



# Science achievement: primary schooling

The mean science achievement of New Zealand Year 5 students was about the same in 2006 as in 1994. Although results from 1994, 1998, and 2002, showed a steady increase, this trend did not continue in 2006 when the results returned to the 1994 levels.

## Indicator Description

Science scores for Year 5 students.

This indicator draws on the Trends in International Mathematics and Science Study (TIMSS) assessments that included questions on the classification of living things, human health, uses of water, rusting, common energy sources, light, the weather, and changes in the environment.

## Why This Is Important

Science is a major influence on many aspects of children's daily lives at play, at school and at home. Science education involves developing skills and knowledge to investigate the living, physical, material, and technological components of the environment and to make sense of them in logical and creative ways.

### New Zealand Year 5 students' science score percentiles in TIMSS (1994 to 2006)

Percentile	Description	1994 Score	1998 Score	2002 Score	2006 Score
95th percentile	Top 5% scored above this level	659	668	647	643
75th percentile	Top 25% scored above this level	576	582	579	568
25th percentile	Bottom 25% scored below this level	448	454	473	447
5th percentile	Bottom 5% scored below this level	310	336	378	344

Note: Data for the small proportion of students assessed in Māori in 2002 (~2%) are excluded from this table to ensure comparability with data reported for 1994, 1998 and 2006.

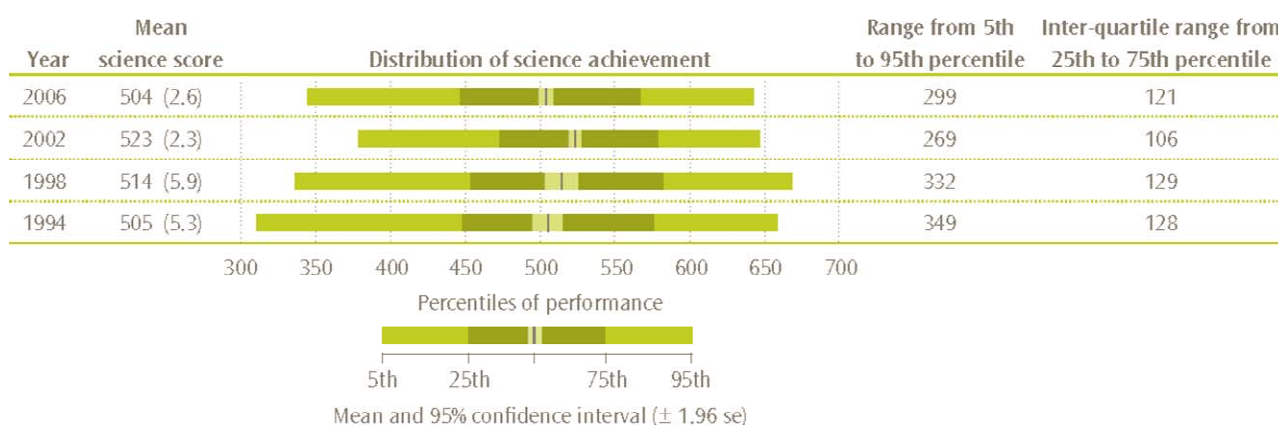
### How We Are Going

There was a significant improvement in New Zealand Year 5 students' science performance over the period 1994 to 2002 but in 2006 this dropped back to 1994 levels. In 2006, the mean performance for New Zealand Year 5 students (504) was statistically similar to the TIMSS Scale Average (500).

The spread of scores, from the 5th to the 95th percentiles, reduced between 1994 and 2006. Most of this reduction results from an improvement in the scores of the lowest performing students, with the 5th percentile increasing from 310 to 344.

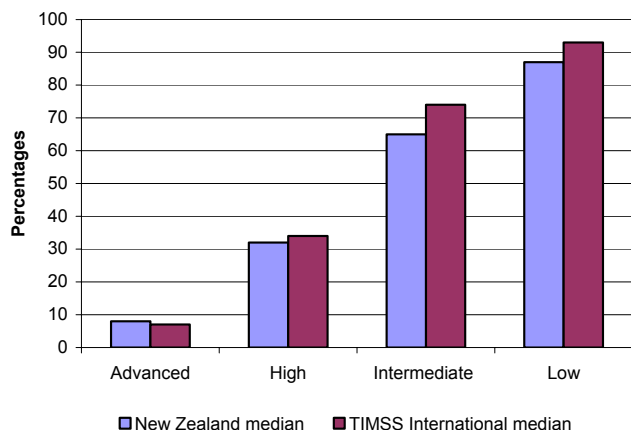
The international science benchmarks are four points on the science scale; the advanced benchmark (625), the high benchmark (550), the intermediate benchmark (475), and the low benchmark (400). The performance of students reaching each benchmark is described in relation to the types of questions they answered correctly. Note that the proportion shown for the low benchmark also includes students who performed at the advanced, high, and intermediate benchmarks. This is because, by definition, students who could do the more complex questions associated with, for example, the high benchmark, would also be able to complete the easier questions associated with the intermediate and low benchmarks.

