

# TIMSS 2015 in Northern Ireland: Mathematics and Science



## Executive summary

This summary accompanies the national report for Northern Ireland for TIMSS 2015 (Burge *et al.*, 2016). It summarises the attainment of Year 6 (Y6) pupils in Northern Ireland in the TIMSS 2015 survey and explores the context of that attainment. TIMSS is a study of mathematics and science at ages 9-10 (and ages 13-14, although Northern Ireland participated only at the younger age range). TIMSS has a four-yearly cycle. Northern Ireland took part in TIMSS for the second time in the 2015 cycle so comparisons can be made with 2011 where appropriate.

## Countries with which Northern Ireland is mainly compared in this report

Northern Ireland's performance in TIMSS 2015 is outlined and compared with that of seven other countries in particular. These are the six countries which outperformed Northern Ireland in all three subject domains (reading, mathematics and science) in the most recent PISA cycle (2012), and England as another constituent country of the UK.

The comparator group is therefore:

- Australia
- Finland
- Hong Kong
- Poland
- Republic of Ireland
- Singapore
- England.

These countries are referenced throughout the summary and report as applicable. Reported findings relate to Northern Ireland unless otherwise specified. Findings are based on the international TIMSS reports (Martin *et al.*, 2016a and Mullis *et al.*, 2016a and 2016b), available through the NFER website. <sup>1</sup>

<sup>1</sup> <http://www.nfer.ac.uk/international/>

## Attainment

- Pupils in Northern Ireland performed very well in TIMSS 2015 mathematics, significantly outperforming 42 of the 50 participating countries and being significantly<sup>2</sup> outperformed by only five countries.
- The average score for science is lower than for mathematics, although still above the TIMSS science international average. Northern Ireland is outperformed by 22 countries in science and is in a band of seven countries scoring similarly.
- Compared with TIMSS 2011, five additional countries significantly outperformed Northern Ireland in the TIMSS 2015 science assessment. This included the comparator country the Republic of Ireland.
- Mathematics and science attainment for 9- and 10-year-olds in Northern Ireland has remained stable. Northern Ireland's mathematics and science scores in 2015 are not significantly<sup>2</sup> different from its 2011 scores.
- In Northern Ireland, there were no significant gender differences in attainment for either mathematics or science.
- The lack of gender differences in attainment in Northern Ireland in both mathematics and science was apparent in both the 2011 and 2015 TIMSS cycles.
- Over a quarter of pupils in Northern Ireland reached the TIMSS 'Advanced International Benchmark' in mathematics, the sixth highest percentage internationally.
- For mathematics, there was a significant increase (from 24 per cent in 2011 to 27 per cent in 2015) in the percentage of pupils in Northern Ireland reaching the TIMSS 'Advanced International Benchmark'.
- Only 5 per cent of Northern Ireland's pupils reached the 'Advanced International Benchmark for science'.
- For science, the distribution of attainment across the international benchmarks has remained stable since 2011.
- For mathematics and science respectively, 3 per cent and 5 per cent of pupils failed to reach the TIMSS Low International Benchmark. In the countries outperforming Northern Ireland, the equivalent figures were 0 to 1 per cent for mathematics, and 0 to 10 per cent for science.
- In Northern Ireland, there was a relatively wide spread of attainment for mathematics, whereas for science the difference between the scores of the highest and lowest attainers was smaller.



<sup>2</sup> Throughout this summary, the term 'significant'

## Attainment by content and skill

- In the mathematics content domains, pupils did significantly better on Number and less well on Geometric Shapes and Measures.
- In the mathematics cognitive domains, they did better on Knowing and Applying and less well on Reasoning.
- In the science content domains, they did less well on Physical Science.
- In the science cognitive domains, there was no significant difference between performance on each of the cognitive domains and overall science performance.
- Since the last TIMSS survey in 2011, there has been some change in Northern Ireland's performance across the content domains for both mathematics and science. Most notably:
  - ◆ improved performance on Data Display, Applying, and Reasoning items in mathematics
  - ◆ improved performance on Earth Science and Reasoning items in science.
- For both mathematics and science, most countries had gender differences in the content or cognitive domains. Northern Ireland was unusual in having no significant gender differences in either the mathematics or science content or cognitive domains.

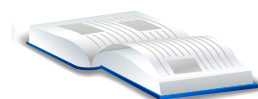
## Pupil engagement and attitudes

- In Northern Ireland, and within countries internationally, for both mathematics and science, pupils who most like the subject had higher average achievement scores.
- In Northern Ireland, and internationally, in both mathematics and science, pupils who were categorised as 'Very Confident' also had higher achievement scores.
- Among the comparator countries, Northern Ireland had the largest percentage of pupils experiencing 'Very Engaging Teaching' in both mathematics and science.
- Pupils experiencing 'Very Engaging Teaching' or 'Engaging Teaching' in mathematics had higher average achievement scores. This was also the case internationally.
- How engaging pupils in Northern Ireland reported finding science teaching did not seem to relate to their average achievement.
- Internationally, four out of the five countries with the highest achievement in mathematics and science had among the lowest percentages of pupils identifying themselves as 'Very Confident' or as experiencing 'Engaging Teaching' for both subjects.
- Northern Ireland had a lower percentage of pupils taught by teachers in mathematics and science who relate their lessons to pupils' daily lives and use interesting materials 'Every or Almost Every Lesson' than the international average.



