



## Results of the Programme for International Student Assessment (PISA) 2015

### Background

The Organisation for Economic Cooperation and Development (OECD) created the Programme for International Student Assessment (PISA) as part of an ongoing program of reporting on educational outcomes across countries. PISA is a triennial program designed to monitor trends in the performance of 15-year-olds in mathematical, scientific and reading literacy over time.

In 2009, the PISA focused on assessment reading literacy. In 2012, the focus was mathematical literacy. In 2015, the focus was on scientific literacy.

More than 500 000 students, representing 35 million 15 year old students, from 72 countries and economies took part in PISA 2015. In Australia 758 schools participated, providing a representative sample of around 14 530 students representing all schools. In Western Australia 98 schools and 1869 students participated.

In PISA 2015, the main mode of assessment moved from a paper-based delivery to a computer based delivery. The computer-based assessment allowed for a greater variety of contexts to be included in the scientific literacy assessment.

Students completed a two-hour cognitive assessment. Students were randomly assigned to a test form that comprised four 30-minute clusters of cognitive materials (scientific literacy, reading literacy, mathematical literacy, and collaborative problem solving). Students then completed a student questionnaire and undertook the financial literacy assessment.

Principals completed a school questionnaire, including information about the school's human and material resources, decision-making processes, instructional practices, and school and classroom climate. A teacher questionnaire was also offered as an international option for the first time in PISA 2015, and Australia was one of the 19 countries that participated in this option.

Results are reported as average scores with the standard error, as distributions of scores, and as percentages of students who attain the international benchmarks (Advanced, High, Intermediate, Low, and Below Low) for countries and specific groups of students within Australia. The Intermediate international benchmark is considered to be the minimum proficient standard.

### Results of the Programme for International Student Assessment (PISA) 2015

#### Key findings Australia

- Australia's results were significantly higher than the OECD average in each of reading, scientific and mathematical literacy.
- Australia has a greater spread of scores from lowest to highest than the OECD average in each assessed area.
- Significant gaps in achievement remain for Australian students related to gender, Indigenous status, geolocation and socioeconomic status.

#### Key findings Western Australia

- Western Australia performed significantly above the OECD average, and above Australia, in each assessed area.
- In terms of means, Western Australia was ranked second, after the Australian Capital Territory in all assessed areas. The Australian Capital Territory and Western Australia performed at a level not significantly different to one another in all assessed areas.

**In Scientific literacy:**

- Australia's average score in scientific literacy was 510 points. This was significantly higher than the OECD average of 493 points.
- In terms of means, Western Australia ranked second (521 points). Western Australia performed at a level not significantly different to the Australian Capital Territory and Victoria but performed significantly higher than the other jurisdictions.
- Australia was ranked fourteenth with nine countries scoring significantly higher in scientific literacy in 2015. Australia's performance was not significantly different to that of 8 other countries and was significantly higher than all remaining countries.
- Australia and 12 other countries showed a significant decline in their scientific literacy performance between 2006 and 2015. For Australia, this decline was 17 points. For Western Australia, this decline was 22 points.
- The proportion of students who reached the National Proficiency Standard in scientific literacy was 61% in Australia and 65% in Western Australia.

**In Reading:**

- Australia's average score in reading was 503 points. This was significantly higher than the OECD average of 493 points.
- Australia was ranked sixteenth, with 11 countries scoring significantly higher in reading literacy in 2015. Australia's performance was not significantly different to that of 13 other countries and was significantly higher than all remaining countries.
- The reading literacy performance of Australia and eight other countries declined significantly between 2009 and 2015. For Australia this decline was 12 points.
- In terms of means, Western Australia ranked second (507). Western Australia performed statistically significantly higher than Tasmania and the Northern Territory but not statistically different to the other jurisdictions.
- In 2015, the performance of Western Australia was not significantly different to the performance in 2009. Between 2000 and 2015 Western Australia experienced a significant decline in reading literacy performance (31 points).
- 61% of Australian students and 63% of Western Australian students achieved the National Proficiency Standard in reading literacy.
- The proportions of low and high performers for Australia across the six PISA cycles reporting reading literacy shows that there has been a downward shift, with fewer high performers and more low performers.

