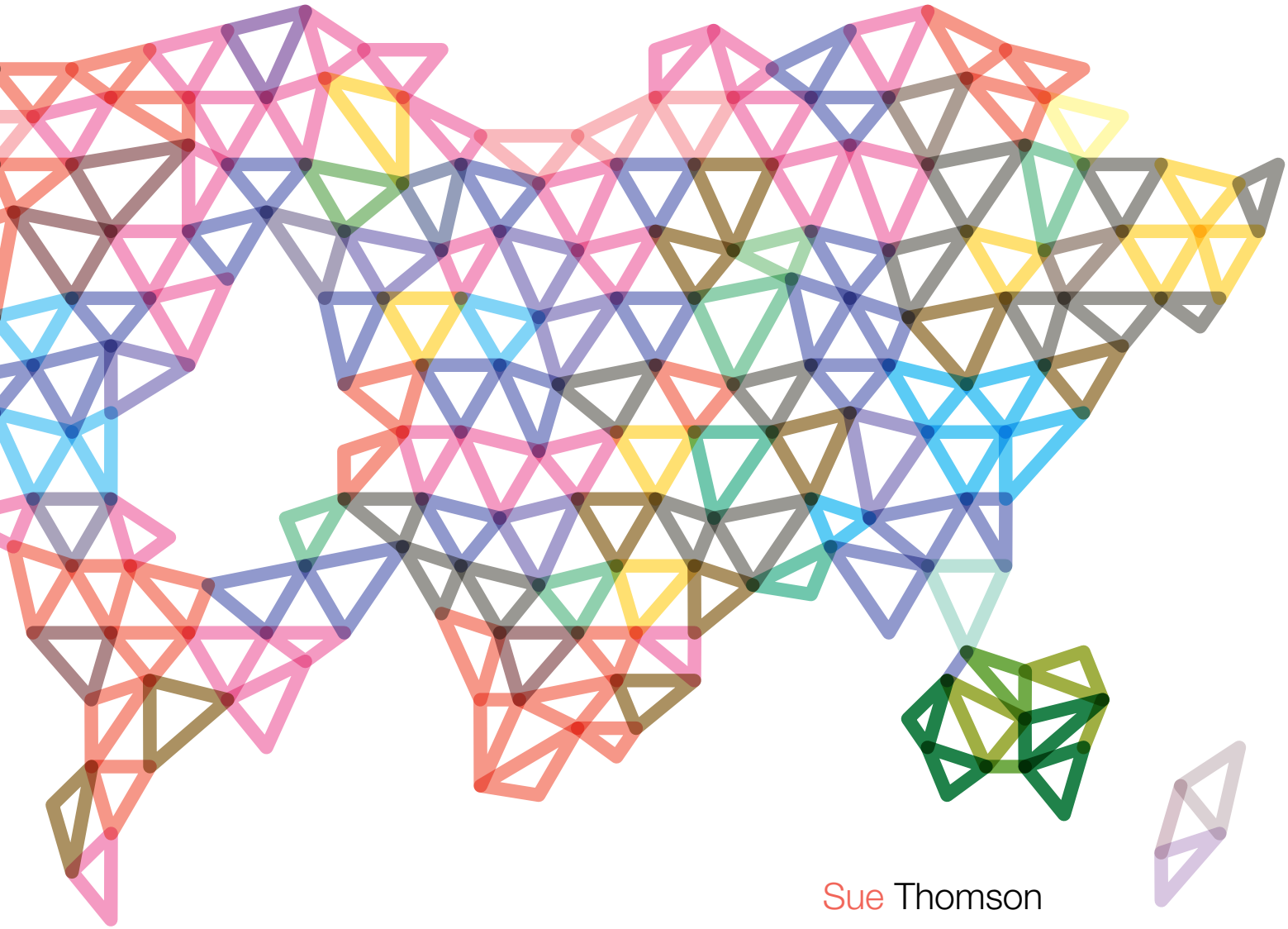
TIMSS 2015

A first look at Australia's results



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TIMSS 2015
ACER

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In Australia, TIMSS is managed by a team from the Australian Council for Educational Research (ACER) and guided by the International Assessments Joint National Advisory Committee (IAJNAC). ACER wishes to thank the IAJNAC members for their continued interest in, and commitment to, the project throughout each of its phases. The IAJNAC members' involvement included assisting with the implementation of TIMSS in schools in their jurisdiction, reviewing the report and providing valuable information to ensure the continued success of TIMSS in Australia.

The undertaking of TIMSS 2015 was a collaborative effort. A national survey such as TIMSS could not be successfully undertaken without the cooperation of the school systems, principals, teachers, parents and, of course, the students. Data of the quality collected and analysed in TIMSS depends upon a high participation rate of the randomly selected schools and students. Australia was able to satisfy the internationally set response criteria for schools and students for TIMSS 2015. ACER gratefully recognises the assistance both of education-system officials Australia wide, and of the principals, teachers, parents and students in the participating schools – who gave generously of their time and support in contributing to the project.

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- Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (2016). *TIMSS 2015 International Results in Mathematics*. Retrieved from http://timssandpirls.bc.edu/timss2015/international-results.
- Martin, M. O., Mullis, I. V. S., Foy, P., & Hooper, M. (2016). *TIMSS 2015 International Results in Science*. Retrieved from http://timssandpirls.bc.edu/timss2015/international-results.
- Mullis, I. V. S. & Martin, M. O. (Eds). (2013). *TIMSS 2015 Assessment Frameworks*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Executive summary

The Trends in International Mathematics and Science Study (TIMSS) is an international comparative study of student achievement directed by the International Association for the Evaluation of Educational Achievement (IEA). TIMSS 2015 represents the sixth such study since TIMSS was first conducted in 1995. Forty-nine education systems tested at Year 4 level and 39 tested at Year 8 level. In Australia, TIMSS is managed by the Australian Council for Educational Research (ACER) and is jointly funded by the Australian Government and the state and territory governments.

The goal of TIMSS is to provide comparative information about educational achievement across countries to improve teaching and learning in mathematics and science. It is designed, broadly, to align with the mathematics and science curricula in the participating education systems and countries, and focuses on assessment at Year 4 and Year 8. It also provides comparative perspectives on trends in achievement in the context of different education systems, school organisational approaches and instructional practices; and to enable this, TIMSS collects a rich array of background data from students, schools and teachers, and also collects data about the education systems themselves.

This report is a first look at the results from TIMSS 2015. Focusing on the achievement results in mathematics and science at Year 4 and Year 8, this report will be followed early in 2017 by the full Australian National Report, which will examine achievement more fully and incorporate descriptive and analytical findings using the background and demographic data.

Key findings from this report

Mathematics at Year 4

- With an average score of 517 score points on the TIMSS Year 4 mathematics scale, Australian students significantly outperformed students in 20 other countries, such as Italy, Spain and New Zealand.
- However, Australian Year 4 students were outperformed by students in 21 other countries, including Northern Ireland, Ireland, England and the United States, as well as the participating East Asian countries Singapore, Hong Kong, Korea, Chinese Taipei and Japan.
- Australia's 2015 Year 4 mathematics score is significantly higher than the corresponding score in 1995. This, however, is due to a single increase recorded in TIMSS 2007 with no dip in following years; for the past three cycles, Australia's Year 4 mathematics scores have remained the same.
- Nine per cent of Australian Year 4 students achieved the Advanced international benchmark in mathematics – compared to 50 per cent of students in Singapore and 27 per cent of students in Northern Ireland.
- Seventy per cent of Australian Year 4 students achieved the Intermediate international benchmark – the proficient standard for Australia.

Mathematics at Year 8

- With an average score of 505 score points on the TIMSS Year 8 mathematics scale, Australian students significantly outperformed students in 21 other countries, such as Italy, New Zealand and Malaysia.
- However, Australian Year 8 students were outperformed by students in 12 other countries, including Canada, Ireland, England and the United States, as well as the top five countries from Asia – Singapore, Korea, Chinese Taipei, Hong Kong and Japan.
- Australia's result dipped in TIMSS 2007 and was followed by a recovery in TIMSS 2011. Australia's 2015 Year 8 mathematics score is exactly the same as the corresponding score in 1995.
- Seven per cent of Australian Year 8 students achieved the Advanced international benchmark in mathematics – compared to more than one-third of students in the top five countries and 54 per cent of students in Singapore.
- Sixty-four per cent of Australian Year 8 students achieved the Intermediate international benchmark – the proficient standard for Australia.

