MATHEMATICS LITERACY ACHIEVEMENT: SENIOR SECONDARY SCHOOLING

New Zealand continues to perform above the OECD average in mathematical literacy at the senior secondary level, but has declined markedly in mathematics performance in recent years.

Indicator Description

Mathematical literacy of 15-year-old students.

Why This Is Important

Mathematical literacy relates to the ability to formulate and solve mathematical problems in real life situations. This type of literacy provides a foundation for skills that are useful in professional contexts and, more generally, in daily life. This literacy influences attainment at senior secondary school.

Mathematical attainment at senior secondary level contributes to preparation for successful participation in tertiary education and the ability to contribute to, and participate in, a changing labour market and an increasingly knowledge-based society. Attainment level is also related to individual well being.
How We Are Going

The mathematics scores from the Programme for International Student Assessment (PISA) 2003, 2006, 2009 and 2012 study years can be summarised on a combined mathematical literacy scale. This enables a comparison to be made between the mathematics literacy achievements of 15-year-old students in each of these years. Because the mathematical literacy domain underwent considerable expansion and change between 2000 and 2003, mathematical outcomes from PISA 2003 onwards are not comparable with results from PISA 2000.

In 2012, 65 countries participated in PISA, including the 34 Organisation of Economic Co-operation and Development (OECD) member countries. New Zealand 15-year-old students performed above the OECD average in PISA 2012.

New Zealand’s average score was: significantly below 17 other countries (including 10 of the OECD nations); similar to 8 nations (all OECD members); and significantly above 39 countries (including 15 OECD members).

Between 2003 and 2012, New Zealand’s average 15-year-old student performance in mathematical literacy declined noticeably from 523 to 500 (23 points). Other countries that declined over the same period include Australia (20 points), Finland (26 points) and Sweden (31 points). Most of the New Zealand decline occurred between 2009 and 2012. A number of countries showed significant improvements over the 2003-2012 period including Hong Kong-China, Korea and Macao-China. Germany and Poland, which were lower scoring than New Zealand in 2003, are now performing higher than New Zealand because of the combined effect of increases in their mathematics performance and the recent drop in the mathematics performance of New Zealand students.

Fifteen percent of New Zealand 15-year-old students achieved at the top proficiency levels (Level 5 or above) in mathematical literacy compared to the OECD average in PISA 2012 of thirteen percent. Level 2 reflects the basic Level of mathematic literacy considered necessary to use mathematics effectively in real-life situations. Twenty three percent of New Zealand students did not reach Level 2 in 2012. The proportion of New Zealand students below Level 2 was the same as the OECD average.
Figure 1: PISA mathematics literacy mean scores for New Zealand OECD 2003, 2006, 2009 and 2012

Note:
1. Error bars on the graph provide a 95 percent confidence interval for the estimate of the average.
**Gender**

In PISA 2012, New Zealand 15-year-old boys achieved a mean mathematical literacy score 15 points higher than girls. This continued the trend of gender differences in mathematics performance from PISA 2003, 2006 and 2009. This relationship is the reverse to what is seen for PISA reading performance where girls achieve higher than boys on average.

*Figure 2: New Zealand PISA mathematics literacy mean scores by gender 2003, 2006, 2009 and 2012*

Note:
1. Error bars on the graph provide a 95 percent confidence interval for the estimate of the average.
Ethnicity

Māori and Pasifika students are priority students traditionally under-served by the education system, along with special education students, and those from low socio-economic areas. The Ministry of Education is dedicated to improving outcomes for these groups.

In 2012, the mean scores for 15-year-old Māori and Pasifika students were lower than both the OECD mean and the New Zealand mean. Over a third of Māori and Pasifika students were performing below Level 2 (compared to 23% for New Zealand and OECD). Five percent of Māori achieved at Level 5 or above, as did three percent of Pasifika.

Figure 3: New Zealand PISA mathematics literacy mean scores by ethnic group 2003, 2006, 2009 and 2012

Note:
1. Error bars on the graph provide a 95 percent confidence interval for the estimate of the average.
Socio-economic

Improving education outcomes for students from low socio-economic areas is another priority for the Ministry of Education.

In this indicator, socio-economic status is measured using the PISA index of economic, social and cultural status (ESCS). This index is created by asking the students about their parents’ occupation and education level, their access to educational resources like books and computers, and whether they had certain items in their household that are likely to be related to parental income e.g. dishwasher, pay television etc. New Zealand has an ESCS score that is similar to the OECD average.

The New Zealand students were split into quarters based on their ESCS index scores. The PISA mean mathematics score for those in the lowest quarter (lowest socio-economic group) in 2012 was well below the New Zealand mean and OECD mean scores. Scores had dropped in all socio-economic groups since 2003.
Where to Find Out More

To obtain information about other forms of student disengagement consider indicators:

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

- BES (Iterative Best Evidence Synthesis) Programme – What Works Evidence Hei Kete Raukura

References