**In Mathematics:**

- Australian students achieved an average score of 494 points in mathematical literacy, which was significantly higher than the OECD average of 490 points.
- Australia was ranked 25, with 19 countries scoring significantly higher in mathematical literacy in 2015. Australia's performance was not significantly different to that of 10 other countries but was significantly higher than all remaining countries.
- Australia was one of 10 countries whose performance declined significantly between 2012 and 2015. The decline in Australia's performance was 10 points.
- Australia's proportion of high performers (11%) was consistent with the OECD average. Australia's proportion of low performers (22%) was about the same as the OECD average (23%).
- Western Australia performed at a significantly higher level than the OECD average.
- In terms of means, Western Australia ranked second (504) behind ACT (505). Western Australia performed statistically significantly higher than South Australia, Queensland, Tasmania and the Northern Territory but not statistically different to the Australian Capital Territory, Victoria and New South Wales.

55% per cent of Australian students and 60% in Western Australia achieved the National Proficiency Standard in mathematical literacy.

- Since 2003 the Australian mean has declined significantly from 524 to 494 points. The Western Australian mean declined significantly from 548 to 504.
- Between PISA 2003 and PISA 2015, the proportion of Western Australian low performers increased by 10% and the proportion of Australian top performers decreased by 16%.

A more comprehensive summary of the report can be found at *Appendix 1*.

## Appendix 1

### 2015 PISA summary

#### Participation

In 2015, 510 000 students from 72 countries or economies, including all 35 OECD countries and 37 non-OECD countries, participated in the PISA.

14 530 students from 758 schools across Australia took part. Of these, 1869 students were from Western Australia from 98 schools across both the public and private sectors.

The PISA sample is age-based with most participating Australian students in Years 9, 10 or 11. For most jurisdictions the majority of students were in Year 10.

As in 2012, a report on the performance of students by educational sector is provided at the national level only. This indicates that while based on comparisons of raw data, mean performance declines from Independent to Catholic to public school sectors, when background factors were accounted for through multi-level modeling, the differences at the school level are very small. It should be noted, however, that the peer effect on individual students is a very important factor influencing student performance.

#### The assessments

In PISA 2015, the main mode of assessment moved from a paper-based delivery to a computer based delivery. The computer-based assessment included trend items (that were originally developed for delivery as a paper-based assessment and were adapted for delivery on computer) and new scientific literacy items. The computer-based assessment allowed for a greater variety of contexts to be included in the scientific literacy assessment. Approximately 13% of new scientific literacy items were developed to incorporate interactive presentations, where students' actions determined what they saw on the screen.

Fifty-seven countries, including all OECD countries, administered PISA as a computer-based assessment. The 15 countries and economies that administered PISA as a paper-based assessment completed only trend items (which represent about half of all the items used in the computer-based assessments). Results for both the computer- and paper-based assessments are reported on the same scale.

Students completed a two-hour cognitive assessment. Students were also allowed up to 45 minutes to complete the student questionnaires, which they responded to after the completion of the PISA cognitive assessment. Students then undertook the financial literacy assessment.

Students were randomly assigned to a test form that comprised four 30-minute clusters of cognitive materials (scientific literacy, reading literacy, mathematical literacy, and collaborative problem solving), with each cluster consisting of units that required them to construct responses to a stimulus and a series of questions. The stimulus material was typically a brief written passage or text accompanying a table, chart, graph, photograph or diagram. A range of item-response formats, such as multiple choice questions and questions requiring students to construct their own responses, were used to cover the full range of cognitive abilities and knowledge identified in the Assessment Framework.

Principals answered a questionnaire about the school, including information about the quality of the school's human and material resources, decision-making processes, instructional practices, and school and classroom climate.