Science at Year 4

- With an average score of 524 score points on the TIMSS Year 4 science scale, Australian students significantly outperformed students in 17 other countries, such as Portugal, New Zealand and France.
- However, Australian Year 4 students were outperformed by students in 17 other countries, including the United States and England, as well as the participating East Asian countries Singapore, Korea, Japan, Hong Kong and Chinese Taipei.

- Notwithstanding a 2015 recovery following the dip in TIMSS 2011, Australia's TIMSS 2015 Year 4 science score is not significantly different to that of TIMSS 1995.
- Eight per cent of Australian Year 4 students achieved the Advanced international benchmark in science – compared to 37 per cent of students in Singapore.
- Seventy-five per cent of Australian Year 4 students achieved the Intermediate international benchmark – the proficient standard for Australia.

Science at Year 8

- With an average score of 512 score points on the TIMSS Year 8 science scale, Australian students significantly outperformed students in 20 other countries, such as Italy, Turkey and Malaysia.
- However, Australian Year 8 students were outperformed by students in 14 other countries, including Canada, the United States, England and Ireland, as well as the top five Asian countries – Singapore, Japan, Chinese Taipei, Korea and Hong Kong.
- Australia recorded an improved score in TIMSS 2003 followed by a weaker result in TIMSS 2007. Australia's 2015 Year 8 science score is not significantly different to that of TIMSS 1995.
- Seven per cent of Australian Year 8 students achieved the Advanced international benchmark in science – compared to more than one-fifth of students in Chinese Taipei and Japan, and 42 per cent of students in Singapore.
- Sixty-nine per cent of Australian Year 8 students achieved the Intermediate international benchmark – the proficient standard for Australia.

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Reader's Guide

Sample surveys

TIMSS is conducted as a sample survey in most participating countries. In surveys such as this, a sample of students is selected to represent the population of students at a particular year level in that country. The samples are designed and conducted so that they provide reliable estimates about the population that they represent. Sample surveys are cheaper to undertake and less of a burden for schools than a full census of the particular population.

The basic sample design for TIMSS is generally referred to as 'a two-stage stratified cluster sample design'. The first stage consists of a sample of schools and the second stage consists of the identification of a single mathematics classroom selected at random from the target year level in sampled schools.

The students in the selected classroom are representative of the students in the population, and weights are used to adjust for any differences arising from intended features of the design (e.g. to over-sample minorities) or non-participation by students who were selected. In this way we can provide measures of achievement for the population, based on the responses of a sample.

Scores in TIMSS 2015

TIMSS 2015 used item response theory (IRT) methods to summarise the achievement of students on a scale with a mean of 500 and a standard deviation of 100 (please refer to the international TIMSS website for more information about IRT methods: http://timss.bc.edu/publications/timss/2015-methods.html). It should be noted that the results for Year 4 and Year 8 should not be compared, nor should the results for mathematics and science at a particular year level. While the scales are expressed in the same numerical units, they are not directly comparable such that conclusions could be drawn about how much learning in mathematics equals how much learning in science (or how much learning at Year 4 equals how much learning at Year 8). That is, achievement on the TIMSS scales cannot be described in absolute terms (like all such scales developed using IRT technology). Comparisons can be made only in terms of relative performance (higher or lower), for example, among countries and population groups as well as over time.

The TIMSS mathematics and science scales for Year 4 and Year 8 were based on the 1995 assessments and the methodology enables comparable trend measures from assessment to assessment within each year level.

International comparison statistics

Several international comparison statistics are given in the report: the *TIMSS scale centrepoint*, the *international average* and the *international median*.

The *TIMSS scale centrepoint* is the mean of the scales (for each of Year 4 mathematics, Year 4 science, Year 8 mathematics and Year 8 science) established in the first cycle of the study, calibrated to be 500, with a standard deviation of 100 score points.

The *international average* is the mean score or percentage of all countries participating in TIMSS 2015 at that year level.

The *international median* is the midpoint in a ranking of countries by score or percentage. By definition, half of the countries will have a score or percentage above the median and half below.

It should be noted that both the international average and the international median will be different depending on the set of countries included. Therefore, these statistics should be used in the context of a number of comparison statistics.

Standard errors and confidence intervals

In this and other reports, student achievement is often described by a mean score. For TIMSS, each mean score is calculated from the sample of students who undertook the assessments. These sample means are an approximation of the actual mean score (known as the population mean) that would have been derived had all students in Australia participated in the TIMSS assessment.

If another sample of students was chosen on a different day, it is highly likely that the sample mean would be slightly different. Indeed, the sample mean is just one point along the range of student achievement scores, and so more information is needed to gauge whether the sample mean is an underestimation or overestimation of the population mean.

In this report, means are presented with an associated standard error. The standard error is an estimate of the error in the estimate of the population mean from the sample and is based on the standard deviation of sampling distribution of the mean. The size of the sample, as well as the variance in the scores within the sample, can affect the size of the standard error. Smaller samples, or samples with a greater variance in scores, will have larger standard errors.

The calculation of confidence intervals can assist our assessment of a sample mean's precision as a population mean. Confidence intervals provide a range of scores within which we are 'confident' that the population mean actually lies. The confidence interval is within plus or minus 1.96 standard errors of the sample mean. A larger standard error results in a larger confidence interval, and a greater likelihood that the confidence intervals of two means will overlap and, therefore, reduce any difference to non-significance (see the next section on statistical significance).

Statistical significance

The term 'significantly' is used throughout the report to describe a difference that meets the requirements of statistical significance at the 0.05 level, indicating that the difference is real, and would be found in at least 95 analyses out of 100 if the comparison were to be repeated. It is not to be confused with the term 'substantial', which is qualitative and based on judgement rather than statistical comparisons. A difference may appear substantial but not be statistically significant (due to factors that affect the size of the standard errors around the estimate, for example) while another difference may seem small but reach statistical significance because the estimate was more accurate.

Trends

It should be noted that a change in 2015 to the method of calculating standard errors means that standard errors for data from past cycles will not match those presented in earlier reports (please refer to the international TIMSS website for more information on calculation of standard errors: http://timss.bc.edu/publications/timss/2015-methods.html).

Please note that there was no fourth-grade assessment in 1999. Additionally, the Australian eighth-grade sample that participated in 1999 was not comparable to that in other cycles, so no trend results are provided for Australia at Year 8 in 1999.

Rounding of figures

Due to rounding to eliminate decimals, some percentages in tables and figures may not exactly add to the totals. Totals, differences and averages are always calculated on the basis of exact numbers and are rounded only after calculation. When standard errors have been rounded to one decimal place and the value 0.0 is shown, this does not imply that the standard error is zero, but that it is smaller than 0.05.

Notes about participating countries

A number of countries have official names that are longer than those by which they are usually designated in conversation. In order to facilitate the reading of the TIMSS reports, these countries are referred to by their shortened form (e.g. Hong Kong, Korea, Iran) in the text, but are referred to by their official name (e.g. Hong Kong SAR; Korea, Republic of; Iran, Islamic Republic of) in the box displaying participating countries in Figure 1.1.

Seven countries participated in TIMSS Numeracy – namely, Bahrain, Indonesia, Iran, Jordan, Kuwait, Morocco and South Africa (please refer to the international TIMSS website for more information about TIMSS Numeracy: http://timssandpirls.bc.edu/timss2015/frameworks.html). Except for Jordan and South Africa, they also participated in the TIMSS fourth-grade assessment, and their Year 4 mathematics results are based on an average of both assessments. As Jordan and South Africa participated only in TIMSS Numeracy, their Year 4 mathematics results are based solely on the results of TIMSS Numeracy and, additionally, they will not appear in the results for Year 4 science.

Norway chose to assess fifth and ninth grades to obtain better comparisons with Sweden and Finland (but also collected benchmark data at fourth and eighth grades to enable trend measurement). Botswana and South Africa assessed ninth grade to better match their curricula and to maintain trend measurement.

Definitions of background characteristics

There are various definitions used in this report that are particular to the Australian context, as well as many that are used internationally. This section provides an explanation for those that are not self-evident.

Number of books in the home

This variable is used as a proxy for socioeconomic status, where information about parents' occupations, education and wealth are not available. It is derived from student self-reports of the number of books in their homes. Their responses have been grouped so that a *few books* equals 25 or fewer books, an *average number* of books equals between 26 and 200 books and *many books* equals more than 200 books. While the relationship between the number of books in the home and student achievement is not definitive, there is a very strong relationship between the two.

