA index of economic, social and cultural status (ESCS) all indicate that pupils in the PISA samples in the UK and Republic of Ireland have a higher socio-economic status than on average across OECD countries. The means for England and NI were both 0.29, with 0.19 for Wales and 0.13 for Scotland and the Republic of Ireland.

66. The change in score for each unit of the index varies around the OECD average for the UK countries. Across the OECD, a change of one standard deviation on the ESCS Index is related to a predicted difference in score of 39 points.

67. For England and NI (with differences of 41 and 45 points respectively) socio-economic background is seen to have a greater effect than the average in OECD countries. In contrast, the Republic of Ireland, Scotland and Wales (with differences of 38, 37 and 35 points respectively), show an effect of socio-economic background which is lower than the OECD average.

68. Looking at the amount of variance in scores which can be explained by socio-economic background gives a better picture of the interaction between mathematics scores and the ESCS Index. This shows the extent to which pupils in each country are able to overcome the predicted effects of socio-economic background.

69. Across the OECD on average, 14.6 per cent of the variance in scores can be explained by socio-economic background. NI has a variance greater than the OECD average (16.7 per cent), while Wales has the lowest percentage (10.4 per cent). The variance for the Republic of Ireland, Scotland and England is 14.6 per cent, 12.9 per cent and 12.4 per cent respectively.

70. This suggests that socio-economic background has the least impact on performance in mathematics in Wales, whereas it has the biggest impact in NI. In NI, the figures indicate that more disadvantaged pupils have significantly less chance of performing as well as their more advantaged peers than their counterparts across the OECD on average.

PUPILS AND SCHOOL ATTITUDINAL SURVEYS

School attitudes

71. This section draws on responses to school and student questionnaires to describe aspects of school management, school climate, assessment practices and school resources.

72. Principals in NI report that they have a high level of responsibility for many aspects of school management. Compared with the OECD average, principals in NI play a greater role in most aspects of school management.

73. Compared with 2009, principals report there is a lower degree of involvement from national education authorities in the management of schools while the role of local authorities (such as Education and Library Boards) was largely unchanged.

74. Principals report fewer pupil-related problems that hindered learning than the OECD average. The problem reported most frequently was pupils truanting, which was said to hinder learning by 20 per cent of principals in NI. This compares to the OECD average of 32 per cent. Principals reported pupils skipping classes much less frequently than the OECD average (seven per cent compared to 30 per cent). Eighteen per cent reported disruption of classes by students, compared with the OECD average of 32 per cent. Compared with PISA 2009, the only notable difference was in the proportion of principals saying “Students lacking respect for teachers.” The proportion increased from seven per cent in 2009 to 19 per cent in 2012.

75. In response to the question ‘is your school’s capacity to provide instruction hindered by any of the following issues, in relation to staffing?’ a lack of qualified teachers of subjects other than mathematics, science and English (18 per cent) was the most frequently reported staffing problem in NI. In terms of resources, 62 per cent of the principals reported a shortage or inadequacy of school buildings and grounds, while 58 per cent reported a shortage or inadequacy of computers as a hindrance to the school’s capacity to provide instruction. A shortage or inadequacy of library materials was the least likely to be a hindrance in the provision of instruction (17 per cent).

76. All principals in NI reported that assessments were used to inform parents about their child’s progress and to monitor the school’s progress, 96 per cent used assessments to compare the school’s performance with local

or national performance and 94 per cent to identify areas to be improved. Across the OECD, the only similarly high response was given for using assessment to inform parents about their child's progress (97 per cent). The percentages for NI are similar to those reported in 2009 by principals. The largest differences are for two items. The proportions of principals saying that assessments are used "To make decisions about students' retention or promotion" in their schools increased from 69 to 84 per cent. Similarly for, "To group students for instructional purposes", the increase was from 64 to 83 per cent.

77. Pupils were on the whole very positive about the teachers at their school with 87 per cent of pupils reporting that they get along well with most of their teachers. They were less positive on the teachers really listening to what they had to say (77 per cent). Pupils felt that school had prepared them well for the future with 91 per cent reporting that school had taught them things which could be useful in a job. For all the statements, pupils in NI were more positive about relationships with teachers than pupils across the OECD on average.

Pupil attitudes to mathematics

78. The pupil questionnaire focused on pupils' attitudes towards learning mathematics. Pupils did not report a particularly high level of intrinsic motivation to learn mathematics (33 per cent of pupils in NI enjoy reading about mathematics), and there is little difference between the proportions of pupils in NI and the OECD average, apart from a slightly greater proportion of pupils in NI reporting that they look forward to their mathematics lessons (42 per cent compared with the OECD average of 36 per cent).