A teacher questionnaire was also offered as an international option for the first time in PISA 2015, and Australia was one of the 19 countries that participated in this option. There were two questionnaire options: one which had a focus for science teachers and the other for non-science teachers. The questionnaires collected information about teachers' educational background and training, teaching practices, teacher-directed teaching and learning activities in science lessons.

## Reporting scales

PISA, reports results as mean scores along with various statistics that reflect the distribution of performance. The PISA performance scale provides a more detailed picture of performance by providing a profile of what students have achieved in terms of skills and knowledge – what they can do and what they know. This performance scale is divided into levels of difficulty, or proficiency levels. In PISA 2015 there are six levels of mathematical and seven levels of scientific and reading literacy proficiency. Results are reported as average scores with the standard error, as distributions of scores, and as percentages of students who attain the international benchmarks (Advanced, High, Intermediate, Low, and Below Low) for countries and specific groups of students within Australia. The Intermediate international benchmark (Level 2) is considered to be the minimum proficient standard.

## Results 2015

Australia's results were significantly higher than the OECD average in each of scientific, reading, and mathematical literacy.

Western Australia performed significantly above the OECD average, and above Australia, in each assessed area.

Singapore achieved the highest scores in all three domains. The difference between their means and those of Australia indicates that their 15 year old students are performing at a level representing one-and-a-half years of schooling above that of Australian students in scientific literacy, one year in reading literacy and two-and-a-third years in mathematical literacy.

In terms of means, Western Australia was ranked second, behind Australian Capital Territory, in all three assessments.

## Main study: Scientific literacy

### Australia

Australia achieved an average score of 510 points in scientific literacy, which was significantly higher than the OECD average of 493 points.

Australia's performance was significantly below 9 countries (4 OECD: Canada, Estonia, Finland and Japan; 5 partner: Chinese Taipei, Hong Kong (China), Macao (China), Singapore, and Vietnam).

Australia's performance was not significantly different from that of 8 countries (7 OECD: Germany, Korea, the Netherlands, New Zealand, Slovenia, Switzerland, the United Kingdom; 1 partner: B-S-J-G (China)).

Australia's performance was significantly higher than the remaining participating countries, which included 23 OECD countries.

Singapore was the highest performing country in scientific literacy in PISA 2015 with a score of 556 points. Australia's score of 510 points was equivalent to around one-and-a-half years of schooling lower than Singapore's achieved score.

Australia was one of the countries with the broadest range of student abilities (336 points), which is similar to the spread between highest and lowest achievers in Israel (346 points), New Zealand (341 points), and Singapore (340 points).

Australia's proportion of high performers (11%) was higher than the OECD average, which was 8%. However, 24% of students in Singapore and between 15% and 10% of students from Chinese Taipei, Japan, Finland, B-S-J-G (China), New Zealand, Canada, the Netherlands, the United Kingdom, Korea, Slovenia, Germany and Switzerland were high performers. All other countries had fewer than 11% of students who were high performers.

Australia had a lower proportion of low performers (18%) compared to the OECD average (21%), while countries that performed significantly higher than Australia had between 6% and 12% of low performers.

61% of Australian students achieved the National Proficient Standard in scientific literacy.

The mean performances of all sub-groups declined (males by 16 points, females 18; Indigenous students 4, non-Indigenous students 16) from 2006 to 2015.

### **Western Australia**

Western Australia performed at a significantly higher level than the OECD average (493 points). In terms of means, Western Australia (521) was ranked second, after Australian Capital Territory (527), for scientific literacy.

The Australian Capital Territory and Western Australia performed at a level not significantly different to one another but performed significantly higher than New South Wales, South Australia, Queensland, the Northern Territory and Tasmania. Western Australia also performed at a statistically similar level to Victoria.

Western Australia had the narrowest distribution of scores, with a range of 321 points separating the 5th and 95th percentiles.

