

Trends in International Maths and Science Survey (TIMSS) 2007 – Highlights From Scotland's Results

TRENDS IN INTERNATIONAL MATHS AND SCIENCE SURVEY (TIMSS) 2007 – HIGHLIGHTS FROM SCOTLAND'S RESULTS

By

**Jackie Horne, Kasia Bejtka and Sarah Miller
Education Analytical Services Division**

You will find more information about education in Scotland, and advice on supporting your child's learning on the Parentzone website,
www.itscotland.org.uk/parentzones

If you have any enquiries about this web only education research report please contact:

Dissemination Officer

The Scottish Government

Education Analytical Services Division

1 B South

Victoria Quay

Edinburgh EH6 6QQ

Tel: 0131 244-0894

Fax: 0131 244-5581

Email: recs.admin@scotland.gsi.gov.uk

Website: <http://www.scotland.gov.uk/Topics/Research/by-topic/education-and-training>

© Crown Copyright 2008

Limited extracts from the text may be produced provided the source is acknowledged. For more extensive reproduction, please write to, the Chief Researcher at Office of Chief Researcher, 4th Floor West Rear, St Andrew's House, Edinburgh EH1 3DG

**Scottish Government Social Research
2008**

TRENDS IN INTERNATIONAL MATHS AND SCIENCE SURVEY (TIMSS) 2007 – HIGHLIGHTS FROM SCOTLAND'S RESULTS



Introduction

The Trends in International Maths and Science Survey (TIMSS) is an international assessment of pupil attainment in maths and science at primary and secondary school level. TIMSS is run by the International Association for the Evaluation of Educational Achievement (IEA) and takes place every four years. Scotland has participated in TIMSS every year since its inception in 1995, except for 1999.

A total of 59 countries and eight benchmarking participants (e.g. Canadian provinces) took part in the study in 2007. Eighteen of the 59 countries were within the OECD, with the remainder being non-OECD, including a number classified as 'developing'¹.

The Scottish fieldwork was undertaken by the National Foundation for Educational Research (NFER). The assessments were administered in Spring 2007 and contained a mixture of multiple choice and constructed response items (requiring pupils to generate and write their answers). Separate representative samples of Scottish primary and secondary schools took part in the assessment (139 primary schools and 129 secondary schools). From these schools, usually one class, occasionally two classes,

¹ See The World Bank website for a list of lower income countries
<http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20421402~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html>

were randomly selected to give a total sample of 3,929 P5 pupils and 4,070 S2 pupils.

This paper highlights the main Scottish results, sets them in the international context, and looks at Scotland's performance in maths and science since 1995.

How does the study assess attainment in maths and science?

TIMSS assesses the performance of pupils in maths and science at 4th grade (generally nine and ten year olds) and again at 8th grade (generally thirteen and fourteen year olds). The survey design is based on *stage* rather than on *age*. As Scottish pupils begin formal schooling earlier than those of many other countries, it was agreed with the IEA that P5 and S2 pupils should be tested in Scotland as these year groups are the best match to 4th grade and 8th grade, respectively (a similar arrangement also applies to England and New Zealand). The average age at the time of testing in Scotland at P5 was 9.8 years, and in S2 it was 13.7 years. This means that Scotland's pupils were amongst the youngest of all pupils tested at both grades.

Interpreting the results of TIMSS

Similar to other international studies, the number and range of countries participating in TIMSS, and the grades assessed in each country (i.e. grade 4 or grade 8 or both) varies from one cycle of the study to the next.

In order to account for this, *attainment* results for TIMSS 2007 are calculated and presented in relation to a fixed scale (international) average set at 500. This *TIMSS scale average* uses the 1995 international average as the fixed point of reference. This avoids any misinterpretation of individual countries' attainment results in relation to the international average which can rise and fall due to different countries taking part in the survey in each cycle. Nevertheless, for other aspects of the survey such as pupil confidence, assessment methods, etc. the results are presented in relation to the *international average* for the countries that participated in TIMSS 2007.

Of the 59 countries that took part in TIMSS in 2007, 18 were within the OECD, with the remainder being non-OECD, including a number of countries classified as 'developing'.² Given the large number of different countries taking part in TIMSS, comparisons in this report are largely focused on OECD members as they are regarded as more meaningful than all country comparisons.

It should also be noted that in this report, differences between figures are only reported if they are statistically significant. In other words, results are only reported where we can be confident at the 95% level that differences are real,

² As TIMSS presents results separately for Scotland and England, for the purposes of this report and analysis, Scotland and England are treated as separate OECD countries.

rather than due to chance in sampling. For example, New Zealand scored two points below Scotland in grade 4 maths (P5) but this difference is not statistically significant, i.e. we cannot be sure that this difference in scores is real rather than due to chance. Therefore, New Zealand's score is said to be no different to, or similar to, Scotland's.

Scotland's performance compared to OECD countries

Comparisons in this section are focused on the 18 OECD countries that participated in TIMSS 2007. Sixteen OECD countries (counting Scotland and England separately) took part in the maths and science assessment at grade 4. Twelve OECD countries took part at grade 8. A full list of countries, including OECD members, which took part in TIMSS at each grade and their results compared to Scotland's are shown in the tables in Annex B.

Average scores

Maths

Scotland's average score in **P5 maths** in 2007 was 494. Eleven OECD countries including England scored higher than Scotland, two OECD countries scored similarly (New Zealand and the Slovak Republic), and two OECD countries scored below Scotland (Czech Republic and Norway).

Scotland's average score in **S2 maths** in 2007 was 487. Six OECD countries including England scored higher than Scotland, three OECD countries scored similarly (Australia, Sweden, Italy), and two OECD countries (Norway and Turkey) scored below Scotland.

Science

Scotland's average score in **P5 science** in 2007 was 500. Thirteen OECD countries scored including England scored above Scotland, one OECD country scored similarly (New Zealand) and one OECD country (Norway) scored below Scotland.