## Education workforce

- In Northern Ireland, most pupils (83 per cent) attended schools where the principal has a postgraduate degree. This is considerably higher than the international average.
- However, this was similar to a number of comparator countries, namely, Australia, England, the Republic of Ireland and Singapore.
- In Northern Ireland, the majority of pupils were taught mathematics by teachers whose main area of study was primary education, without specialisation in mathematics. The same was true of science, where three-quarters of pupils were taught by non-science specialists.
- The percentage of pupils in Northern Ireland taught by a teacher with a mathematics specialism was higher than the percentage of pupils taught by a science specialist (18 per cent and 12 per cent respectively).
- The level of participation in professional development activities in mathematics was higher in Northern Ireland than on average internationally. This was not the case for science, where levels of participation in professional development activities were relatively low (both in Northern Ireland and on average internationally).
- Teachers in Northern Ireland reported relatively frequent collaboration with colleagues to improve teaching. This was also the case on average internationally.
- In Northern Ireland, nearly all pupils had teachers who reported that they were 'Very Satisfied' or 'Satisfied' with their jobs. This mirrors the high level of job satisfaction reported in 2011. However, higher levels of career satisfaction did not appear to be associated with increased pupil achievement.



## School resources

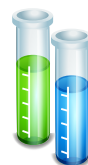
- In terms of teaching space and conditions, and teaching materials and supplies, teachers in Northern Ireland rated their working conditions relatively highly compared with international averages.
- The majority of pupils were taught mathematics and science by teachers who were classified as having 'Hardly Any Problems' with their working conditions; teachers of 30 per cent of pupils in both mathematics and science reported 'Moderate Problems'.
- For both subjects, principals reported that no pupils in Northern Ireland attended schools in which teaching was 'Affected a Lot' by resource shortages.
- For mathematics, 67 per cent of pupils were in schools in which teaching was reported to be 'Affected' by shortages in resources (similar to the international average). For science, the equivalent figure was 80 per cent which was higher than the international average.

## School resources (continued)

- Computers were available to the majority of Y6 pupils in their mathematics and science lessons. This was consistent with the findings from 2011. However, the number of computers available in Northern Ireland's schools has increased on average since 2011.
- Fewer than 10 per cent of pupils were in schools where capacity to teach was affected 'A Lot' by a shortage or inadequacy of five specific technological resources (technologically competent staff; audio visual resources; computer technology; and computer software / applications for mathematics / science). This is lower than the international average.
- In Northern Ireland, fewer pupils were affected by a lack of 'Computer Technology for Teaching and Learning' and by 'Audio-visual Resources<sup>3</sup> of Delivery for Teaching' than was the case in any of the comparator countries.
- Northern Ireland had a higher percentage of pupils attending schools without a school library than the international average and most comparator countries. In Northern Ireland, school libraries also seem to be less well equipped than is the case on average internationally.

## School learning environment

- Principals and teachers in Northern Ireland reported some of the highest levels of emphasis on academic success of any nation. Teachers reported higher levels of emphasis on academic success than principals.
- The vast majority of pupils in Northern Ireland attended schools which were categorised as 'Very Safe and Orderly' (teacher reports). Similarly most pupils in Northern Ireland attended schools with 'Hardly Any' or 'Minor' problems with discipline (principal reports).
- On average, pupils in Northern Ireland reported experiencing bullying behaviours less frequently than those in most other participating countries.
- Teachers in Northern Ireland reported that their teaching was rarely limited by disruptive or uninterested pupils.
- Most aspects of the school learning environment in Northern Ireland have remained stable between the 2011 and 2015 TIMSS cycles.



<sup>3</sup> This includes interactive whiteboards and digital projectors.

## The curriculum and learning activities

- Teaching time for mathematics was higher than the international average. However, for science, teaching time was lower than the international average.
- A very small proportion of Y6 pupils in Northern Ireland were taught science by teachers who reported emphasising science investigation in at least half their science lessons. This proportion is considerably below the international average and is lower than in 2011. In a number of the highest performing countries, teachers reported emphasising science investigation to a greater extent than in Northern Ireland.
- According to teachers' reports of topics taught in lessons, a higher proportion of Y6 pupils are taught the TIMSS mathematics topics than the TIMSS science topics. This is also the case on average internationally.

## Characteristics of pupils and their homes

- A higher proportion of children in Northern Ireland reported having 'Many Resources' compared with the average internationally. Children with access to more home resources for learning had higher average achievement in both mathematics and science.
- Parents in Northern Ireland had relatively positive attitudes towards mathematics and science. Children with parents who had a 'Very Positive Attitude' had higher average achievement in both mathematics and science.
- A high proportion of teachers reported that their teaching was limited to 'Some extent' by pupils' lack of prerequisite knowledge or skills, in both mathematics and science. The proportion was similar to that on average internationally.
- Teachers of pupils in Northern Ireland were more likely to report pupils' lack of sleep as limiting their teaching compared with pupils' lack of nutrition.
- The proportion of pupils whose teachers reported lack of sleep as a limiting factor was greater in Northern Ireland than the international average for both mathematics and science.
- Pupils in Northern Ireland whose teachers reported that pupils' lack of basic nutrition and lack of sufficient sleep limited their teaching had lower average achievement in both mathematics and science than those whose teachers reported not having these limitations. This pattern mirrored the international data.