Parental education

Parental education is a component of socioeconomic status. Year 8 students were asked to indicate the highest level of education attained by each of their parents or guardians. For the analyses in this report, the responses from both questions were combined to identify the highest level of education attained by either parent. Where no response is given for one parent, the response for the other parent was used. Where no information was given for either parent, parental education was recorded as missing.

Please note that, due to a very low response rate to the Early Learning Survey, completed by parents, information about parental education is not available for Year 4 students.

Educational resources in the home

The presence or absence of educational resources in the home expresses potential advantage or disadvantage for students that may reflect the ability of parents to provide materially for their children or indicate differences in practical and psychological support for academic achievement. These resources may be physical, such as books or an internet connection, or take the form of more intangible attributes such as parental education or occupation.

The Home Educational Resources scale was created, using Year 8 students' responses to three items:

- parents' educational background
- number of books in the home
- home study supports – students having their own room and an internet connection at home.

Students with *many resources* had a score on the scale of at least 12.4, which corresponds to their reporting that they had more than 100 books in the home along with both home study supports (own room and an internet connection), and that at least one of their parents had finished university, on average. In contrast, students with *few resources* had a scale score no higher than 8.3, which corresponds to their reporting that they had 25 or fewer books in the home, that they had neither their own room nor an internet connection, and that neither of their parents had proceeded beyond upper secondary school. All other students were classified as having *some resources*.

Please note that, due to a very low response rate to the Early Learning Survey, completed by parents, information about parental education, and therefore the Home Educational Resources scale, is not available for Year 4 students.

Indigenous background

Indigenous background is derived from school records – collected from parents and guardians in accordance with the nationally agreed definitions as set out in the 2012 *Data Standards Manual* of the Australian Curriculum, Assessment and Reporting Authority – that identify students as being of Australian Aboriginal or Torres Strait Islander origin. Students were identified as either Indigenous or not Indigenous for the purpose of TIMSS.

Language spoken at home

The language spoken at home variable is derived from student self-report of how often English was spoken at home. Where the student spoke English 'never' or only 'sometimes', the student was considered to speak a language other than English at home. Those who indicated that they spoke English 'always' or 'almost always' were considered to be English speakers in the home environment.

Geographic location of the school

In Australia, the participating schools were coded with respect to the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) Schools Geographic Location Classification. For the analysis in this report, only the broadest categories are used:

- *metropolitan* – including mainland state capital cities or major urban districts with a population of 100,000 or more (e.g. Queanbeyan, Cairns, Geelong, Hobart)
- *provincial* – including provincial cities and other non-remote provincial areas (e.g. Darwin, Ballarat, Bundaberg, Geraldton, Tamworth)
- *remote* – remote areas and very remote areas. Remote: very restricted accessibility of goods, services and opportunities for social interaction (e.g. Coolabah, Mallacoota, Capella, Mt Isa, Port Lincoln, Port Hedland and Alice Springs). Very remote: very little accessibility of goods, services and opportunities for social interaction (e.g. Bourke, Thursday Island, Yalata, Condingup, Nhulunbuy).

Reference

Australian Curriculum, Assessment and Reporting Authority (2012). *Data Standards Manual: Student background characteristics*, 6th edn. Retrieved from http://www.acara.edu.au/reporting/data-standards-manual-student-background-characteristics.

Chapter 1

Introduction

TIMSS 2015

The Trends in International Mathematics and Science Study (TIMSS) is an international study directed by the International Association for the Evaluation of Educational Achievement (IEA), an independent international cooperative of national research institutions and government agencies that has been conducting studies of cross-national achievement in a wide range of subjects since 1959. In Australia, TIMSS is implemented by the Australian Council for Educational Research (ACER), which is Australia's representative to the IEA. In Australia, TIMSS is part of the National Assessment Program.

TIMSS is an assessment of mathematics and science that has been conducted at Year 4 and Year 8 on a four-year cycle since 1995. Australia has participated in TIMSS since its inception, providing rich data about trends in mathematics and science achievement over 20 years.

To inform educational policy in the participating countries, TIMSS also routinely collects extensive background information that addresses concerns about the quantity, quality and content of instruction. This background information is collected through a series of questionnaires for students, parents, teachers, principals and curriculum specialists.

What is the focus of TIMSS?

The main goal of TIMSS is to assist countries to monitor and evaluate mathematics and science teaching and learning across time and across year levels. TIMSS has a curriculum focus. Three levels of the curriculum have been defined in previous studies, and considered in relation to the context in which they occur. These are:

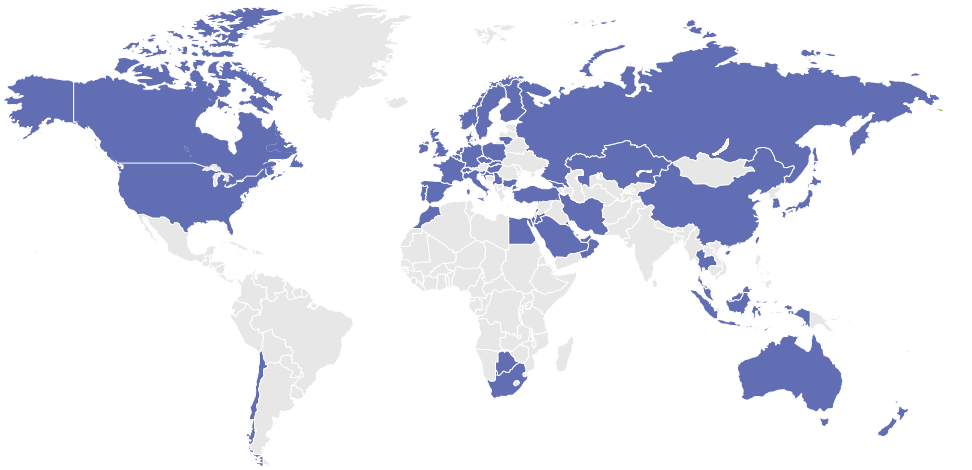
- The *intended* curriculum – defined as the curriculum as specified at national or system level. *What are mathematics and science students around the world expected to learn? How do countries vary in their intended goals, and what characteristics of education systems, schools and students influence the development of these goals? How should the education system be organised to facilitate this learning?*
- The *implemented* curriculum – defined as the curriculum as interpreted and delivered by classroom teachers. *What is actually taught in classrooms? Who teaches it? What opportunities are provided for students to learn mathematics and science? How do instructional practices vary among countries and what factors influence these variations?*

- The *attained* curriculum – which is that part of the curriculum that is learnt by students, as demonstrated by their attitudes and achievements. *What mathematics and science concepts, processes and attitudes have students learnt? What factors are linked to students' opportunity to learn, and how do these factors influence students' achievements?*

Who participated in TIMSS 2015?

Internationally

Forty-nine countries and seven benchmarking participants[1] participated in the Year 4 TIMSS assessment and 39 countries and seven benchmarking participants participated in the Year 8 TIMSS assessment. These are shown in Figure 1.1.



Participating countries

Australia	France*	Kuwait	Saudi Arabia
Bahrain	Georgia	Lebanon^	Serbia*
Belgium (Flemish)*	Germany*	Lithuania	Singapore
Botswana (9)^	Hong Kong SAR	Malaysia^	Slovak Republic*
Bulgaria*	Hungary	Malta^	Slovenia
Canada	Indonesia*	Morocco	South Africa (5, 9)
Chile	Iran, Islamic Republic of	Netherlands*	Spain*
Chinese Taipei	Ireland, Republic of	New Zealand	Sweden
Croatia*	Israel^	Northern Ireland*	Thailand^
Cyprus*	Italy	Norway (5, 9)	Turkey
Czech Republic*	Japan	Oman	United Arab Emirates
Denmark*	Jordan	Poland*	United States
Egypt^	Kazakhstan	Portugal*	
England	Korea, Republic of	Qatar	
Finland*		Russian Federation	

Benchmarking participants

Buenos Aires, Argentina
Ontario, Canada
Quebec, Canada
Norway (4, 8)
Abu Dhabi, UAE
Dubai, UAE
Florida, US

* Country participated at grade 4 only. See the Reader's Guide for more information.
^ Country participated at grade 8 only. See the Reader's Guide for more information.

FIGURE 1.1 Map of participating countries

In Australia

A stratified random sample of 287 primary schools and 285 secondary schools participated in the data collection for TIMSS 2015. The stratification of the sample ensured that the TIMSS sample was representative of the Australian Year 4 and Year 8 populations (according to jurisdiction, school sector, geographic location of the school and socioeconomic category for the area of the school).

1 A benchmarking participant is a province or region that participated in TIMSS for their own internal benchmarking. Data from these provinces are not included in the international averages or medians and are not included in this report.