### Distribution of New Zealand Year 5 science achievement in TIMSS from 1994 to 2006



Note: For trend purposes, only students tested in English are included in the results for 2002. Standard errors are presented in parentheses.

**Percentage of New Zealand Year 5 students reaching the TIMSS science benchmarks (2006)**



Eight percent of students reached the advanced benchmark in 2006, which was significantly fewer than in 1998 and 1994. While the proportion of students reaching the advanced benchmark peaked in 1998 (12%), the proportion of students reaching the high, intermediate and low benchmarks peaked in 2002 (39%, 74%, and 92% respectively). Thirteen percent of New Zealand Year 5 students did not reach the lowest TIMSS benchmark. In terms of the benchmark definitions, these were students who did not demonstrate some elementary knowledge of life science and physical science.

New Zealand Year 5 students' mean performance in science was significantly higher than 13 of the 36 countries that also tested at Year 5 level but was significantly lower than 21 countries including Singapore, England, the United States, and Australia. New Zealand's mean science achievement was not significantly different from that of students in Scotland.

The TIMSS science content area scores were calculated separately from the overall science score. These consisted of 3 areas: Life Science, Physical Science and Earth Science<sup>1</sup>. New Zealand Year 5 students achieved significantly above the TIMSS Scale Average in Life Science and Earth Science and statistically similar to the TIMSS Scale Average in Physical Science.

The mean achievement of Year 5 girls and boys was about the same in 2006 as in 1994. As was the case in the previous assessments, there was no significant difference between Year 5 girls' and boys' mean performance. In terms of content area scores in TIMSS 2006, boys scored significantly higher than girls in Earth Science while girls scored significantly higher than boys in Life Science.

**New Zealand Year 5 students' mean science scores in TIMSS, by gender (1994 to 2006)**

Year	Mean (Standard Error)		
	Girls	Boys	Overall
1994	511 (4.8)	499 (7.0)	505 (5.3)
1998	511 (5.9)	518 (6.6)	514 (5.9)
2002	526 (3.2)	521 (2.3)	523 (2.3)
2006	506 (2.8)	502 (3.5)	504 (2.6)

*Note: Data for the small proportion of students assessed in Māori in 2002 (~2%) are excluded from this table to ensure comparability with data reported for 1994, 1998 and 2006.*

<sup>1</sup> The TIMSS domains were similar to the Science in New Zealand Curriculum strands in terms of content, with Material World and Physical World combined similar to the physical science domain, Living World similar to the life science domain, and Planet Earth and Beyond similar to the earth science domain.

### New Zealand Year 5 students' mean science scores in TIMSS by ethnic group (1994 to 2006)

Year	Mean (Standard Error)					Overall
	European/ Pākehā	Māori	Pasifika	Asian	Other	
1994	534 (3.9)	457 (12.0)	441 (14.9)	493 (16.7)	521 (14.2)	505 (5.3)
1998	541 (4.8)	478 (8.0)	436 (13.8)	517 (10.0)	497 (23.0)	514 (5.9)
2002	532 (3.0)	496 (5.2)	496 (5.2)	529 (4.2)	536 (9.9)	523 (2.3)
2006	528 (2.3)	459 (4.9)	431 (5.4)	529 (6.8)	502 (6.7)	504 (2.6)

Note: Data for the small proportion of students assessed in Māori in 2002 (~2%) are excluded from this table to ensure comparability with data reported for 1994, 1998 and 2006.

In terms of ethnic group, European/Pākehā, Māori, and Pasifika students all demonstrated little change between 1994 and 2006. Students in the Other grouping had a drop in achievement between 2002 and 2006. Asian students had the same mean science achievement in 2006 as in 2002 and thus maintained the significant increase observed between 1994 and 2002.

#### Where To Find Out More

This indicator is closely linked to other national assessment programs for Science, as well as achievement indicators for primary school students, such as:

- Science achievement: middle schooling
- Science literacy achievement: senior secondary school
- Reading literacy achievement: primary schooling
- Mathematics achievement: primary schooling.

The Ministry of Education has established an Iterative Best Evidence Synthesis Programme to systematically identify, evaluate, analyse, synthesise and make accessible, relevant evidence linked to a range of learner outcomes. Evidence about what works for this indicator can be found in:

- Quality Teaching for Diverse Students in Schooling: Best Evidence Synthesis.

#### References

- Alton-Lee, A. (2003). *Quality Teaching for Diverse Students in Schooling: Best Evidence Synthesis*. Wellington: Ministry of Education.
- Caygill, R. (2008). *Trends in Year 5 science achievement 1994 to 2006: results from the Trends in International Mathematics and Science Study (TIMSS)*. Wellington: Ministry of Education.
- Martin, M.O., Mullis, I.V.S., & Foy, P. (2008). *TIMSS 2007 international science report: findings from IEA's Trends in International Mathematics and Science Study at the fourth and eighth grades*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.