Scotland's average score in **S2 science** in 2007 was 496. Eight OECD countries including England scored above Scotland, one OECD country scored the same as Scotland (Italy) and two OECD countries scored below (Norway and Turkey).

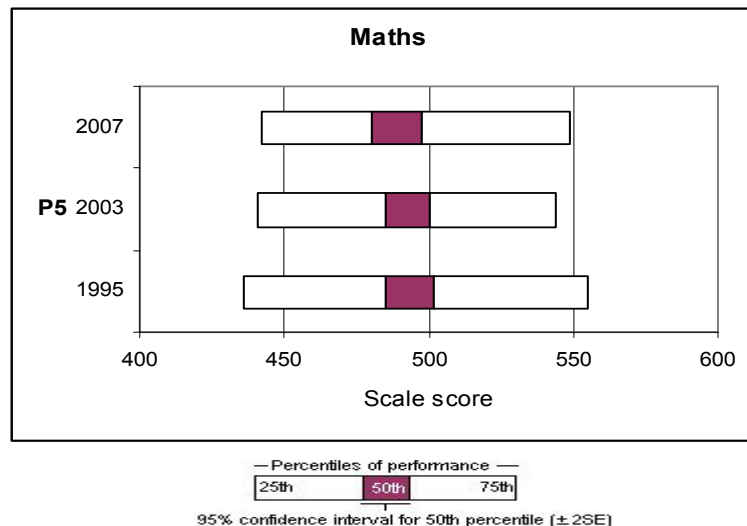
The attainment distribution

The gap in scores between the lowest performers (25th percentile – bottom quartile) and highest performers (75th percentile - upper quartile) is used as a measure of educational equity.

Maths

The gap between the lowest and highest performers in **P5 maths** has narrowed since 1995 due to an increase in the score of low performers but also a decrease in the score of high performers (see chart 1).

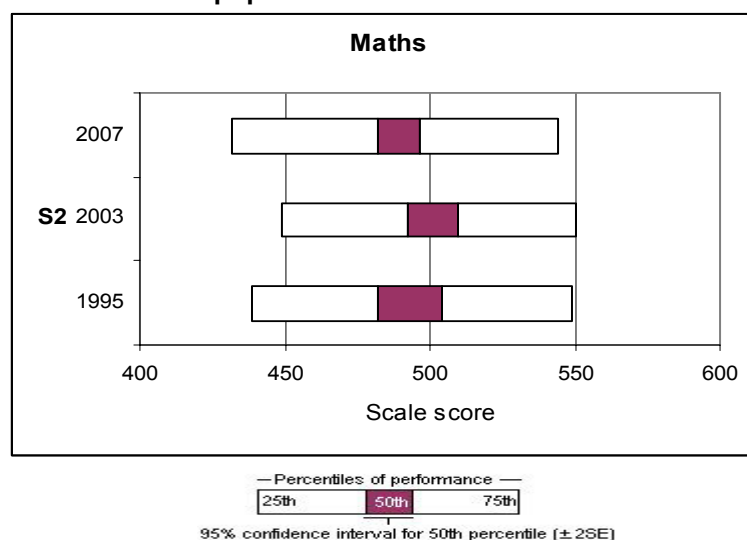
Chart 1 Scottish pupils' attainment distribution in P5 maths



Of the 15 other OECD countries that took part in TIMSS 2007 at grade 4, 10 countries had a narrower gap than Scotland between their highest and lowest performers in 2007.

After narrowing between 1995 and 2003, the gap between the lowest and highest performers in **S2 maths** increased over the four years to 2007 returning to a similar level to 1995 (chart 2).

Chart 2 Scottish pupils' attainment distribution in S2 maths

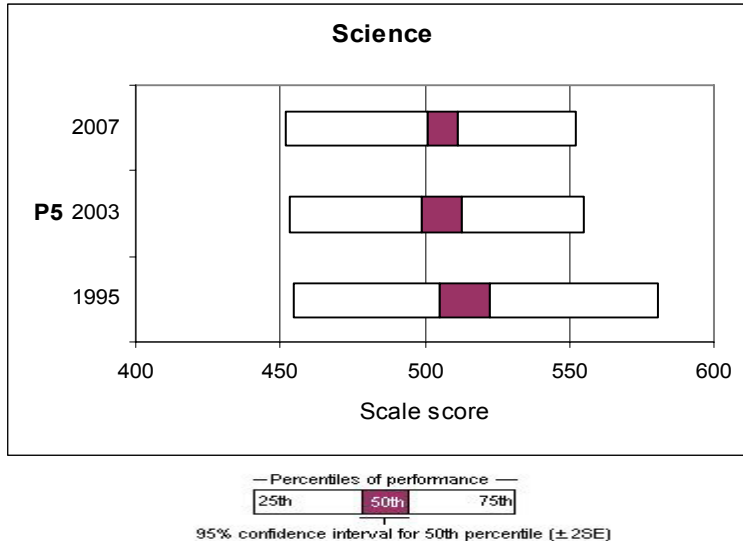


Of the 11 other OECD countries that took part in TIMSS 2007 at grade 8, six countries had a narrower gap than Scotland between their highest and lowest performers.

Science

The attainment distribution between the lowest and highest performers in **P5 science** has narrowed between 1995 and 2007. However, this is due to a decrease in scores of the middle and higher performing learners rather than any increase at the bottom of the range.