At each school at least one intact class from the relevant year level – along with all Indigenous students in that year level – was selected to participate in TIMSS 2015. This resulted in a sample of 6057 Year 4 students and 10,338 Year 8 students. Statistical weighting enables those students to represent the total student population at each year level (for more information, please refer to the Reader's Guide). Table 1.1 provides the distribution of the weighted student numbers across the Australian jurisdictions at both Year 4 and Year 8.

TABLE 1.1 Distribution of weighted student numbers across the Australian jurisdictions in TIMSS 2015

	ACT	NSW	VIC	QLD	SA	WA	TAS	NT	Total
Year 4	4886	92,855	62,187	57,370	16,999	30,399	5662	2548	**272,907**
Year 8	4393	84,266	67,334	57,134	17,922	26,912	6392	2101	**266,454**

Assessment areas in TIMSS 2015

TIMSS is organised around two dimensions – a content dimension, which specifies the domains or subject matter to be assessed in mathematics and science, and a cognitive dimension, which specifies the thinking processes and sets of behaviours expected of students as they engage with the content. The proportion of item score points devoted to a content domain and, therefore, the contribution of the content domain to the overall mathematics or science scale score differ somewhat across year levels (as shown in Table 1.2). For example, in 2015 at Year 4, 50 per cent of the TIMSS mathematics assessment focused on the number content domain, while the analogous percentage at Year 8 was 30 per cent. The proportion of items devoted to each cognitive domain was similar across grades.

TABLE 1.2 TIMSS mathematics and science content and cognitive domains, and percentages of assessment for each domain

Mathematics content and cognitive domains			
Year 4		Year 8	
Content domains	% of assessment	Content domains	% of assessment
Number	50	Number	30
Geometric shapes and measures	35	Algebra	30
		Geometry	20
Data display	15	Data and chance	20
Cognitive domains	% of assessment	Cognitive domains	% of assessment
Knowing	40	Knowing	35
Applying	40	Applying	40
Reasoning	20	Reasoning	25

Science content and cognitive domains			
Year 4		Year 8	
Content domains	% of assessment	Content domains	% of assessment
Life science	45	Biology	35
Physical science	35	Chemistry	20
		Physics	25
Earth science	20	Earth science	20
Cognitive domains	% of assessment	Cognitive domains	% of assessment
Knowing	40	Knowing	35
Applying	40	Applying	35
Reasoning	20	Reasoning	30

Reporting of results in TIMSS 2015

Means and standard errors

The TIMSS 2015 mathematics and science results are represented as average scores on the TIMSS mathematics and science scales. These scales, each at both Year 4 and Year 8, were established in TIMSS 1995 to have a mean of 500 and a standard deviation of 100, and were designed to remain constant from assessment to assessment.

Typically, changes in mean performance of students from one cycle of an assessment to the next are used to assess improvement in the quality of schools and education systems. However, the mean level of performance does not provide the complete picture of student achievement and can mask significant variation within an individual class, school or education system. Countries aim not only to encourage high performance but also to minimise internal disparities in performance. Therefore, as well as a high mean score, a limited range of scores is desirable. This will be reported by examining the difference between the 5th and 95th percentiles.

Countries are generally shown in decreasing order of achievement; however, this should not be interpreted as a simple ranking. Statistical tests are used to determine whether a country's score is significantly different to that of Australia, and appropriate colour coding is used in figures.

The TIMSS benchmarks

The TIMSS achievement scales summarise Year 4 and Year 8 students' performance when interacting with a variety of mathematical and scientific tasks and questions. Students' achievement is based on their responses to test questions designed to assess a range of content areas. When comparing groups of students across and within countries, summary statistics such as the average, or mean, scale score are often used. This score, however, does not provide detailed information as to what types of tasks the students were able to undertake successfully. Instead, to provide descriptions of achievement on the scale in relation to performance on the questions asked, TIMSS uses points on the scale as international benchmarks.

Internationally, it was decided that performance should be measured at four levels. These four levels summarise the achievement reached by:

- the 'Advanced international benchmark', which was set at 625
- the 'High international benchmark', which was set at 550
- the 'Intermediate international benchmark', which was set at 475
- the 'Low international benchmark', which was set at 400.

The descriptions of the levels are cumulative, so that a student who reached the High benchmark can typically demonstrate the knowledge and skills for both the Intermediate and the Low benchmarks as well.

> The Measurement Framework for Schooling in Australia 2015 (the Australian Curriculum, Assessment and Reporting Authority, 2015) has set the Proficient Standard for TIMSS mathematics and science as the Intermediate international benchmark.
>
> The Measurement Framework for Schooling in Australia is the basis for reporting on progress towards the Melbourne Declaration on Educational Goals for Young Australians. Proficient standards represent a 'challenging but reasonable' expectation of student achievement.

Tables 1.3 and 1.4 describe the TIMSS 2015 international benchmarks for mathematics and science.

TABLE 1.3 The TIMSS 2015 international benchmarks for mathematics

	Year 4	Year 8
	Advanced international benchmark	
	Students can apply their understanding and knowledge in a variety of relatively complex situations and explain their reasoning.	*Students can apply and reason in a variety of problem situations, solve linear equations and make generalisations.*
625	They can solve a variety of multi-step word problems involving whole numbers. Students at this level show an increasing understanding of fractions and decimals. They can apply knowledge of a range of two- and three-dimensional shapes in a variety of situations. They can interpret and represent data to solve multi-step problems.	They can solve a variety of fraction, proportion and per-cent problems, and justify their conclusions. Students can use their knowledge of geometric figures to solve a wide range of problems about area. They demonstrate understanding of the meaning of averages and can solve problems involving expected values.
	High international benchmark	
	Students can apply their knowledge and understanding to solve problems.	*Students can apply their understanding and knowledge in a variety of relatively complex situations.*
550	They can solve word problems involving operations with whole numbers, simple fractions and two-place decimals. Students demonstrate understanding of geometric properties of shapes and of angles that are less than or greater than a right angle. Students can interpret and use data in tables and a variety of graphs to solve problems.	They can use information to solve problems involving different types of numbers and operations. They can relate fractions, decimals and percentages to each other. Students at this level show basic procedural knowledge related to algebraic expressions. They can solve a variety of problems with angles, including those involving triangles, parallel lines, rectangles and similar figures. Students can interpret data in a variety of graphs and solve simple problems involving outcomes and probabilities.
	Intermediate international benchmark	
	Students can apply basic mathematical knowledge in simple situations.	*Students can apply basic mathematical knowledge in a variety of situations.*
475	They demonstrate an understanding of whole numbers and some understanding of fractions and decimals. Students can relate two- and three-dimensional shapes and identify and draw shapes with simple properties. They can read and interpret bar graphs and tables.	They can solve problems involving negative numbers, decimals, percentages and proportions. Students have some knowledge of linear expressions and two- and three-dimensional shapes. They can read and interpret data in graphs and tables. They have some basic knowledge of chance.
	Low international benchmark	
	Students have some basic mathematical knowledge.	*Students have some knowledge of whole numbers and basic graphs.*
400	They can add and subtract whole numbers, have some understanding of multiplication by one-digit numbers and can solve simple word problems. They have some knowledge of simple fractions, geometric shapes and measurement. Students can read and complete simple bar graphs and tables.	There were too few items at this level to enable a description.