79. While pupils are, on average, not particularly interested in learning mathematics, they show a greater level of instrumental motivation to learn mathematics, apparently recognising that it is useful. Ninety-two per cent of pupils in NI said that learning mathematics is worthwhile because it will improve career chances, compared with the OECD average of 78 per cent. This difference of 14 percentage points was also seen for the statement "Making an effort in mathematics is worth it because it will help me in the work that I want to do later on", which 89 per cent of pupils in NI agreed with.

80. Pupils reported a high level of conscientiousness towards mathematics-related tasks, with the majority of pupils in NI saying that

they worked hard and sensibly in order to learn mathematics. This was to a greater degree than the OECD average. For example, 84 per cent of pupils in NI reported that they finish their homework in time for mathematics lessons, compared to the OECD average of 68 per cent.

81. Pupils in NI reported that their parents believe in the importance of studying mathematics (97 per cent), which may reflect home environments which encourage the study of mathematics. This was greater than the OECD average (90 per cent). Generally, pupils in NI showed a high level of confidence in their ability to perform mathematical tasks, and fairly low levels of anxiety about learning mathematics.

NOTES TO EDITORS

Sample and Data

Locally, the survey was carried out by the National Foundation for Educational Research (NFER). Pupils sat the two-hour assessment in November 2012 under test conditions, following the standardised procedures implemented by all countries. A proportion of the questions used in the 2-hour test were ones used in previous rounds. This continuity between rounds provides a measure of change.

Pupils also completed a questionnaire to provide information on their economic and social backgrounds, study habits, and attitudes to reading. Principals in the participating schools completed a school questionnaire to provide information on the school's structure, organisation and climate, pupil intake, teacher body, instruction, curriculum and assessment, as well as school's policies and practices.

PISA covers pupils who are aged between 15 years 2 months and 16 years 2 months at the time of the assessment and who have completed at least six years of formal schooling, regardless of the type of institution in which they are enrolled, whether they are in full-time or part-time education. The fifteen year olds who took part in NI were mainly in Year 12.

The PISA study has strict sampling requirements regarding both the participation rate which is acceptable and the replacement of schools which decline to take part. The international response rate for the United Kingdom is calculated based on the results for England, Wales, NI and Scotland, with weighting according to the population in each country as well as school size. An NFER analysis of the characteristics of responding and non-responding schools in NI, England and Wales showed no significant differences and it was accepted by the PISA referee.

The pupil response rate was 86.4 per cent for the England, Wales and NI. The school response rate was 88.3 per cent with a total 9714 pupils and 397 schools participating across England, Wales and NI. This is a good response rate and means that UK findings are regarded by PISA as fully comparable with other countries.

The mean score for each subject scale was set to 500 among OECD countries in the PISA cycle when the subject was the major domain for the first time. The reading scale was set to 500 in its first year in 2000. Similarly the mathematics scale was set to 500 in 2003 and the science scale was set to a mean of 500 in 2006. As with any repeated measurement that uses samples it should be expected that the mean varies slightly from year to year without necessarily indicating any real change in the global level of skills.

A single scale of proficiency is applied to each subject area, in which each question is associated with a particular point on the scale that indicates its difficulty, and each pupil's performance is associated with a particular point on the same scale that indicates his or her estimated proficiency. The relative difficulty of tasks in a test is estimated by considering the proportion of test takers who answer each question correctly. The relative proficiency of pupils taking a particular test can be estimated by considering the proportion of test questions they answer correctly. A single continuous scale shows the relationship between the difficulty of questions and the proficiency of pupils.

Pupils are not asked every question prepared for the PISA test, during the 2-hour assessment. Instead, statistical analysis is applied to estimate the likelihood they are able to answer questions they have not actually been presented with.

Proficiency

PISA estimates the relative proficiency levels of pupils taking a particular test by considering the proportion of test questions they answer correctly. A single continuous scale shows the relationship between the difficulty of questions and the proficiency of pupils. By constructing a scale that shows the difficulty of each question, it is possible to locate the level of mathematical literacy that the question represents. By showing the proficiency of each pupil on the same scale, it is possible to describe the level of mathematical literacy that the pupil possesses. For PISA 2012, the range of difficulty of tasks allows for the description of six levels of proficiency: Level 1 is the lowest described level, then Level 2, Level 3 and so on up to Level 6. Pupils achieving level 3 are expected to successfully complete questions at level 2 and below.

FULL REPORT

The full report entitled “Student Achievement in Northern Ireland: Results in Mathematics, Science, and Reading Among 15-Year-Olds from the OECD PISA 2012 Study” by Rebecca Wheater, Robert Ager, Bethan Burge and Juliet Sizmur, is available at **http://www.nfer.ac.uk/publications/PQUK03**

Copies of the full report are available on a print-on-demand basis by writing to: Publications Unit, NFER, The Mere, Upton Park, Slough, Berks, SL1 2DQ. Email: **book.sales@nfer.ac.uk** Tel: 01753 637002. There is an administration charge of £20 plus postage and packing for a single copy, with a ten per cent discount for bulk orders of ten copies or more.

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