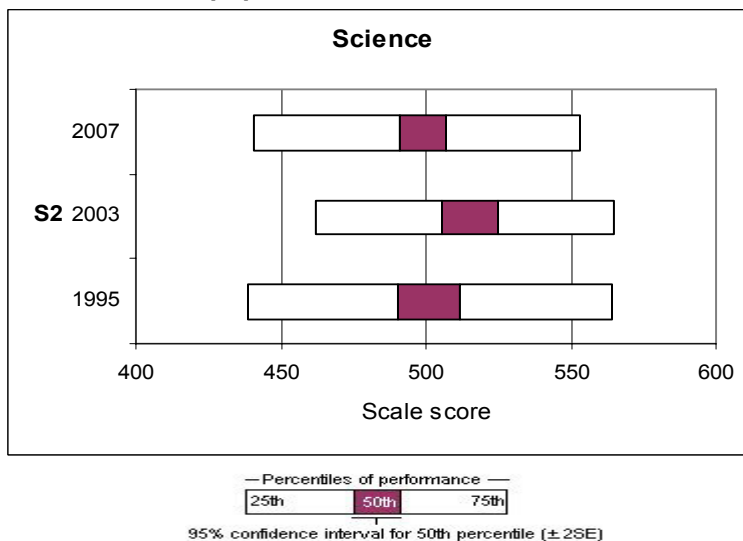
Chart 3 Scottish pupils' attainment distribution in P5 science



Of the 15 other OECD countries that took part in TIMSS 2007 at grade 4, only three countries had a narrower gap between their top and low performers in grade 4 science.

There has been a narrowing of the attainment distribution in **S2 science** between 1995 and 2007, although this has come largely at the expense of Scotland's highest performers. Chart 4 also shows that the gain in performance at the lower end of the distribution between 1995 and 2003 was lost over the 4 years to 2007.

Chart 4 Scottish pupils' attainment distribution in S2 science



Of the 11 other OECD countries that took part in TIMSS 2007 at grade 8, eight countries had a narrower gap than Scotland between their highest and lowest performers.

Overall trends in maths and science attainment since 1995³

Maths

*Scotland's average score of 494 in **P5 maths** in 2007 remains similar to its score in both 1995 and 2003.*

Similar to Scotland, two other OECD countries' (Japan and Norway) grade 4 maths scores remain unchanged compared to 1995. Four OECD countries have increased their scores (England, United States, Australia and New Zealand), whilst four OECD countries saw their scores decline (Netherlands, Hungary, Austria and the Czech Republic).

*Scotland's average score in **S2 maths** has fallen by 10 points since 2003 (to 487) returning to a level similar to 1995.*

Whilst three OECD countries have increased their grade 8 maths scores compared to 1995 (Republic of Korea, England and the United States) and six OECD countries saw theirs decline, Scotland was the only country whose score stayed the same.

Science

*Scotland's average score of 500 in **P5 science** is similar to its score in 2003, but is 14 points lower than in 1995*

Similar to Scotland, four other OECD countries (Japan, Austria, the Czech Republic and Norway) have seen their performance in grade 4 (P5) science decline compared to 1995. Norway experienced the biggest drop (27 points), followed by the Czech Republic (17 points), Scotland (14 points), Austria (12 points) and Japan (5 points).

Two OECD countries have increased their scores (England by 14 points, Hungary by 28 points) and four OECD countries scores have not changed (United States, Australia, Netherlands and New Zealand) compared to 1995.

³ 11 OECD countries took part in the TIMSS assessment at 4th grade in 1995 and 2007, whilst 10 countries took part in the assessment at 8th grade in 1995 and 2007.

*Scotland's average score in **S2 science** has declined by 16 points since 2003 (to 496) returning to a similar level to 1995*

Asides from Scotland, there were five other OECD countries whose performance in grade 8 science remained similar comparing scores in 1995 and 2007.

Only one OECD country managed to improve its performance; the Republic of Korea. Three OECD countries experienced a decline in performance (the Czech Republic, Norway and Sweden) compared to 1995.

Maths and science in focus - Scotland's performance across topic areas and by gender

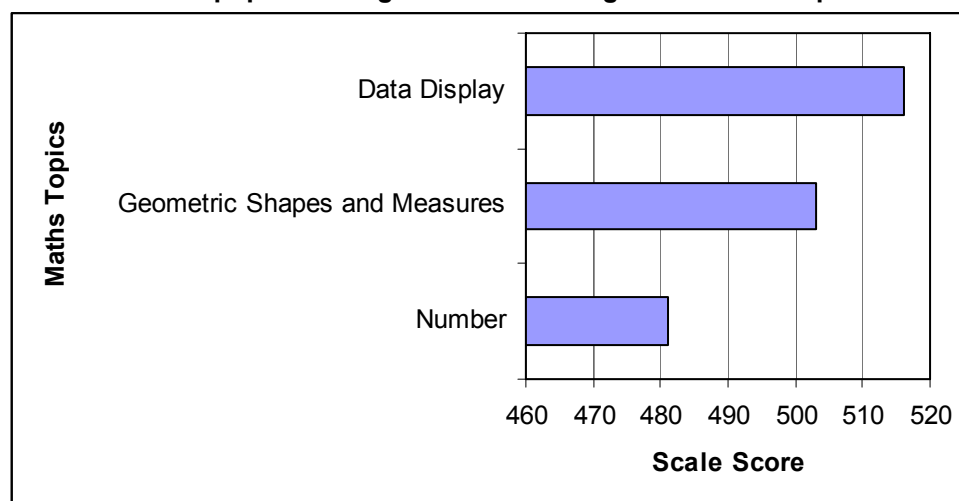
The TIMSS maths and science content (topic areas) and cognitive domains are outlined in Annex A.

Subject area

Maths

Scotland's **P5 pupils** perform below the TIMSS scale average of 500 (see page 2) in number (481), similar to the average in the content domain of geometric shapes and measures (503) and higher in data display (516) (see chart 5). In the maths cognitive domains, Scotland's **P5 pupils** perform similar to the TIMSS scale average in knowing (500) and reasoning (497), but in applying they perform below average (489).