TABLE 1.4 The TIMSS 2015 international benchmarks for science

	Year 4	Year 8
	Advanced international benchmark	
625	*Students communicate understanding of life, physical and Earth sciences and demonstrate some knowledge of the process of scientific inquiry.*	*Students communicate understanding of complex concepts related to biology, chemistry, physics and Earth science in practical, abstract and experimental contexts.*
	Students demonstrate knowledge of characteristics and life processes of a variety of organisms, communicate understanding of relationships in ecosystems and interactions between organisms and their environment, and communicate and apply knowledge of factors related to human health. They communicate understanding of properties and states of matter and physical and chemical changes, apply some knowledge of forms of energy and energy transfer, and show some knowledge of forces and an understanding of their effect on motion. Students communicate understanding of Earth's structure, physical characteristics, processes and history, and show knowledge of Earth's revolution and rotation. Students demonstrate basic knowledge and skills related to scientific inquiry, recognising how a simple experiment should be set up, interpreting the results of an investigation, reasoning and drawing conclusions from descriptions and diagrams, and evaluating and supporting an argument.	Students apply knowledge of cells and their functions as well as characteristics and life processes of organisms. They demonstrate understanding of diversity, adaptation and natural selection among organisms, and of ecosystems and the interaction of organisms with their environment. Students apply knowledge of life cycles, and heredity in plants and animals. Students demonstrate knowledge of the composition and physical properties of matter, and apply knowledge of chemical and physical change in practical and experimental contexts. Students communicate understanding of physical states and changes in matter in practical and experimental contexts, apply knowledge of energy transfer, and demonstrate knowledge of electricity and magnetism. Students communicate understanding of forces and pressure, and demonstrate knowledge of light and sound in practical and abstract situations. Students communicate understanding of Earth's structure, physical features and resources as well as of Earth in the solar system. Students show understanding of basic aspects of scientific investigation. They identify which variables to control in an experimental situation, compare information from several sources, combine information to predict and draw conclusions, and interpret information in diagrams, maps, graphs and tables to solve problems. They provide written explanations to communicate scientific knowledge.
	High international benchmark	
550	*Students communicate and apply knowledge of the life, physical and Earth sciences in everyday and abstract contexts.*	*Students apply and communicate understanding of concepts from biology, chemistry, physics and Earth science in everyday and abstract situations.*
	Students communicate knowledge of characteristics of plants, animals and their life cycles, and apply knowledge of ecosystems and of humans' and organisms' interactions with their environment. Students communicate and apply knowledge of states and properties of matter, and of energy transfer in practical contexts, as well as showing some understanding of forces and motion. Students apply knowledge of Earth's structure, physical characteristics, processes and history, and show basic understanding of the Earth–Moon–Sun system.	Students apply knowledge of cells and their functions and of the characteristics and life processes of organisms. They communicate understanding of ecosystems and the interaction of organisms with their environment, and apply some knowledge of human health related to nutrition and infectious disease. Students show some knowledge and understanding of the composition and properties of matter and chemical change. They apply basic knowledge of energy transformation and transfer and of light and sound in practical situations, and demonstrate understanding of simple electrical circuits and properties of magnets. Students apply their knowledge of forces and motion to everyday and abstract situations.

TABLE 1.4 The TIMSS 2015 international benchmarks for science (cont.)

	Year 4	Year 8
	Students compare, contrast and make simple inferences using models, diagrams and descriptions of investigations, and provide brief descriptive responses using science concepts, both in everyday and abstract contexts.	They apply knowledge of Earth's physical features, processes, cycles and history, and show some understanding of Earth's resources, their use and conservation, as well as some knowledge of the interaction between the Earth and the Moon. Students demonstrate some scientific inquiry skills, including selecting and justifying an appropriate experimental method. They combine and interpret information from various types of diagrams, graphs and tables; select relevant information to analyse and draw conclusions; and provide short explanations conveying scientific knowledge.
	Intermediate international benchmark	
475	*Students show basic knowledge and understanding of life, physical and Earth sciences.*	*Students demonstrate and apply their knowledge of biology, chemistry, physics and Earth science in various contexts.*
	Students demonstrate some knowledge of life processes of plants and humans, communicate and apply knowledge of the interaction of living things with their environments as well as impacts humans can have on their environment, and communicate knowledge of basic facts related to human health. They apply knowledge about some properties of matter and about some facts related to electricity and to energy transfer, and apply elementary knowledge of forces and motion. They show some understanding of Earth's physical characteristics and demonstrate some basic knowledge of Earth in the solar system. Students interpret information in diagrams, apply factual knowledge to everyday situations, and provide simple explanations for biological and physical phenomena.	Students demonstrate some knowledge of characteristics and life processes of animals and human health. They apply knowledge of ecosystems, the interaction of living things and the adaptation of animals to their environments. Students apply some knowledge of the properties of matter. They also show knowledge of some aspects of force, motion and energy. Students apply knowledge of Earth's processes, resources and physical features. They interpret information from tables, graphs and pictorial diagrams to draw conclusions; apply knowledge to practical situations; and communicate their understanding through brief descriptive responses.
	Low international benchmark	
400	*Students show basic knowledge of life and physical sciences.*	*Students show basic knowledge of biology, chemistry, physics and Earth science.*
	Students demonstrate some basic knowledge of behavioural and physical characteristics of plants and animals as well as of the interaction of living things with their environments, and apply knowledge of some facts related to human health. Students show basic knowledge of states of matter and physical properties of matter. They interpret simple diagrams, complete simple tables and provide short, fact-based written responses.	Students apply basic knowledge of ecosystems and adaptation of animals to their environment, show knowledge of basic facts related to thermal and electrical conductivity and electromagnetism, and show knowledge of some basic Earth science facts. Students interpret simple pictorial diagrams and apply basic knowledge to practical situations.

Chapter 2

Year 4 mathematics

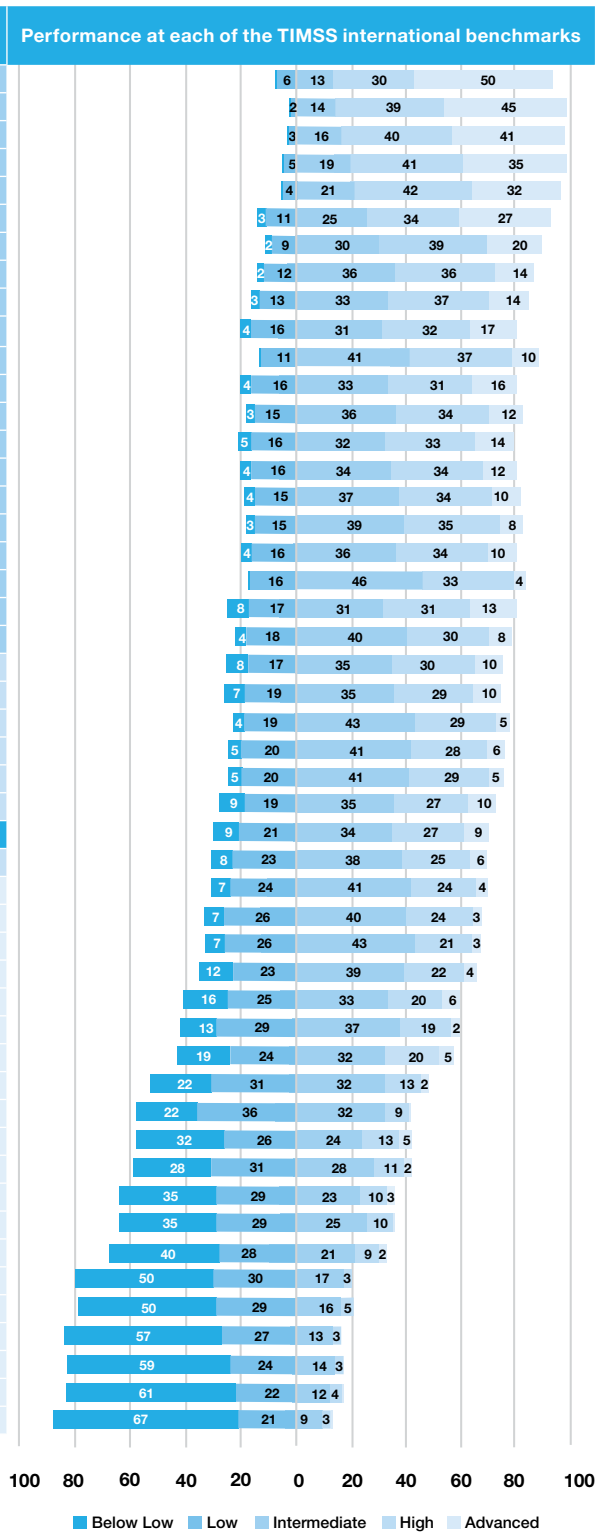
Australia's Year 4 mathematics results within the international context

Figure 2.1 (see page 11) shows the means, standard errors, gaps between the 5th and 95th percentiles and, to the right of the percentile gaps, the percentages of students in each country at the TIMSS benchmarks.

- Singapore and Hong Kong were the top-performing countries of TIMSS 2015, scoring at the upper levels of the High international benchmark, and almost at the Advanced international benchmark, the cut point of which is set at 625 score points. The scores for these countries were not significantly different to each other but were significantly higher than those for all other countries.
- Australia's average score of 517 score points was significantly higher than the scores for 20 other countries, such as Italy, Spain and New Zealand, and places average achievement at the Intermediate benchmark.
- Australia's average score was significantly lower than the average scores for 21 other countries, including Northern Ireland, Ireland, England and the United States, as well as the participating Asian countries Singapore, Hong Kong, Korea, Chinese Taipei and Japan.
- This figure also shows the range of achievement within countries, with 288 score points separating the 5th and 95th percentiles for Singapore, but more than 340 score points separating highest and lowest in Kuwait (342 points), the United Arab Emirates (347 points) and Jordan (355 score points).
- Australia's gap between high and low achievers – of 275 score points – was mid-range, similar to that of Singapore (288 points). New Zealand had a 297 score-points gap between high and low performers. As a comparison, the gap for students in the Netherlands was the lowest, at 183 points.
- In Singapore, 50 per cent of students achieved the Advanced international benchmark. In Hong Kong, Korea, Japan and Chinese Taipei, very high proportions of students (between 32 and 45%) also achieved the Advanced benchmark.