The Australian Capital Territory was the jurisdiction with the highest proportion of high performers with a proportion of 14% of students. Western Australia had 12% compared to the OECD average of 8%.

Western Australia had a lower proportion of low performers (15%) compared to the OECD average of 21%.

The proportion of students in each jurisdiction who reached the National Proficient Standard in scientific literacy was 65% in Western Australia compared with 68% in the Australian Capital Territory.

All jurisdictions, except Victoria and the Northern Territory, showed a significant decline in their scientific literacy performance between PISA 2006 and PISA 2015. Western Australia declined by 22 points.

In 2015, for every jurisdiction, there was a lower proportion of high performers than in 2006. Western Australia showed a 7% decline in their proportions of high performers between 2006 and 2015.

Between PISA 2006 and 2015, the proportions of low performers increased in Western Australia by 5%.

## **Reading literacy**

### **Australia**

Australia achieved an average score of 503 points in reading literacy, which was significantly higher than the OECD average of 493 points.

Australia's performance was significantly below 11 countries (8 OECD: Canada, Estonia, Finland, Ireland, Japan, Korea, New Zealand and Norway; 3 partner: Singapore, Hong Kong (China) and Macao (China)).

Australia's performance was not significantly different from that of 13 countries (11 OECD: Belgium, Denmark, France, Germany, the Netherlands, Poland, Portugal, Slovenia, Sweden, the United Kingdom and the United States; 2 partner: Chinese Taipei and B-S-J-G (China)).

Australia's performance was significantly higher than the remaining participating countries, which included 15 OECD countries.

Singapore was the highest performing country in reading literacy in PISA 2015, with an average score of 535 points, which is 32 points or equivalent to around one year of schooling higher than the Australian average and 44 points higher than the OECD average.

The narrowest spread of scores between the lowest and highest achieving students was found in Vietnam (239 points) and the widest spread of scores was found in Malta (395 points). In Australia, the difference between the lowest and highest achieving students was 338 points, which was similar to Austria, Sweden, Cyprus and the Slovak Republic, but wider than the OECD average (315 points).

Australia's proportion of high performers (11%) was higher than the OECD average (8%). However, Singapore had the largest proportion of high performers with 18% of their students achieving at this level. Other high-performing countries (Canada, Finland, Hong Kong (China), Korea, New Zealand, and Norway) had between 12% and 14% of high performers.

On average, 20% of students across OECD countries were low performers. The countries that performed significantly higher than Australia had between 9% and 17% of low performers. In Australia, 18% of students were low performers.

61% of Australian students achieved the National Proficient Standard in reading literacy.

### **Western Australia**

Western Australia performed at a significantly higher level than the OECD average (493 points). In terms of means, Western Australia (507) was ranked second, after the Australian Capital Territory (516), for reading literacy.

Western Australia had one the narrowest distribution of scores, with a range of 324 points separating the 5th and 95th percentiles.

Western Australia performed at a level not significantly different to the Australian Capital Territory, Victoria, New South Wales, South Australia, and Queensland and significantly higher than the Northern Territory and Tasmania.

The Australian Capital Territory was the jurisdiction with the highest proportion of high performers with a proportion of 14% of students. Western Australia had 11% compared to the OECD average of 8%.

Western Australia had a lower proportion of low performers (17%) compared to the OECD average of 20%.

The proportion of students in each jurisdiction who reached the National Proficient Standard in scientific literacy was 63% in Western Australia compared with 65% in the Australian Capital Territory.

The average reading literacy scores between PISA 2000 and 2015 declined in WA by 31 points.

In the 15-year period from 2000 to 2015, there has been an increase in the proportion of low performers and a decline in the proportion of high performers across all jurisdictions.

- Between 2000 and 2015, the increase in the proportion of low performers in WA was 6%.
- Between 2000 and 2015, the decrease in the proportion of high performers in WA was 10%.

## **Mathematical literacy**

### **Australia**

Australian students achieved an average score of 494 points in mathematical literacy, which was significantly higher than the OECD average of 490 points.