Chart 5 Scottish pupils' average scores across grade 4 maths topics

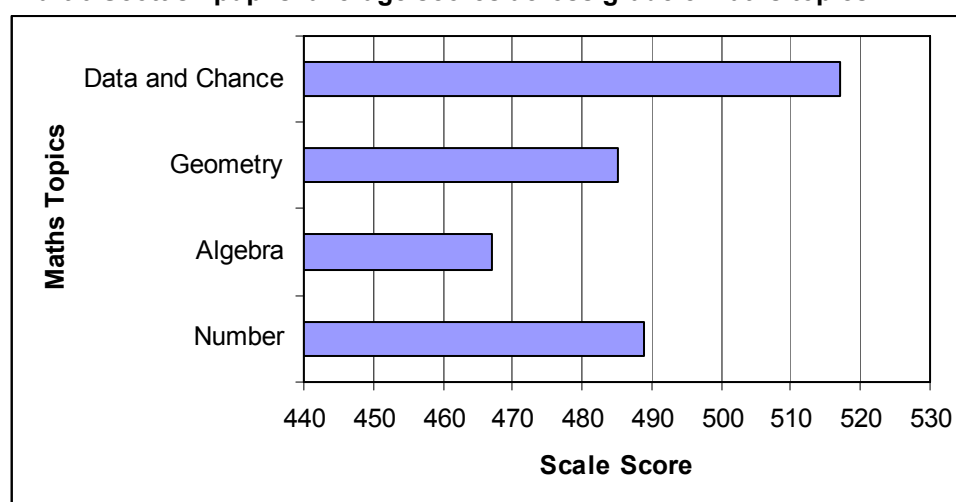


56 per cent of the time in maths classes in **P5** in Scotland is spent on number, a higher percentage than the international average (50%), yet this is the content area in which Scotland performs the lowest.

Scotland's **S2 pupils** perform below the TIMSS scale average across 3 of the 4 content domain areas of number (489), algebra (467) and geometry (485),

Scotland's performance in algebra being the poorest of the three areas (see chart 6). However, our **S2 pupils** score considerably above the TIMSS scale average in data and chance (517), continuing the trend from primary school in data display. In the cognitive domains, Scotland's **S2 pupils** perform below average in knowing (489) and applying (481) and similar to the TIMSS scale average in reasoning (495).

Chart 6 Scottish pupils' average scores across grade 8 maths topics

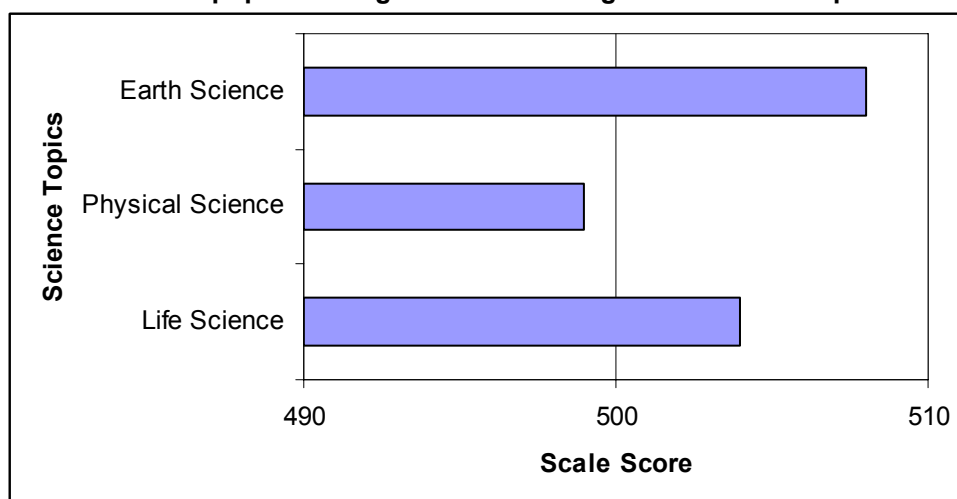


In maths classes at **S2**, 36 per cent of time is spent on number, higher than the international average of 24 per cent, and an area in which Scotland's performance is weak. 24 per cent of time is spent on algebra, lower than the international average of 29 per cent, the area in which our performance is the weakest. Similarly, 22 per cent of maths class time is spent on geometry, again lower than the international average of 27 per cent. In the area in which we score higher than the TIMSS scale average – data and chance – Scotland's spends a similar amount of teaching time than other countries.

Science

Scotland's **P5 pupils** perform in line with the TIMSS scale average of 500 in life science (504) and physical science (499), and above average in earth science (508) (see chart 7). Scotland performs below the TIMSS scale average in knowing (494), higher in applying (511) and similar to the average in reasoning (501).

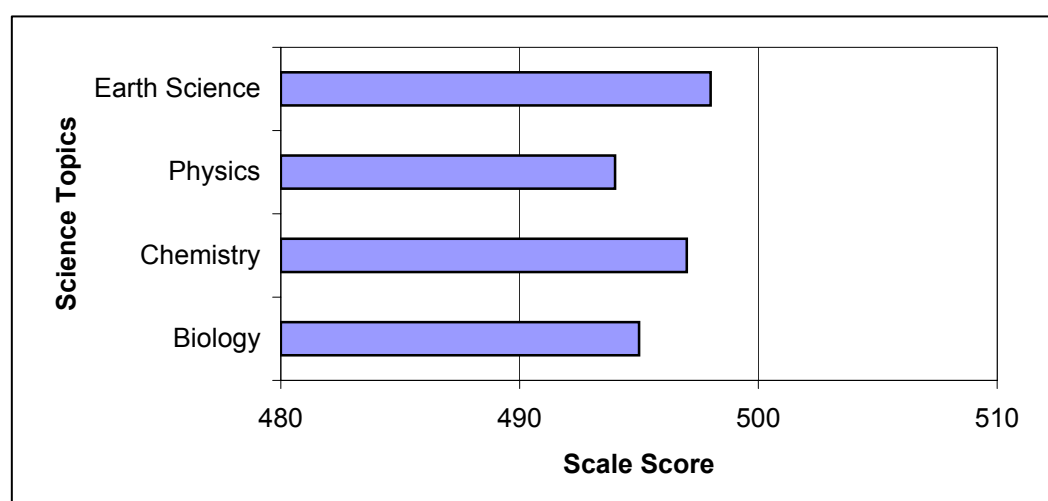
Chart 7 Scottish pupils' average scores across grade 4 science topics



In **P5** science classes, Scotland's pupils spend a similar amount of time on life science (41 per cent) and earth science (26 per cent) as the international average. A slightly higher amount of time is spent on physical science (29 per cent) compared to the international average and a lower amount of time spent on other science (4 per cent).

