



NFER Education Briefings

Key insights from TIMSS 2015 (Northern Ireland)

What is TIMSS?

The Trends in International Mathematics and Science Study (TIMSS) is a worldwide research project run by the IEA¹. It takes place every four years and provides data about trends in mathematics and science achievement. The 2015 survey updates the picture of performance from 2011.

It assesses the knowledge and skills of pupils aged 9–10 and 13–14 and gathers extensive background information about pupils' home and

learning environments and the quantity, quality and content of teaching. This information can provide powerful insights into how well education systems are functioning, and how to improve teaching and learning in mathematics and science for pupils around the world.

¹The International Association for the Evaluation of Educational Achievement

Who takes part?

TIMSS 2015 involved 64 participants: 57 countries and seven benchmarking participants² with pupils in one or both age groups. Of these, 57 took part in the primary assessment for 9–10 year olds (50 countries and 7 benchmarking participants).

TIMSS 2015 participants are varied, ranging from high-income countries or regions through to low- and middle-income ones. Their education systems also vary, for example, differing in the age at which children start school. More information about the education system in each participating country and region can be found in the TIMSS encyclopaedia.³



TIMSS 2015 in the UK

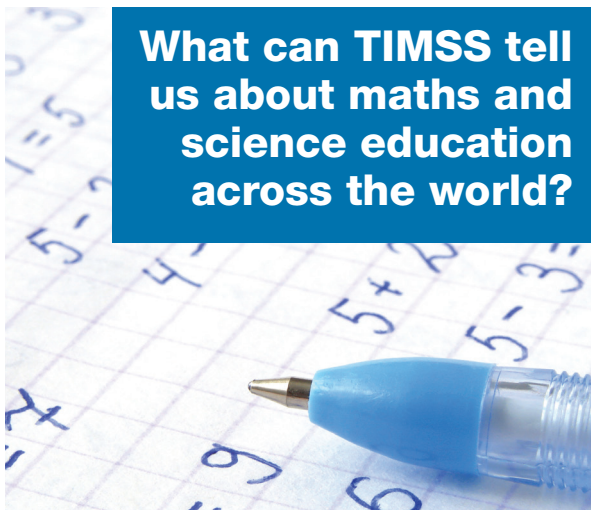
The four countries of the United Kingdom are regarded separately by the IEA and, of these, Northern Ireland and England chose to participate in the 2015 cycle. Northern Ireland also participated in TIMSS in 2011 and so comparisons can be made with this earlier survey. England has participated in all six cycles since 1995. Scotland has also participated in previous cycles.

² Countries participating in TIMSS follow guidelines and strict sampling targets to provide samples that are nationally representative. 'Benchmarking participants' are regional entities which follow the same guidelines and targets to provide samples that are representative at regional level.

³ Mullis, I. V. S., Martin, M. O., Goh, S. and Cotter, K. (Eds) (2016). *TIMSS 2015 Encyclopedia: Education Policy and Curriculum in Mathematics and Science*.

NFER has a long history of involvement in international large-scale assessments dating back over fifty years. We have delivered TIMSS since its inception in 1995, including administration of the 2011 and 2015 surveys in Northern Ireland. Outcomes from the 2015 cycle, internationally and for Northern Ireland, are available through the NFER website: www.nfer.ac.uk/timss

What can TIMSS tell us about maths and science education across the world?



Has maths and science achievement changed over time?

Simply looking at whether the score for maths or science is higher or lower than in a previous TIMSS cycle does not tell us accurately whether achievement has improved, is stable or is in decline. It is crucial to consider whether a score is statistically significantly different – in other words, differences have not arisen solely by chance. In 2015, Northern Ireland's TIMSS score for maths was 570 and in 2011 it was 562. Although the score increased, the international analysis found that Northern Ireland had maintained an equivalent level of performance.

How does achievement compare between countries?

