



Northern Ireland
Assembly

Research and Information Service Briefing Note

Paper 03/17

9th January 2017

NIAR 506-16

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TIMSS and PISA

1 Introduction

The Trends in International Maths and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) are international research projects conducted every four and three years respectively.

The studies aim to allow an international comparison of student performance and analysis of trends over time. This briefing note considers a number of findings from the two studies undertaken in 2015.

2 TIMSS

TIMSS is an international research project conducted every four years. It assesses the knowledge and skills of pupils aged from nine to ten and 13-14, providing information about trends in maths and science achievement.¹

The study presents mean scores and states whether the scores are significantly different. A statistically significant difference indicates that a relationship is not caused simply by chance. It is important to note that only considering country rankings may be

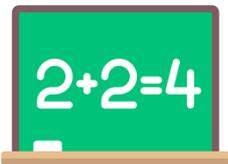
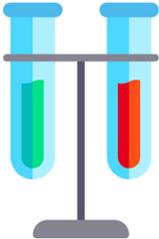
¹ Nfer (2016) *NFER Education Briefings: Key insights from TIMSS 2015* (Northern Ireland) Slough: Nfer

misleading if scores between countries are not statistically significant. The remainder of the paper uses the term 'significant' as shorthand for 'statistically significant'.²

Attainment

The most recent study, in 2015, included 57 countries.³ Northern Ireland took part only at the younger age range; all the results in this section refer to pupils aged between nine and ten years (primary year six).⁴ Figure 1 below illustrates the key findings.

Figure 1: Overview of key findings for Northern Ireland from TIMSS 2015⁵

<p>Maths</p> 	<p>International performance</p>	<ul style="list-style-type: none"> • Significantly outperformed 42 of 50 countries • Highest performing in Europe
	<p>Pupils at advanced benchmark</p>	<ul style="list-style-type: none"> • 27%
	<p>Pupils failing to achieve lowest benchmark</p>	<ul style="list-style-type: none"> • 3%
	<p>Spread of attainment</p>	<ul style="list-style-type: none"> • Relatively wide
<p>Science</p> 	<p>International performance</p>	<ul style="list-style-type: none"> • 22 countries outperformed NI • Above international average
	<p>Pupils achieving the advanced benchmark</p>	<ul style="list-style-type: none"> • 5%
	<p>Pupils failing to achieve the lowest benchmark</p>	<ul style="list-style-type: none"> • 5%
	<p>Spread of attainment</p>	<ul style="list-style-type: none"> • Smaller spread of attainment

Since the previous study in 2011, maths and science attainment for nine and ten year olds in Northern Ireland has remained stable. However, in maths, there was a significant increase in the proportion of pupils achieving the advanced benchmark (from 24% to 27%). There were no significant differences in attainment by gender for maths and science.⁶

² Statistically significant at p less than 0.05

³ Seven benchmarking participants also took part: these are regional entities providing samples for benchmarking purposes

⁴ Nfer (2016) *TIMSS 2015 in Northern Ireland: Mathematics and Science* Slough: Nfer

⁵ Burge, B., Classick, R., Stacey, O. (2016) *TIMSS 2015 in Northern Ireland: Mathematics and Science* Slough: NFER

⁶ Burge, B., Classick, R., Stacey, O. (2016) *TIMSS 2015 in Northern Ireland: Mathematics and Science* Slough: NFER

Teaching

The TIMSS survey also collects information on teaching, including qualifications and training. The key findings included:⁷

- Teachers in Northern Ireland were, on average, **less qualified than teachers internationally** (most teachers have a degree, while in many other countries a higher proportion have a postgraduate degree);
- **A higher proportion of pupils were taught by a teacher with a maths specialism** (18%) than by one with a science specialism (12%);
- **Participation in professional development for maths was higher** in Northern Ireland than on average internationally;
- However, **participation in professional development for science was relatively low** (in line with findings internationally);
- **Almost all (96%) pupils had teachers who reported that they were ‘very satisfied’ or ‘satisfied’** with their job; and
- Principals and teachers reported some of the **highest levels of emphasis on academic success** of any nation.