Australia's performance was significantly below 19 countries (14 OECD: Japan, Korea, Switzerland, Estonia, Canada, the Netherlands, Denmark, Finland, Slovenia, Belgium, Germany, Poland, Ireland and Norway; 5 partner: Singapore, Hong Kong (China), Macao (China), Chinese Taipei and B-J-S-G (China)).

Australia's performance was not significantly different from that of 10 countries (8 OECD: Austria, New Zealand, Sweden, France, the United Kingdom, the Czech Republic, Portugal and Italy; partner: Vietnam and the Russian Federation).

Australia's performance was significantly higher than the remaining participating countries, which included 10 OECD countries.

Singapore was the highest performing country in mathematical literacy in PISA 2015 with a score of 564 points. Australia's score of 494 points was equivalent to around two-and-a-third years of schooling lower than Singapore's achieved score.

The spread between the 5th and 95th percentiles was about mid-range for the OECD average with 293 points. Among the highest performing countries, the spread between the low and high achievers varied: Singapore's spread was 312 points, Hong Kong (China)'s was 298 points, Macao (China)'s was 261 points and Chinese Taipei's was 337 points. In Australia, there were 306 points between students in the 5<sup>th</sup> and 95th percentiles.

On average, 11% of students across the OECD countries were high performers, which was the same proportion of high performers as Australia, France, Portugal, New Zealand, Norway, the United Kingdom, and Italy. Thirty-five per cent of students in Singapore performed at this level while approximately 25% of students in Chinese Taipei, Hong Kong (China) and B-S-J-G (China), and around 20% of students in Macao (China), Korea and Japan were highly proficient in mathematical literacy.

On average, 23% of students across OECD countries were low performers. Australia, New Zealand, the United Kingdom, the Czech Republic, Austria and Spain had 22% of low performers. In the high-performing countries, Macao (China), Singapore and Hong Kong (China) had fewer than 10% of low performers on the mathematical literacy proficiency scale.

55% of Australian students achieved the National Proficient Standard in mathematical literacy.

### **Western Australia**

Western Australia performed at a significantly higher level than the OECD average (490 points). In terms of means, Western Australia (504) was ranked second, after Australian Capital Territory (505), for mathematical literacy.

Western Australia also performed at a level not significantly different to the Australian Capital Territory, Victoria and New South Wales and outperformed South Australia, Queensland, the Northern Territory and Tasmania.

The Australian Capital Territory was the jurisdiction with the highest proportion of high performers with a proportion of 14% of students. Western Australia had 12% compared to the OECD average of 11%.

Western Australia had a lower proportion of low performers (18%) compared to the OECD average of 23%.

The proportion of students in each jurisdiction who reached the National Proficient Standard in mathematical literacy was 60% in Western Australia compared with 61% in the Australian Capital Territory. The OECD average was 54%.

In seven jurisdictions, the average mathematical literacy scores between PISA 2003 and 2012 declined significantly. In Western Australia the decline was 32 points. The changes in mathematical literacy performance between 2012 and 2015 show that Western Australia, New South Wales, and Queensland each experienced significant declines in performance (by 12 points, 15 points and 17 points).

In WA between 2003 and 2015 there has been a steady decline in the proportion of high performers and an increase in the proportion of low performers.

Between 2003 and 2015, the increase in the proportion of low performers in Western Australia was 10%.

Between 2003 and 2015, the decrease in the proportion of high performers in Western Australia was 16%.

### **Male and female students**

There was no significant difference in the performance of male and female students in scientific and mathematical literacy apart from males performing significantly higher than females in the scientific literacy in the Northern Territory and males performed significantly higher than females in mathematical literacy in Victoria and the Northern Territory.

In reading literacy females in all jurisdictions except the Northern Territory performed significantly higher than males.