- Very low levels of students in these countries (between 2 and 7%) performed either at or below the Low international benchmark.
- Northern Ireland was the best-performing of the non-Asian countries, with 27 per cent of students at the Advanced benchmark; however, in contrast to the high standards achieved in Asian countries, 14 per cent of its students were achieving either at or below the Low benchmark.
- Nine per cent of Australian students achieved the Advanced international benchmark. Seventy per cent of Australian students achieved at least the Intermediate international benchmark, which is the proficient standard for Australia. Of concern are the 30 per cent of Australian Year 4 students achieving at or below the Low international benchmark (21% performed at the Low benchmark and a further 9% did not reach the Low benchmark).

	Country	Mean	SE	Gap 95th–5th percentiles
Achievement significantly higher than Australia's	Singapore	618	3.8	288
	Hong Kong	615	2.9	216
	Korea	608	2.2	221
	Chinese Taipei	597	1.9	235
	Japan	593	2.0	227
	Northern Ireland	570	2.9	282
	Russian Federation	564	3.4	242
	Norway (5)	549	2.5	231
	Ireland	547	2.1	238
	England	546	2.8	275
	Belgium (Flemish)	546	2.1	200
	Kazakhstan	544	4.5	269
	Portugal	541	2.2	237
	United States	539	2.3	269
	Denmark	539	2.7	248
	Lithuania	535	2.5	235
	Finland	535	2.0	218
	Poland	535	2.1	233
	Netherlands	530	1.7	183
	Hungary	529	3.2	288
	Czech Republic	528	2.2	231
Achievement not different to Australia's	Bulgaria	524	5.3	276
	Cyprus	523	2.7	266
	Germany	522	2.0	216
	Slovenia	520	1.9	228
	Sweden	519	2.8	228
	Serbia	518	3.5	287
	Australia	517	3.1	275
	Canada	511	2.3	247
Achievement significantly lower than Australia's	Italy	507	2.6	236
	Spain	505	2.5	226
	Croatia	502	1.8	215
	Slovak Republic	498	2.5	264
	New Zealand	491	2.3	297
	France	488	2.9	246
	Turkey	483	3.1	312
	Georgia	463	3.6	287
	Chile	459	2.4	240
	United Arab Emirates	452	2.4	347
	Bahrain	451	1.6	292
	Qatar	439	3.4	318
	Iran	431	3.2	335
	Oman	425	2.5	331
	Indonesia	397	3.7	293
	Jordan	388	3.1	355
	Saudi Arabia	383	4.1	301
	Morocco	377	3.4	313
	South Africa (5)	376	3.5	335
	Kuwait	353	4.6	342



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 2.1 Mean scores and percentages of students at the international benchmarks for Year 4 mathematics, by country

Trends in mathematics performance across countries

In this section, different perspectives are provided on changes of scores over time. Figure 2.2 shows the trends for Australia for TIMSS 1995, 2003, 2007, 2011 and 2015, along with those for several other countries by way of comparison. Table 2.1 shows Australia's position relative to those of all participating countries in 2015, 2011, 2007, 2003 and 1995. Figure 2.3 shows changes between 1995 and 2015 in the percentages of students achieving the Advanced international benchmark, as well as the percentages of students not achieving the Low benchmark.

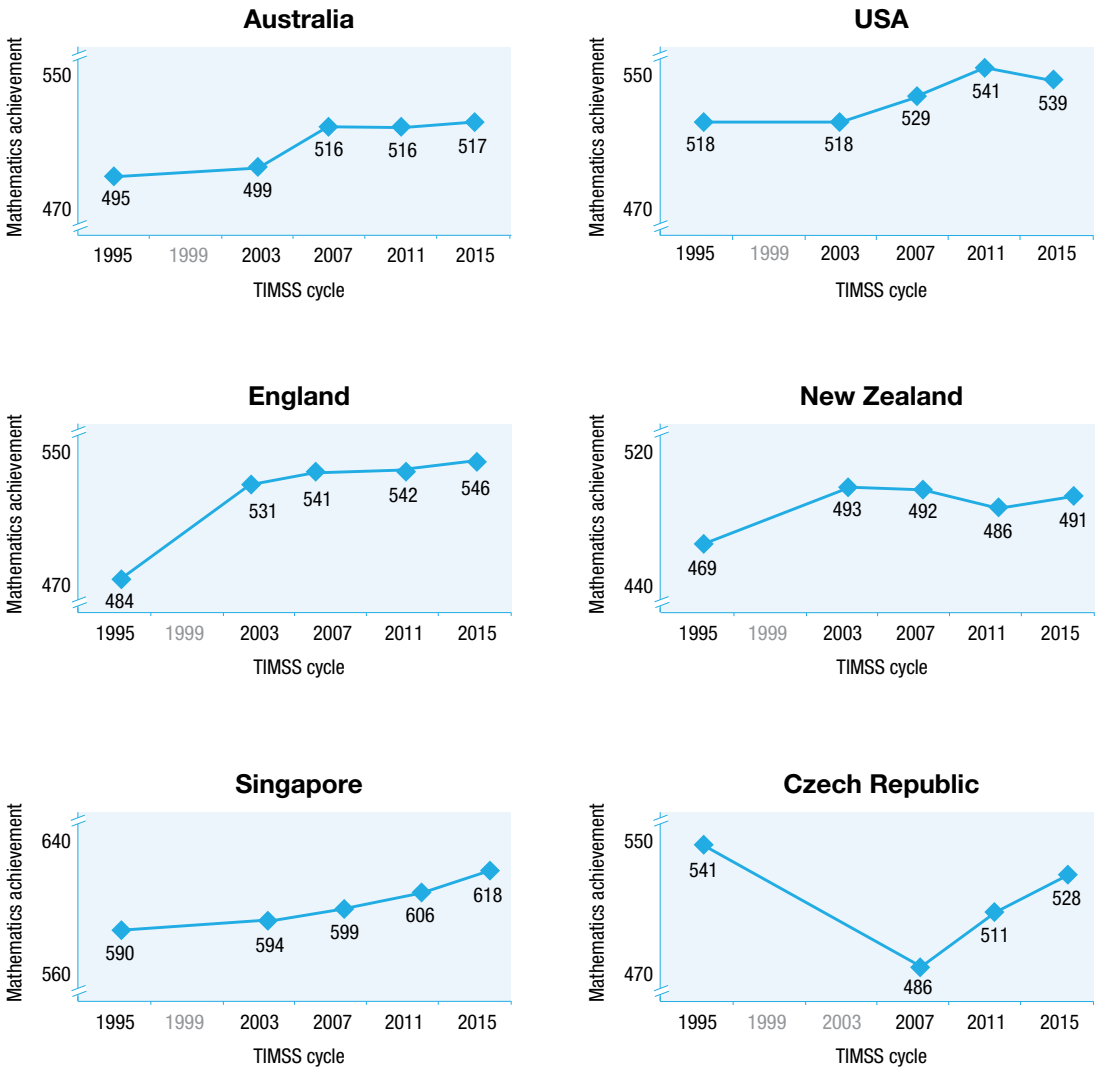


FIGURE 2.2 Trends in Year 4 mathematics achievement scores, 1995–2015, selected countries

- Australia's 2015 Year 4 mathematics score was significantly higher than the corresponding score in 1995; however, this was due to a single increase between 2003 and 2007, with no following decline. For the past three cycles, Australia's scores have been the same.
- Scores for students in the United States significantly increased over the period 2003 to 2011, but did not change over the last cycle. Similarly, England and New Zealand showed significant growth in early cycles but this has slowed over recent years.
- Singapore's score has increased steadily since TIMSS 1995, such that the mean score for 2015 is significantly higher than for all other cycles. In comparison, the score for the Czech Republic has rebounded over the past two cycles after a sharp decline in TIMSS 2007.