It is tempting to focus on rankings when comparing achievement between countries. However, rankings can be misleading because small differences in scores may not be statistically significant. The TIMSS data allows us to establish whether one score is significantly different from another. Northern Ireland is ranked sixth for maths in 2015, but the Russian Federation, ranked seventh, has a score that is not significantly different. Therefore, it is better to look at which countries significantly outperformed others.

Another reason not to rely on rankings when comparing performance across countries is that rankings can be volatile, varying according to the mix of countries participating in any given cycle. One country's position relative to other countries is not just based on its own performance. It is also influenced by which countries participated and whether their performance has changed since the last round of TIMSS. For example, despite Northern Ireland's science score in 2015 not varying significantly from 2011, it was outperformed by five additional countries.



How does achievement vary within countries?

A country's average TIMSS maths or science score doesn't tell us everything we might need to know. In addition to knowing how well pupils in Northern Ireland performed overall, it is also important, for the purposes of teaching and learning, to examine the spread in performance between the highest and lowest achievers.

TIMSS provides data on the 'spread' of achievement in two ways: the proportion of pupils achieving certain 'International Benchmarks'; and the difference between a country's highest and lowest scores. For example, Singapore is the highest achieving country for both maths and science, but has a relatively wide spread of achievement – over 280 scale points in both subjects.

What characteristics are associated with achievement?

TIMSS also provides in-depth contextual information about education systems, schools, teachers and pupils, and explores the relationships between these characteristics and achievement. This information can help countries make evidence-based decisions on aspects of their own education policy that they might review and adapt.

However, it is important to recognise that the data from TIMSS alone does not provide a magic formula for policy changes that will improve achievement. For example, it cannot tell us whether the high performance of countries such as Singapore and Hong Kong is a direct result of the specific teaching practices they adopt or whether it is due to other aspects of the learning (or wider) environment. It is therefore important to consider TIMSS alongside other sources of evidence.



Key findings from TIMSS 2015 in Northern Ireland



Achievement

- Primary-age pupils performed very well in mathematics in TIMSS 2015, significantly outperforming 42 of the 50 participating countries and being significantly outperformed by only five countries. There has been no significant change in score since 2011.
- The average score for science was lower than for mathematics, although still above the international average. Northern Ireland was outperformed by 22 countries and its score has not changed significantly since 2011.
- There were no significant gender differences in achievement for either mathematics or science in Northern Ireland.

Teachers

- Among a group of high-performing comparator countries, Northern Ireland had the largest percentage of pupils experiencing 'Very Engaging Teaching' in both mathematics and science.
- A higher proportion of pupils were taught by a teacher with a mathematics specialism (18 per cent) than were taught by a science specialist (12 per cent). Teaching time for mathematics was higher than the international average whereas, for science, teaching time was lower.
- 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.

School learning environment

- Most pupils attended schools where the principal had a postgraduate degree. This was considerably higher than the international average.
- Teachers rated their working conditions relatively highly compared to the international average, in terms of teaching space and conditions, and teaching materials and supplies. Nearly all pupils had teachers who reported that they were 'Very Satisfied' or 'Satisfied' with their jobs.
- The vast majority of pupils attended schools which were categorised as 'Very Safe and Orderly' and with 'Hardly Any' or 'Minor' problems with discipline. On average, pupils in Northern Ireland reported experiencing bullying behaviours less frequently than those in most other participating countries.
- Principals and teachers reported some of the highest levels of emphasis on academic success of any nation.

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 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.

How can TIMSS inform national policy?

Over the coming months, NFER will be undertaking detailed analysis of the TIMSS data, which will enable a range of policy questions to be addressed. For example:

- What can be learned from the highest achieving countries and those which have improved most between TIMSS cycles?
- What reforms to curriculum and resourcing have other countries undertaken and, where these appear successful, what aspects of the approach could be implemented elsewhere?
- Are current policies having the intended impact? For example, have policies funding more IT staff in primary schools resulted in fewer schools reporting a lack of technologically competent staff?
- Have there been any unintended consequences in countries changing their curricula? For example, have changes in emphasis resulted in certain areas not being taught at all and has there been any impact on achievement?