3 PISA

The OECD provides the PISA study, which assesses the science, maths and reading abilities of 15 year olds around the world, and provides contextual information about schools and teachers. Northern Ireland has participated in the study since 2000.⁸

The 2015 study and analysis

A total of 71 countries participated in PISA 2015. Each study, conducted every three years, includes the three areas but focuses on one; in 2015 the focus was science. The report allows for benchmarking against individual countries, a cohort of high performing countries⁹ in PISA science and against industrialised countries (the OECD average).¹⁰

The recent report on Northern Ireland’s performance in PISA considers both where scores are significantly different, and the size of differences in mean (average) scores between countries. These effect sizes are as follows:¹¹

⁷ Burge, B., Classick, R., Stacey, O. (2016) *TIMSS 2015 in Northern Ireland: Mathematics and Science* Slough: NFER

⁸ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

⁹ Singapore, Japan, Estonia, Taiwan, Finland, Macao, Canada, Vietnam, Hong Kong and China

¹⁰ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

¹¹ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

- **Mean score at least 20 points ahead of Northern Ireland:** equivalent to eight months of schooling;
- **Mean score between ten and 20 points** ahead of Northern Ireland: between four and eight months of schooling;
- **Mean score within ten points** of Northern Ireland: four months of schooling; and
- **Mean score at least ten points below** Northern Ireland: four months of schooling.

Science

The average PISA science score for Northern Ireland (500) was not significantly different from the mean score in 2006 (the last time science was the focus of PISA).

A total of 14 countries had an average score at least ten points ahead of Northern Ireland. These included England, Finland and Japan. The Republic of Ireland was one of 18 countries with a score within ten points of Northern Ireland in science.¹² Figure 2 below provides an overview of key findings for science.

Figure 2: Overview of key findings for Northern Ireland from PISA science 2015¹³

Science	
International performance	<ul style="list-style-type: none"> • 14 countries had an average score at least 10 test points higher than NI (equivalent to at least 4 months' schooling) • 34 countries scored at least 10 points lower
Pupils achieving top two levels	<ul style="list-style-type: none"> • Similar to OECD average • Skills of the highest performing pupils have declined significantly over the past decade
Low achieving pupils	<ul style="list-style-type: none"> • A smaller proportion of pupils lack basic science skills (18%) than OECD average (21%)
Spread of attainment	<ul style="list-style-type: none"> • Gap between highest and lowest performing pupils is equivalent to 8 years of schooling • Few countries have a significantly smaller difference

¹² Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

¹³ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

Maths

In line with findings for science, attainment in maths in Northern Ireland did not change significantly between 2006 and 2015.

A total of 18 countries had an average score at least ten points ahead of Northern Ireland (equivalent to at least four months of schooling), including the Republic of Ireland and Finland. England was within ten points of Northern Ireland, among a group of 16 countries.¹⁴

Figure 3: Overview of key findings for Northern Ireland from PISA maths 2015¹⁵

Maths	
International performance	<ul style="list-style-type: none"> • 18 countries had an average score at least 10 test points higher than NI (equivalent to at least 4 months' schooling) • 35 countries scored at least 10 points lower
Pupils achieving top two levels	<ul style="list-style-type: none"> • Smaller proportion than OECD average • Highest achieving pupils obtain lower scores than their counterparts in many other countries • Some evidence of a decline in the skills of the highest performing pupils over the past decade
Low achieving pupils	<ul style="list-style-type: none"> • 19% of students lack basic maths skills • This is lower than the OECD average (23%)
Spread of attainment	<ul style="list-style-type: none"> • Gap between highest and lowest performing pupils is equivalent to 7 years of schooling • This is significantly smaller than the difference in most other industrialised countries

Reading

The average reading score in Northern Ireland in 2016 was not significantly different to the average score in 2006.¹⁶

A total of 12 countries had an average score at least ten points ahead of Northern Ireland. This included the Republic of Ireland and Finland, whose average scores were 20 points ahead (equivalent to eight months of schooling).

England, Sweden and the United States were among a group of 19 countries within ten points of Northern Ireland. Wales was between ten and 20 points behind Northern

¹⁴ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

¹⁵ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

¹⁶ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

Ireland, along with countries such as Austria and Italy. Figure 4 overleaf illustrates key findings.¹⁷

Figure 4: Overview of key findings for Northern Ireland from PISA reading 2015

Reading	
	<p>International performance</p> <ul style="list-style-type: none"> • 12 countries had an average score at least 10 test points higher than NI (equivalent to at least 4 months' schooling) • 39 countries scored at least 10 points lower
	<p>Pupils achieving top two levels</p> <ul style="list-style-type: none"> • Smaller proportion than OECD average (6% compared to 8%) • Steady decline in the skills of the highest performing pupils over the past decade
	<p>Low achieving pupils</p> <ul style="list-style-type: none"> • Around 15% lack basic reading skills • This is lower than the OECD average (19%) • Reading skills of the lowest achieving pupils have improved since 2006
	<p>Spread of attainment</p> <ul style="list-style-type: none"> • Gap between highest and lowest performing pupils is equivalent to 7 years of schooling • This is significantly smaller than the difference in most other industrialised countries

Results by gender

In Northern Ireland there was no significant difference between male and female students in maths or science. Consistent with every other country, girls performed better than boys in reading. However, the difference in Northern Ireland was substantially smaller than in most other countries.¹⁸

Community background

With regard to community background, there was no significant difference between the PISA scores of Protestant and Catholic pupils, regardless of socio-economic disadvantage.