TABLE 2.1 Relative trends in Year 4 mathematics achievement, by country

Country	Position relative to Australia 2015	Position relative to Australia 2011	Position relative to Australia 2007	Position relative to Australia 2003	Position relative to Australia 1995
Singapore	↑	↑	↑	↑	↑
Hong Kong	↑	↑	↑	↑	↑
Korea	↑	↑	–	–	↑
Chinese Taipei	↑	↑	↑	↑	–
Japan	↑	↑	↑	↑	↑
Northern Ireland	↑	↑	–	–	–
Russian Federation	↑	↑	↑	↑	–
Norway (5)	↑	–	–	–	–
Ireland	↑	↑	–	–	↑
England	↑	↑	↑	↑	↓
Belgium (Flemish)	↑	↑	–	↑	–
Kazakhstan	↑	↓	–	–	–
Portugal	↑	↑	–	–	↓
United States	↑	↑	↑	↑	↑
Denmark	↑	↑	•	–	–
Lithuania	↑	↑	↑	↑	–
Finland	↑	↑	–	–	–
Poland	↑	–	–	–	–
Netherlands	↑	↑	↑	↑	↑
Hungary	↑	•	•	↑	↑
Czech Republic	↑	•	↓	–	↑
Bulgaria	•	–	–	–	–
Cyprus	•	–	–	↑	↓
Germany	•	↑	↑	–	–
Slovenia	•	•	↓	↓	↓
Sweden	•	↓	↓	–	–
Serbia	•	•	–	–	–
Australia					
Canada	•	–	–	–	–
Italy	↓	↓	•	•	–
Spain	↓	↓	–	–	–
Croatia	↓	↓	–	–	–
Slovak Republic	↓	↓	↓	–	–
New Zealand	↓	↓	↓	•	↓
France	↓	–	–	–	–
Turkey	↓	↓	–	–	–
Georgia	↓	↓	↓	–	–
Chile	↓	↓	–	–	–
United Arab Emirates	↓	↓	–	–	–
Bahrain	↓	↓	–	–	–
Qatar	↓	↓	–	–	–
Iran	↓	↓	↓	↓	↓
Oman	↓	↓	–	–	–
Indonesia	↓	–	–	–	–
Jordan	↓	–	–	–	–
Saudi Arabia	↓	↓	–	–	–
Morocco	↓	↓	–	–	–
South Africa (5)	↓	–	–	–	–
Kuwait	↓	↓	–	–	–

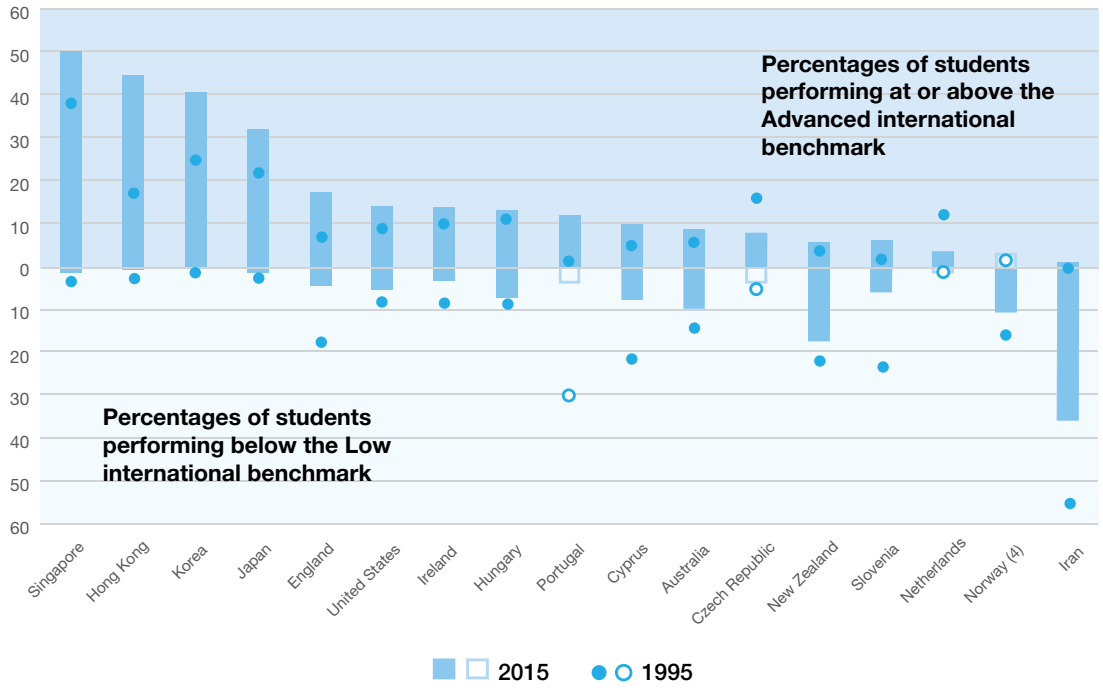
↑ Score significantly higher than Australia's.

↓ Score significantly lower than Australia's.

• Score not significantly different to that of Australia.

– Did not participate in this cycle.

- Of the countries that outperformed Australia at Year 4 in 2015, most also outperformed Australia at Year 4 in 2011.
- Hungary and the Czech Republic, which had the same score as that of Australia in 2011, outperformed Australia in 2015.
- Sweden, whose relative position was significantly lower than Australia's both in 2007 and 2011, achieved a score in TIMSS 2015 that is not significantly different to that of Australia.
- Kazakhstan, which was placed significantly lower than Australia in 2011, scored significantly higher than Australia in 2015.
- In terms of trends since 1995, England, Portugal, Cyprus and Slovenia all scored at a significantly lower level than Australia's in 1995 but have since improved to score at a level the same or significantly higher than Australia's in 2015.



Note: A coloured bar and a coloured circle indicate that the difference in the percentages of students between TIMSS 1995 and TIMSS 2015 was significant.

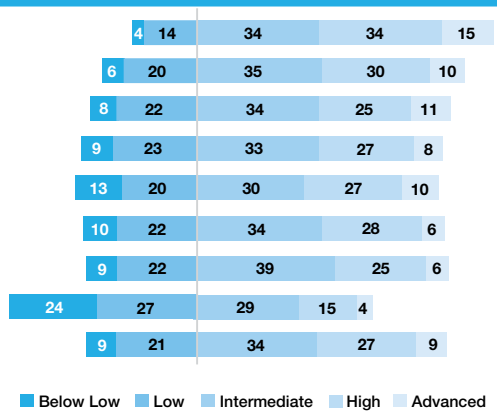
FIGURE 2.3 Percentages of high- and low-achieving students in Year 4 mathematics in TIMSS 1995 and TIMSS 2015, by country

- In the majority of countries (14 out of 17) that participated in both TIMSS 1995 and TIMSS 2015, the percentages of Year 4 students achieving the Advanced benchmark significantly increased between 1995 and 2015.
- Similarly, in 14 of the 17 countries, a higher percentage of students achieved the Low benchmark in 2015 than in 1995.

Mathematics performance in TIMSS 2015 for the Australian jurisdictions

- The spread of average scores across the jurisdictions was 77 score points between the highest-performing jurisdiction, the Australian Capital Territory, and the lowest-performing jurisdiction, the Northern Territory.
- The performance of students in the Australian Capital Territory was significantly higher than that of students in all jurisdictions except Victoria. Students in the Northern Territory performed at a level significantly below those of students in all other jurisdictions.
- The jurisdiction with the highest percentage of students achieving the Advanced benchmark was the Australian Capital Territory, in which 15 per cent of students achieved the highest level. In New South Wales 11 per cent of students achieved this benchmark, and in Western Australia and Victoria 10 per cent of students achieved it. The Northern Territory had the lowest proportion of students at this level, with just four per cent achieving the Advanced benchmark.
- Fifty-one per cent of students in the Northern Territory did not reach the Intermediate benchmark, which is the proficient standard for Australia. In the other Australian jurisdictions, this proportion ranged from 18 per cent in the Australian Capital Territory to 33 per cent in Western Australia.
- Twenty-four per cent of students in the Northern Territory and between four and 13 per cent in all other jurisdictions did not reach the Low benchmark.