Scotland's **S2 pupils** perform in line with the TIMSS scale average across the four content domains of biology (495), chemistry (497), physics (494) and earth science (498). In the cognitive domains, Scotland's **S2 pupils** perform similar to the TIMSS scale average in knowing (498), below the average in applying (480) and above the average in reasoning (511).

Chart 8 Scottish pupils' average scores across grade 8 science topics



In science classes at **S2**, Scotland's pupils spend a higher amount of time on chemistry (30 per cent), physics (31 per cent) and biology (32 per cent) than the international average. Scotland's **S2 pupils** spend a considerably lower amount of time on earth science (6 per cent) and 'other' science (1 per cent) than the international average.

Gender

Maths

Boys in Scotland scored significantly higher than girls in **P5 maths** (nine points higher) in 2007, but scored similarly in **S2 maths**.

Mirroring the overall results for Scotland, there has been little change in girls' and boys' **P5 maths** scores compared to 1995. However, girls' **S2 maths** scores have declined significantly since 2003 (down by 14 points to 486) although they remain the same as in 1995. In other words, the improvement gained by S2 girls in maths scores between 1995 and 2003 was lost by 2007.

Science

There were no differences between boys and girls science scores in Scotland at either P5 or S2 in 2007. Both boys' and girls' **P5 science** scores have declined significantly (by 15 points and 12 points respectively), compared to 1995.

Girls' **S2 science** scores increased between 1995 and 2003 but declined by 13 points over the four years to 2007 to return to a level similar to that in 1995. In comparison, boys' **S2 science** scores were stable between 1995 and 2003 but declined over the four years to 2007 to leave them 16 points lower than in 1995.

Learning and teaching in the international context

What do Scottish pupils think about maths?

Chart 9 illustrates Scottish pupils' attitudes towards maths in P5 and S2 and their confidence in learning maths.⁴

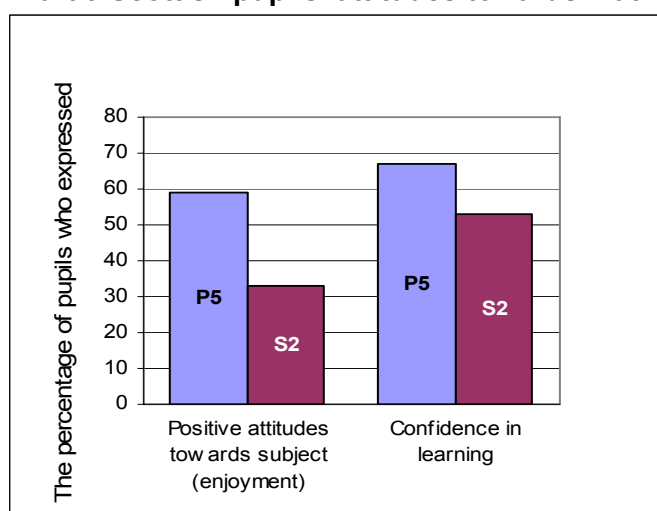
A relatively high proportion of Scottish **P5 pupils** (67%) are confident in learning maths compared to pupils from other OECD countries (only four OECD countries scored higher). However, pupil enjoyment of **P5 maths** is relatively lower (59%), with 10 OECD countries scoring higher than Scotland and only two OECD countries scoring lower.

⁴ The Index of Students' Positive Affect towards maths is based on students' responses to three statements about maths: 1) I enjoy learning maths; 2) Maths is boring (Reversed); 3) I like maths. Average is computed across the three items based on a 4-point scale: 1. Agree a lot; 2. Agree a little; 3. Disagree a little; 4. Disagree a lot. Students agreeing a lot or a little on average across the three statements are assigned to the high level. Students disagreeing a little or a lot on average across the three statements are assigned to the low level. All other students are assigned to the middle level.

The Index of Student's Self Confidence in Learning Maths is based on students' responses to four statements about maths: 1) I usually do well in maths; 2) Maths is harder for me than for many of my classmates (Reversed); 3) I am just not good at maths (Reversed); 4) I learn things quickly in maths. Average is computed across the four items based on a 4-point scale: 1. Agree a lot; 2. Agree a little; 3. Disagree a little; 4. Disagree a lot. Students agreeing a little or a lot on average across the four statements are assigned to the high level. Students disagreeing a little or a lot on average are assigned to the low level. All other students are assigned to the middle level.

Again, repeating the pattern at primary level, a relatively high proportion of **S2 pupils** express a high level of confidence in learning maths (53%). Alongside the United States and England, this is one of the highest figures of the OECD countries. However, the proportion of **S2 pupils** who reported enjoying maths is much lower (33%), and also lower than six OECD countries. It can also be seen from chart 9 that both confidence and enjoyment of maths are higher at P5 than S2.

