WHAT IS TIMSS?

TIMSS (***T**rends in **I**nternational **M**athematics and **S**cience **S**tudy*) is one of the world's largest studies of education. It assesses the maths and science skills of students in both primary school (at Fourth Class) and post-primary school (at Second Year).

The first TIMSS was in 1995, and it has been repeated every four years since then. TIMSS 2019 is the seventh cycle. Ireland has taken part in 1995, 2011 (Fourth Class only), 2015, and 2019.

In 2019, 64 countries and about 672,000 students participated, with 58 countries participating at primary level and 39 countries taking part at post-primary level. Ireland, along with 32 other countries took part at both levels. For brevity, the rest of this flyer summarises the main Second Year results only. For more information about Fourth Class pupils, see www.erc.ie/timss.

WHAT DOES TIMSS ASSESS?

TIMSS assesses student achievement in mathematics and science. Within both domains (subjects), it assesses several **content areas** (subject matter or topics) and **cognitive processes** (skills students need to demonstrate to answer questions correctly).

There are four content areas for maths (Number, Algebra, Geometry and Data & Probability). There are also four content areas for science (Biology, Chemistry, Physics and Earth Science). For both domains, the same three cognitive processes are assessed – in increasing order of complexity, these are Knowing, Applying and Reasoning.

TIMSS IN IRELAND

TIMSS is managed in Ireland by the Educational Research Centre (ERC) on behalf of the Department of Education. The ERC is supported in this work by a National Advisory Committee that includes members of the Inspectorate of the Department of Education as well as members from groups such as the NCCA, the SEC, and from DCU, TCD, and UCD.

TIMSS was administered in Ireland in March and April 2019 in 149 post-primary schools around the country, which were randomly-selected and invited to participate as a nationally representative sample. The quality of the administration was generally very high, ensuring that the data gathered are accurate and reliable.

In total, 4118 Second Year students completed tests of maths and science, together with a background questionnaire. In addition, their school principals and mathematics and science teachers completed questionnaires. Together, these provide a detailed snapshot of the broader educational context in Ireland.

MATHEMATICS – MAIN FINDINGS

Second Year students in Ireland achieved a mean (average) score of 524 on the mathematics assessment. This was statistically significantly higher than the score in 26 other countries (including Finland, Norway, Sweden, France and New Zealand), and was similar to the performance in six countries (Lithuania, Israel, Australia, Hungary, the United States and England). Students in only six countries achieved a significantly higher mathematics score than students in Ireland: five East Asian countries (Singapore, Chinese Taipei, the Republic of Korea, Japan, and Hong Kong), and the Russian Federation.

Boys and girls in Ireland achieved similar mathematics scores. Compared to their overall mathematics score, students in Ireland performed relatively stronger on items that assessed two content areas (Number and Data & Probability) and the cognitive skills of Knowing and Applying, and performed relatively weaker on items that assessed two content areas (Algebra and Geometry) and Reasoning skills.

SCIENCE – MAIN FINDINGS

Second Year students achieved a mean score of 523 in science. This was significantly higher than the score in 23 countries (including New Zealand, Norway and France). Eight countries (including Australia, the United States and England) achieved similar scores to Ireland, and another seven countries (including Singapore, Chinese Taipei, Japan, Finland and Lithuania) achieved significantly higher science scores.

As for mathematics, Second Year boys and girls performed at a similar level on the science assessment. Compared to their overall science performance, Second Year students performed relatively stronger in Earth Science (which includes much of the content taught as geography in Ireland), and performed relatively less well in both Physics and Chemistry. They also displayed a relative strength in Reasoning in science, while they performed relatively less well on knowledge based tasks.

TRENDS (1995-2015-2019)

The mean mathematics score for students in Ireland in TIMSS 2019 was almost identical to the score in 2015 (524 and 523, respectively), and for science, while not statistically significant, there was a drop of seven points in performance (from 530 to 523). Performance in each domain has not changed significantly since 2015 or 1995.

Between TIMSS 1995 and 2015, there was a marked improvement in both mathematics and science among lower-achieving students (those at the 5th percentile of all scores in Ireland), and while there was a more modest improvement (of about 3 points) in mathematics between 2015 and 2019, the science scores of students at the 5th and 25th percentiles declined by about 12 points. The performance of higher-achieving students in mathematics and science (at the 95th percentile) has remained stable between 2015 and 2019, while it is somewhat lower in 2019 than in 1995.

BENCHMARKS OF PERFORMANCE

TIMSS also describes students' mathematics and science performance with reference to four International Benchmarks (Low, Intermediate, High or Advanced) which describe the skills that students can typically demonstrate. A student at the Low Benchmark can consistently demonstrate the most basic mathematical or scientific skills, while someone at the Advanced Benchmark can demonstrate quite complex reasoning and problem-solving skills.

For **mathematics**, almost all Second Year students reached the Low Benchmark (94%) compared to 87% internationally, while 76% reached the Intermediate Benchmark compared to 56% internationally. Almost two-fifth of Irish students (38%) reached the High Benchmark (25% internationally), and 7% reached the Advanced Benchmark, which is just marginally above the corresponding International median percentage (5%). Those students reaching the Advanced Benchmark could demonstrate the most advanced mathematical skills that were assessed. These percentages were identical to those in TIMSS 2015.

Comparatively, 37-51% of students reached the Advanced Benchmark in Japan, the Republic of Korea, Chinese Taipei and Singapore, countries with significantly higher mean mathematics performance than Ireland.

For **science**, 92% of Second Year students reached the Low, 73% reached the Intermediate Benchmark, 40% reached the High Benchmark and 10% reached the Advanced Benchmarks. The percentages reaching each Benchmark in Ireland are higher than on average across all TIMSS countries (85%, 61%, 29% and 7%, respectively), but just slightly so at the Advanced Benchmark. By comparison, 11% of students in England reached the Advanced Benchmark for science, while 15% in the United States and 48% of students in Singapore did so.

The percentages of Second Year students reaching the Low, High and Advanced science benchmarks in TIMSS 2019 were broadly similar to the corresponding figures in 2015, while there was a significant decline in the percentages reaching the Intermediate Benchmark between 2015 and 2019 (from 77% to 73%).

CONTEXTUAL INFORMATION

The ERC is preparing detailed contextual reports at Fourth Class and Second Year that will examine more closely the wealth of information provided in the student, teacher, and principal questionnaires. They are intended for public release towards the end of 2021. These follow-up reports will include comparisons to other countries, and between Fourth Class and Second Year in Ireland, where appropriate. They will include topics such as student engagement and attitudes towards school and mathematics and science, interactions between the home and school, teaching practices and challenges faced by teachers, use of digital technology at school and at home, and the system-level characteristics of Irish education.

MORE INFORMATION

More information about TIMSS and its implementation in Ireland is available from www.erc.ie/timss.

The initial Irish report on the main achievement results summarised here (*TIMSS 2019: Ireland's results in mathematics and science*) is now available for free download from www.erc.ie/timss/reports. Follow-up contextual reports will also be made available through the ERC's website when released.

The ERC would like to thank all the students and schools that took part in TIMSS 2019. We greatly appreciate your cooperation throughout the implementation study.