Socio-economic background

The impact of socio-economic background on achievement was similar to that in many other countries, including Finland. The results show that one in three pupils overcomes

¹⁷ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

¹⁸ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

a disadvantaged background to achieve a top score in PISA science (these are known as resilient pupils)¹⁹.

Academic selection and school type

The UCL Institute of Education report on PISA 2015 considers whether countries with selective post-primary systems have more resilient pupils (those overcoming disadvantage to perform at a high level). It finds no evidence that jurisdictions with academically selective systems have a greater proportion of resilient pupils.²⁰

The report also found that pupils attending a grammar school scored around 100 test points (equivalent to more than three years of schooling) ahead of their non-grammar counterparts in science, reading and maths.²¹

Free school meals

Students in schools where a high proportion of pupils are entitled to free school meals (FSME) perform less well than those with the lowest proportion of pupils with FSME.

Other findings include:

- In schools with a high proportion of students with FSME, **over a third (35%) of students lack basic science skills;**
- **This compares to less than 2%** of those in schools with a low proportion of students with FSME; and
- In schools with high levels of FSME **1% of pupils reach the top PISA levels, compared to 15%** in schools with low levels.

School management and resources

PISA also considers school leadership, management and resources. The findings in this regard include:²²

- A particular concern among principals is a **lack of good quality school infrastructure;**
- Principals are generally **positive about resources to support science learning;**

¹⁹ The OECD classifies a pupil as resilient if they are in the bottom quarter of the PISA index of economic, social and cultural status in the country and performs in the top quarter of pupils in the focus subject.

²⁰ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

²¹ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

²² Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

- Principals in Northern Ireland are more likely to report **staff absenteeism as a barrier to learning** than on average across OECD countries, particularly those in schools with a high proportion of disadvantaged pupils; and
- Principals note that **external inspections ‘lead to a lasting impetus for change’**.

4 Limitations

PISA aims to offer insights into policy and practice, supporting monitoring of trends across countries and in subgroups of pupils within each country. It seeks to allow policy makers to assess the knowledge and skills of their students in comparison to other countries, and to learn from other jurisdictions.²³ However, a number of academics have questioned aspects of PISA and TIMSS, highlighting data limitations in both surveys.²⁴

Both TIMSS and PISA provide a snapshot of pupils’ skills at one point in time, and do not provide information about pupil progress. The studies do not provide information about the value schools and school systems add to pupil progress.²⁵

The results reflect the contribution of a range of factors to pupil performance, including, but not limited to, schools. Other such factors include parental involvement, children’s early years, pupil attitudes and socio-economic background. As such, the findings do not solely reflect the effects of the educational system or particular policies or reforms and cannot identify cause-and-effect relationships.²⁶

5 Conclusion

While the PISA and TIMSS studies have a number of limitations, they do allow for a comparison of Northern Ireland students’ performance with their counterparts internationally.

In primary maths, nine and ten year olds in Northern Ireland had the highest performance in Europe, and significantly outperformed 42 of 50 participating countries. In science, although Northern Ireland pupils performed above the international average, pupils in 22 other countries performed better.

At post-primary, Northern Ireland’s performance in reading, maths and science has remained stable since 2006. However, the skills of the highest performing students in science and reading have declined over this period, and there is some evidence of a

²³ OECD (2016) *PISA 2015 Results (Volume 1) Excellence and Equity in Education* Paris: OECD Publishing

²⁴ Jerrim, J. (2013) “The reliability of trends over time in international education test scores: is the performance of England’s secondary school pupils really in relative decline?” *Journal of Social Policy* Vol. 42, No. 2 pp.-259-279

²⁵ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

²⁶ Jerrim, J., Shure, N. (2016) *Achievement of 15 Year Olds in Northern Ireland: PISA 2015 National Report* London: UCL Institute of Education

drop in performance among the highest performing in maths. Areas for further consideration could include:

- The teaching of science at primary as part of the World Around Us, rather than as a discrete subject;
- The relatively low involvement of primary teachers in continuing professional development for science;
- The proportion of 15 year olds lacking basic maths, reading and science skills;
- The decline in performance of the highest performing students over the past decade;
- The difference in performance between grammar and non-grammar schools;
- The difference in performance between post-primary schools according to the concentration of pupils with FSME;
- Principals' concerns around a lack of good quality school infrastructure; and
- Reported issues around staff absenteeism.