Chart 9 Scottish pupils' attitudes towards maths



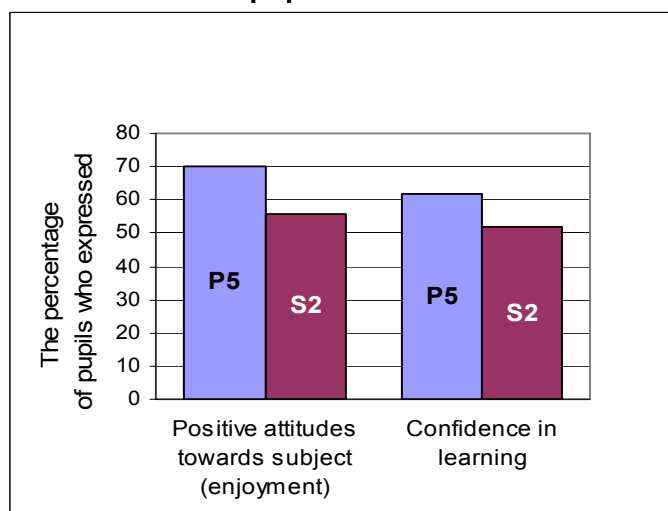
What do Scottish pupils think about science?

Chart 10 illustrates Scottish pupils' attitudes towards science in P5 and S2 (based on similar indices as above).

70% of Scottish **P5 pupils** reported enjoying science, although this was lower than nine other OECD countries.

Similarly, 62% of Scottish **P5 pupils** expressed a high level of confidence in learning science. Although this is higher than the international average (61%), Scotland's figure is lower than 10 other OECD countries.

Chart 10 Scottish pupils' attitudes towards science



Over half (56%) of Scottish **S2 pupils** reported enjoying science, similar to a number of other OECD countries. Over half (52%) of **S2 pupils** also expressed a high level of confidence in learning science. Again, S2 pupils' enjoyment of and confidence in learning science are lower than in P5.

Teaching and assessment in the maths classroom

At **P5**, nine out of ten (91%) pupils have teachers who feel 'very well' prepared to teach maths (data from teacher questionnaires). No country scored higher than Scotland, although a number of OECD countries scored similarly including England, Denmark and United States.

Similarly, there are few perceived limitations on maths teaching in Scotland due to student factors.⁵ Six out of ten (60%) teachers reported 'few or no limitations'. Scotland's score is similar to a number of other OECD countries and higher than the international average (45%).

In terms of teaching methods, 72% of **P5 pupils** in Scotland are taught with a maths textbook as the primary method of instruction (above the international average of 65%), whilst 28% are taught with textbook as a supplementary resource (lower than the international average of 30%). There has been no significant change in these teaching methods since 2003. Computer availability in P5 maths classes at 93% is relatively high, and represents a 12 percentage point increase in Scotland since 2003.

In terms of emphasis on maths homework, around nine out of ten (87%) **P5 pupils** have teachers who place a low emphasis on maths homework (data from teacher questionnaires). In comparison to other OECD countries, the Netherlands has a higher figure (97%), New Zealand has a similar figure (84%), whilst the Czech Republic (82%) and England are slightly lower (80%).⁶

Scotland's low emphasis on maths homework by teachers ties in with figures on frequency of homework and time spent on homework (data from pupil questionnaires). Two thirds (67%) of **P5 pupils** in Scotland reported a low level of maths homework. In comparison to other OECD countries, Scotland's figure is second only to the Netherlands (89%) and similar to England (66%).⁷

⁵ Index based on teachers' responses to five statements about student factors limiting mathematics instruction: 1) Students with different academic abilities; 2) Students who come from a wide range of backgrounds; 3) Students with special needs; 4) Uninterested students; and 5) Disruptive students. Average is computed across the five statements based on a 4-point scale: 1. Not at all/Not applicable; 2. A little; 3. Some; and 4. A lot. High level indicates average is less than or equal to 2. Medium level indicates average is greater than 2 and less than 3. Low level indicates average is greater than or equal to 3.

⁶ Index based on teachers' responses to two questions about how often they usually assign mathematics homework and how many minutes of homework they usually assign. A low emphasis on mathematics homework is defined as no assignment or the assignment of less than 30 minutes of homework about half the lessons or less.

⁷ Index based on students' reports on the frequency of mathematics homework they are given and the amount of time they spend on that homework. A low level indicates mathematics homework assigned no more than twice a week and students spend no more than 30 minutes on that homework.

At **S2 level**, almost all (96%) pupils have teachers who feel 'very well' prepared to teach maths (data from teacher questionnaires). Alongside England, Scotland is one of the highest scoring countries in this respect.

There are few perceived limitations on maths teaching at S2 due to student factors. Seven out of ten teachers in Scotland reported 'few or no limitations', Scotland being the highest scoring country in this respect, alongside England.

In terms of teaching methods, 72% of **S2 pupils** are taught with a maths textbook as the primary method of instruction, unchanged since 2003, but above the international average of 60%. 27% of S2 pupils are taught with a textbook as a supplementary resource. Computer availability within maths classes at S2 is 37%, higher than the international average, but representing no change since 2003.

In terms of emphasis on maths homework at S2, just over half (55%) of pupils have teachers who place a low emphasis on homework (data from teacher questionnaires). In comparison to other OECD countries, Scotland's figure is lower than the Czech Republic, and similar to England, Japan, Sweden and the Republic of Korea, but higher than other OECD countries and the international average (36%).

Similarly, around half (51%) of **S2 pupils** report a low level of maths homework assignment and time doing that homework. This was higher than some other OECD countries and the international average (put % in). However, an even higher proportion of pupils in England (65%), Sweden (62%), the Republic of Korea (62%) and Japan (57%) reported this to be the case.

In terms of assessment, two thirds (66%) of **S2 pupils** have teachers who place a major emphasis on classroom tests in maths, no different to the international average, whilst just under half (47%) of pupils have teachers who place a major emphasis on the teacher's own professional judgement, again no different to the international average. 17% of pupils have teachers who place a major emphasis on national or regional tests, below the international average of 27%.