## **Indigenous students**

Indigenous students achieved significantly lower scores than non-Indigenous students in scientific, reading and mathematical literacy domains. The average score difference equated to one proficiency level or around two-and-a-half years of schooling in scientific literacy and two-and-a-third years of schooling in reading and mathematical literacy.

There was an under-representation of Indigenous students at the higher end of the proficiency scale and an over-representation of Indigenous students at the lower end of the proficiency scale.

Three percent of Indigenous students were high performers in scientific literacy compared to 12% of high performing non-Indigenous students while 42% of Indigenous students were low performers compared to 17% of non-Indigenous students. The trend is similar for reading and mathematical literacy.

31% of Indigenous students reached the National Proficient Standard in scientific literacy compared to 62% of non-Indigenous students.

Since 2006, the scientific and reading literacy performance of Indigenous students has not changed significantly.

The performance in mathematical literacy for Indigenous students remained constant from 2003 to 2009; however, in 2012 there was a significant decrease in performance to an average score of 417 points, which was a decline of 23 points from 2009. The change in performance between 2009 and 2015 was also significant with a decline of 14 points.

## **School sector**

Results of student performance across the three school sectors (government, Catholic and independent) are compared using the unadjusted average score. They show that, on average, students in the independent school sector performed significantly higher than students in the Catholic or government school sectors, and that students in the Catholic school sector performed significantly higher than students in the government school sector.

When student-level socioeconomic background is taken into account, students in independent schools performed significantly higher than students in Catholic schools, and students in Catholic schools performed significantly higher than students in government schools, although these differences are reduced.

When school-level socioeconomic background is also taken into account, the differences between students in government schools and students in Catholic schools, and the differences between students in government schools and students in independent schools were not significant. However, the differences between students in Catholic schools and students in independent schools remain significant. Students in independent schools bring with them an advantage over students in Catholic schools that is not attributed to student and school socioeconomic background. This result has not been seen in PISA 2009 or 2012, where no significant differences in performance between school sectors were found once student- and school-level socioeconomic background were taken into account.

## **Geolocation**

Students from metropolitan schools achieved significantly higher scores than students from provincial schools or remote schools. Students from provincial schools and students in remote schools did not score significantly different to each other.

There was a higher proportion of high performers from metropolitan schools compared to students from provincial or remote schools. Similarly, there was a lower proportion of low performers from metropolitan schools compared to students from provincial or remote schools.

### **Socioeconomic background**

On average, students from higher socioeconomic backgrounds performed at a significantly higher level than students from lower socioeconomic backgrounds.

The proportion of high performers increased and the proportion of low performers decreased with each increase in socioeconomic quartile.

Students in the highest socioeconomic quartile performed 86 score points in mathematics on average higher than students in the lowest socioeconomic quartile, 91 lower in science and 89 lower in reading. This difference equates to around two-and-a-half years of schooling. Students from the highest socioeconomic quartile were overrepresented in the top performers and underrepresented in the low performers in all three domains. The reverse was true for students from the lowest socioeconomic quartile. The impact of schooling is greatest for students from disadvantaged backgrounds or attending schools with a low average socio-economic background.

### **Immigrant background**

Students reported their country of birth as well as that of their parents. Australian-born students performed at a level significantly lower than first-generation students and statistically similar to foreign-born students across all assessment domains while foreign born students performed at a level significantly lower than first-generation students in scientific literacy and reading literacy and not significantly different in mathematical literacy.

Generally, the proportion of low-performing Australian-born and foreign-born students was higher than the proportion of low-performing first-generation students, and the proportion of high-performing Australian-born students was lower than for first-generation students or foreign born students.

### **Language background**

Students were asked what language was spoken at home most of the time.

Students who spoke English at home most of the time performed significantly higher in scientific literacy and reading literacy than students who spoke a language other than English at home most of the time.

Generally, the proportion of low-performing students who spoke English at home most of the time was lower than the proportion of low-performing students who spoke a language other than English most of the time, while the proportions of high performers for both language background groups were similar.