Teaching and assessment in the science classroom

At **P5**, around half (51%) of pupils have teachers who feel 'very well' prepared to teach science. This is similar to the international average, although six OECD countries scored higher than Scotland.

There are few perceived limitations on science teaching at P5 due to student factors: 76% of teachers report 'few or no limitations', one of the highest scores alongside 7 other OECD countries

In terms of textbook usage, 5% of Scottish **P5 pupils** are taught with a science textbook as the primary basis, well below the international average of

52%. This represents a 34 percentage point decrease since 2003, the biggest change across OECD countries.

In terms of science homework, almost all (95%) **P5 pupils** have teachers who place a low emphasis on science homework. This figure is one of the highest figures alongside six other OECD countries (Denmark, Australia, Austria, New Zealand, Norway and the Czech Republic) and is higher than the international average (65%) and other OECD countries, including England (88%).

This figure ties in with nine out of ten (89%) **P5 pupils** in Scotland having a low frequency of science homework and time spent on that homework. Alongside the Netherlands, Scotland has the highest percentage of pupils which are set a low level of science homework, above England (83%), other OECD comparators and the international average (57%).

At **S2** two-thirds (68%) of pupils have teachers who feel 'very well' prepared to teach science. This is similar to the international average, although six OECD countries scored higher.

At S2 level, there are few perceived limitations on science teaching due to student factors: 45% of Scottish teachers report 'few or no limitations', similar to 6 OECD countries and considerably above the international average (37%).

In terms of emphasis on science homework by teachers at S2 level, a similar pattern to P5 is apparent. A high proportion (86%) of pupils have teachers who place a low emphasis on science homework (data from teacher questionnaires). Compared to other countries, including OECD members, Scotland is second only to the Czech Republic and considerably higher than England (60%).

Similarly, three out of four (76%) of S2 pupils report a low level of science homework assignment and time spent doing that homework. In terms of comparisons to other OECD countries, Scotland is second only to Japan in this respect, and similar to the Republic of Korea, and considerably above a number of OECD countries including England (62%).

One in five (22%) S2 pupils are taught with a science textbook as the primary basis, which is considerably below the international average (53%). 68% are taught with a textbook as a supplementary resource which is higher than the international average (40%).

In terms of emphasis on sources to monitor pupils' progress in science at S2 level, 85% of pupils have teachers who place a major emphasis on classroom tests (higher than the international average of 62%). 39% of pupils have teachers who place a major emphasis on teacher's own professional judgement, below the international average of 45%, whilst 9% of pupils have teachers who place a major emphasis on national or regional tests, considerably lower than the international average of 27%.

Annex A The TIMSS Assessment Framework and Methods

The assessments framework and questions used in TIMSS are developed by an international panel of mathematics and science education and assessment experts and approved by all participating countries. In addition, participants needed to meet stringent criteria (including rigorous sampling requirements, quality controlled survey procedures, multiple marking of tests, and rigorous data-cleaning) to ensure that the results are comparable between countries. Assessments include both maths and science questions.

The framework and assessment for TIMSS 2007 is organised around two dimensions, a content dimension specifying the domains or subject matter to be assessed and a cognitive dimension specifying the domains or thinking processes to be assessed, namely knowing, applying, and reasoning. The content domains differ for the fourth and eighth grades, reflecting the nature and difficulty of maths and science widely taught at each grade. Table A.1 below shows the target percentages of testing time devoted to each subject area and cognitive domains in maths and science at grade 4 and grade 8.

Table A.1 Percentages of assessment time devoted to subject areas and cognitive domains in maths and science at grade 4 and grade 8

Maths				Science			
Grade 4		Grade 8		Grade 4		Grade 8	
Subject		Subject		Subject		Subject	
Number	50%	Number	30%	Life Science	45%	Biology	35%
Geometric Shapes and Measures	35%	Algebra	30%	Physical Science	35%	Physics	25%
Data Display	15%	Geometry	20%	Earth Science	20%	Chemistry	20%
		Data and chance	20%			Earth Science	20%
Cognitive		Cognitive					
Knowing	40%	Knowing	35%	Knowing	40%	Knowing	30%
Applying	40%	Applying	40%	Applying	35%	Applying	35%
Reasoning	20%	Reasoning	25%	Reasoning	25%	Reasoning	35%

Further detail on the TIMSS assessment framework can be found on the TIMSS website <http://timss.bc.edu/index.html>.

TIMSS also collects background information from pupils, teachers and Headteachers that can be examined to assess the effects of school, class and teacher level influences on performance in maths and science. High response rates (over 78%) were achieved for the pupil, teacher and Headteacher questionnaires.

Annex B Overview of TIMSS 2007 Results

This Annex provides an overview of Scotland's TIMSS 2007 results compared to all countries that took part in TIMSS.

Comparisons are based on statistical significance, i.e. differences are only reported where we can be confident at the 95% level that differences are real, rather than due to chance in sampling.

Table B.1 Comparison of Scotland's average score in grade 4 (P5) maths

Significantly higher mean score than Scotland	Mean score not significantly different from Scotland	Significantly lower mean score than Scotland
19 countries (in order): Hong Kong SAR Singapore Chinese Taipei Japan Kazakhstan Russian Federation England Latvia Netherlands Lithuania United States Germany Denmark Australia Hungary Italy Austria Sweden Slovenia And 6 benchmarking participants: Massachusetts, US Minnesota, US Quebec, Canada Alberta, Canada British Columbia, Canada	3 countries: Armenia Slovak Republic New Zealand	13 countries including: Czech Republic Norway Ukraine Georgia Iran, Islamic Republic of Algeria Colombia Morocco El Salvador Tunisia Kuwait Qatar Yemen

Note: The word 'significantly' refers to statistical significance.
The shaded countries are OECD members.

Table B.2 Comparison of Scotland's average score in grade 8 (S2) maths

Significantly higher mean score than Scotland	Mean score not significantly different from Scotland	Significantly lower mean score than Scotland
<p>13 countries:</p> <p>Chinese Taipei</p> <p>Korea, Republic of</p> <p>Singapore</p> <p>Hong Kong SAR</p> <p>Japan</p> <p>Hungary</p> <p>England</p> <p>Russian Federation</p> <p>United States</p> <p>Lithuania</p> <p>Czech Republic</p> <p>Slovenia</p> <p>Armenia</p> <p>And 7 benchmarking participants:</p> <p>Massachusetts, US</p> <p>Minnesota, US</p> <p>Quebec, Canada</p> <p>Alberta, Canada</p> <p>British Columbia, Canada</p> <p>Basque Country, Spain</p>	<p>5 countries:</p> <p>Australia</p> <p>Sweden</p> <p>Malta</p> <p>Serbia</p> <p>Italy</p>	<p>30 countries including:</p> <p>Malaysia</p> <p>Norway</p> <p>Cyprus</p> <p>Bulgaria</p> <p>Israel</p> <p>Ukraine</p> <p>Romania</p> <p>Bosnia and Herzegovina</p> <p>Lebanon</p> <p>Thailand</p> <p>Turkey</p> <p>Jordan</p> <p>Tunisia</p> <p>Georgia</p> <p>Iran, Islamic Republic of</p> <p>Bahrain</p> <p>Indonesia</p> <p>Syrian Arab Republic</p> <p>Egypt</p> <p>Algeria</p> <p>Colombia</p> <p>Oman</p> <p>Palestinian National Authority</p> <p>Botswana</p> <p>Kuwait</p> <p>El Salvador</p> <p>Saudi Arabia</p> <p>Ghana</p> <p>Qatar</p> <p>Morocco</p> <p>And one benchmarking participant: Dubai, UAE</p>

Note: The word 'significantly' refers to statistical significance.
The shaded countries are OECD members.

Table B.3 Comparison of Scotland's average score in P5 science

Significantly higher mean score than Scotland	Mean score not significantly different from Scotland	Significantly lower mean score than Scotland (selected countries)
21 countries: Singapore Chinese Taipei Hong Kong SAR Japan Russian Federation Latvia England United States Hungary Italy Kazakstan Germany Australia Slovak Republic Austria Sweden Netherlands Slovenia Denmark Czech Republic Lithuania And 6 benchmarking participants: Massachusetts, US Minnesota, US Quebec, Canada Alberta, Canada British Columbia, Canada	1 country: New Zealand	13 countries: Armenia Norway Ukraine Iran Georgia Colombia El Salvador Algeria Kuwait Tunisia Morocco Qatar Yemen

Note: The word 'significantly' refers to statistical significance.
 The shaded countries are OECD members.

Table B.4 Comparison of Scotland's average score in S2 science

Significantly higher mean score than Scotland (all countries)	Mean score not significantly different from Scotland	Significantly lower mean score than Scotland (selected countries)
14 countries Singapore Chinese Taipei Japan Korea, Republic of England Hungary Czech Republic Slovenia Hong Kong SAR Russian Federation United States Lithuania Australia Sweden	2 countries: Italy Armenia 2 benchmarking participants: Basque Country, Spain Dubai, UAE	32 countries including: Norway Ukraine Jordan Malaysia Thailand Serbia Bulgaria Israel Bahrain Bosnia and Herzegovina Romania Iran, Islamic Republic of Malta Turkey Syrian Arab Republic Cyprus Tunisia Indonesia Oman Georgia Kuwait Colombia Lebanon Egypt Algeria Palestinian National Authority Saudi Arabia El Salvador Botswana Qatar Ghana Morocco 1 benchmarking participant: Dubai, UAE

Note: The word 'significantly' refers to statistical significance.
The shaded countries are OECD members.

How will the results of TIMSS be used?

Combined with other national and international studies of pupil achievement, these results will help to inform and monitor developments in the curriculum and improving learning and teaching in maths and science in Scotland. Benchmarking Scotland's performance internationally is also important. Comparing Scotland's education system and performance with other countries gives us an insight into our strengths and weaknesses in an international context. This helps us to identify areas where we need to focus our resources and acknowledge and celebrate our successes, as well as improve our performance.

Want to know more?

TIMSS

For more information about the TIMSS 2007 results in Scotland, please contact Jackie Horne (tel: 0131-244-0740; e-mail: jackie.horne@scotland.gsi.gov.uk).

For more information about the TIMSS 2007 International Report please go to the International Study Centre website: <http://timss.bc.edu/>

Other international studies

If you would like to learn more about international studies, that include Scotland, please visit, <http://www.scotland.gov.uk/Topics/Education/Schools/Excellence/benchmarking> and <http://www.ltscotland.org.uk/assess/of/internationalstudies.asp>

The Scottish Survey of Achievement

The Scottish Survey of Achievement (SSA) uses a sample survey to find out how well pupils are learning in Scotland as a whole. The information is used to help plan for improvement to support quality learning and teaching. For more information about the SSA and results, please visit Learning and Teaching Scotland's assessment website, www.ltscotland.org.uk/assess/of/ssa

HMIE

HM Inspectors of Education (HMIE) promote sustainable improvements in standards, quality and achievements for all learners in Scottish education through independent evaluation. If you would like information about inspections of Scottish schools, or are interested in knowing more about good practice in Scottish education please visit, www.hmie.gov.uk

Your child's progress and achievements

If you would like to know more about how your own child is progressing, or you have concerns about their learning, you should get in touch with the school and talk to your child's teachers.

ISSN 0950 2254
ISBN 978 0 7559 7345 3
(Web only publication)

www.scotland.gov.uk/socialresearch

RR Donnelley B58732 12-08