Jurisdiction	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
ACT	544	7.9	251	4 14 34 34 15
VIC	525	5.5	257	6 20 35 30 10
NSW	519	7.5	282	8 22 34 25 11
TAS	513	9.6	269	9 23 33 27 8
WA	512	9.1	300	13 20 30 27 10
QLD	511	5.6	265	10 22 34 28 6
SA	510	7.9	255	9 22 39 25 6
NT	467	13.3	311	24 27 29 15 4
Australia	517	3.1	275	9 21 34 27 9



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 2.4 Mean scores and percentages of Australian students at the international benchmarks for Year 4 mathematics, by jurisdiction

TABLE 2.2 Multiple comparisons of Year 4 mathematics achievement, by jurisdiction

Jurisdiction	Mean	SE	ACT	VIC	NSW	TAS	WA	QLD	SA	NT
ACT	544	7.9		•	↑	↑	↑	↑	↑	↑
VIC	525	5.5	•		•	•	•	•	•	↑
NSW	519	7.5	↓	•		•	•	•	•	↑
TAS	513	9.6	↓	•	•		•	•	•	↑
WA	512	9.1	↓	•	•	•		•	•	↑
QLD	511	5.6	↓	•	•	•	•		•	↑
SA	510	7.9	↓	•	•	•	•	•		↑
NT	467	13.3	↓	↓	↓	↓	↓	↓	↓	

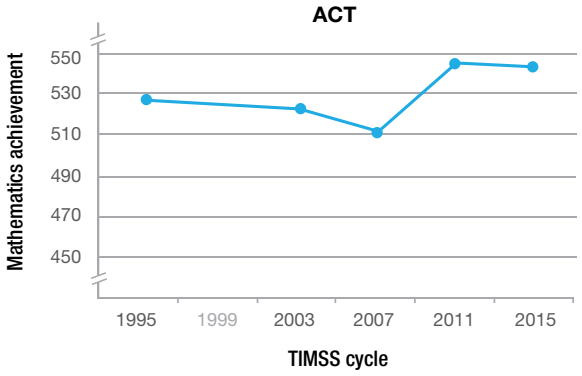
Note: Read across the row to compare a state/territory's performance with the performance of each jurisdiction listed in the column heading.

↑ Average performance statistically significantly higher than in comparison jurisdiction.

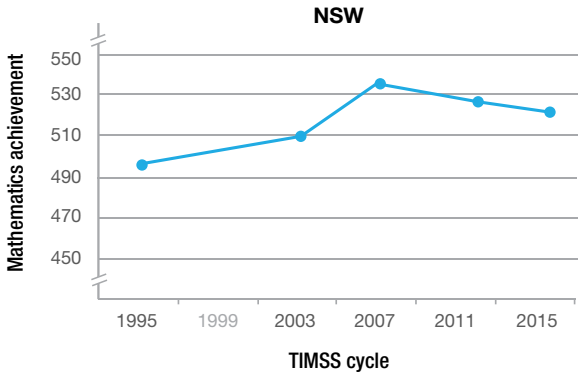
• No statistically significant difference from comparison jurisdiction.

↓ Average performance statistically significantly lower than in comparison jurisdiction.

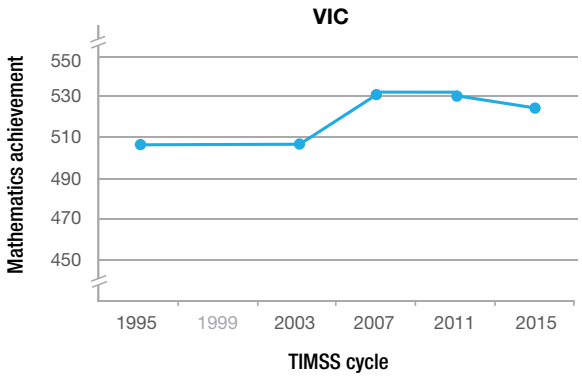
Trends for the Australian jurisdictions



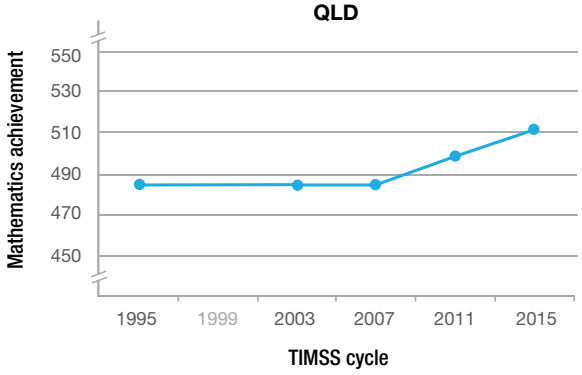
Differences between years				
	2011	2007	2003	1995
2015	-1	31 ↑	21	16
2011		32 ↑	22	18
2007			-10	-14
2003				-4



Differences between years				
	2011	2007	2003	1995
2015	-6	-15	9	23 ↑
2011		-9	15	29 ↑
2007			24 ↑	38 ↑
2003				14



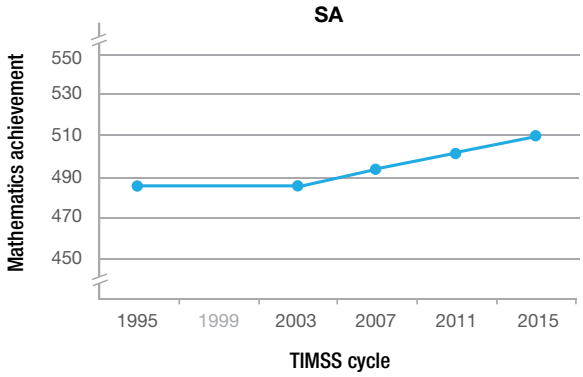
Differences between years				
	2011	2007	2003	1995
2015	-6	-7	17 ↑	18
2011		-1	23 ↑	24 ↑
2007			24 ↑	25 ↑
2003				1



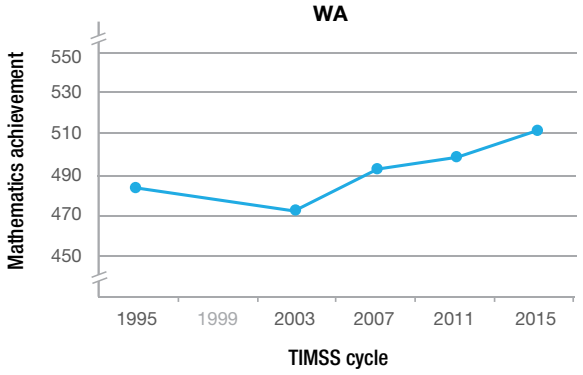
Differences between years				
	2011	2007	2003	1995
2015	12	26 ↑	27 ↑	27 ↑
2011		14	15	15
2007			1	1
2003				0

Note: Read across the row to determine if the performance in the row year is significantly higher (↑) or significantly lower (↓) than the performance in the column year.

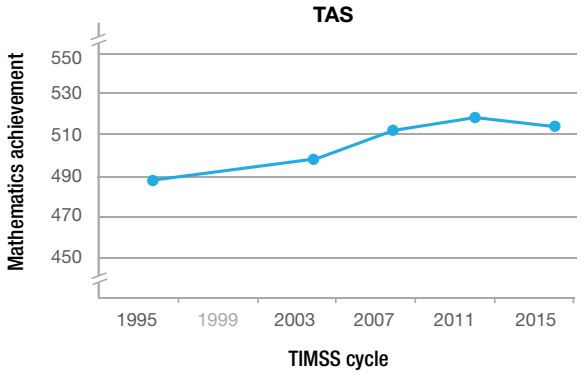
FIGURE 2.5 Trends in Year 4 mathematics achievement within Australia, 1995–2015, by jurisdiction



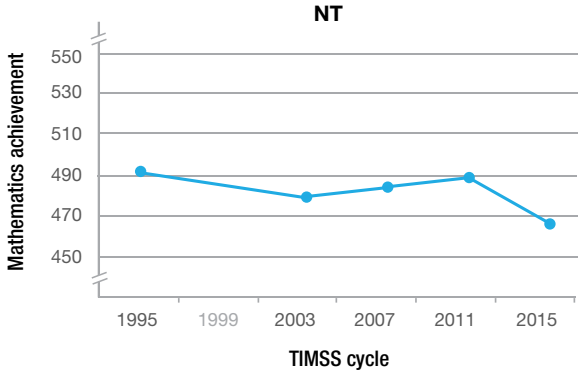
Differences between years				
	2011	2007	2003	1995
2015	8	17	25 ↑	25 ↑
2011		9	17	17
2007			8	8
2003				0



Differences between years				
	2011	2007	2003	1995
2015	13	19	40 ↑	29 ↑
2011		6	27 ↑	16
2007			21 ↑	10
2003				-11



Differences between years				
	2011	2007	2003	1995
2015	-4	3	16	27 ↑
2011		7	20	31 ↑
2007			13	24 ↑
2003				11

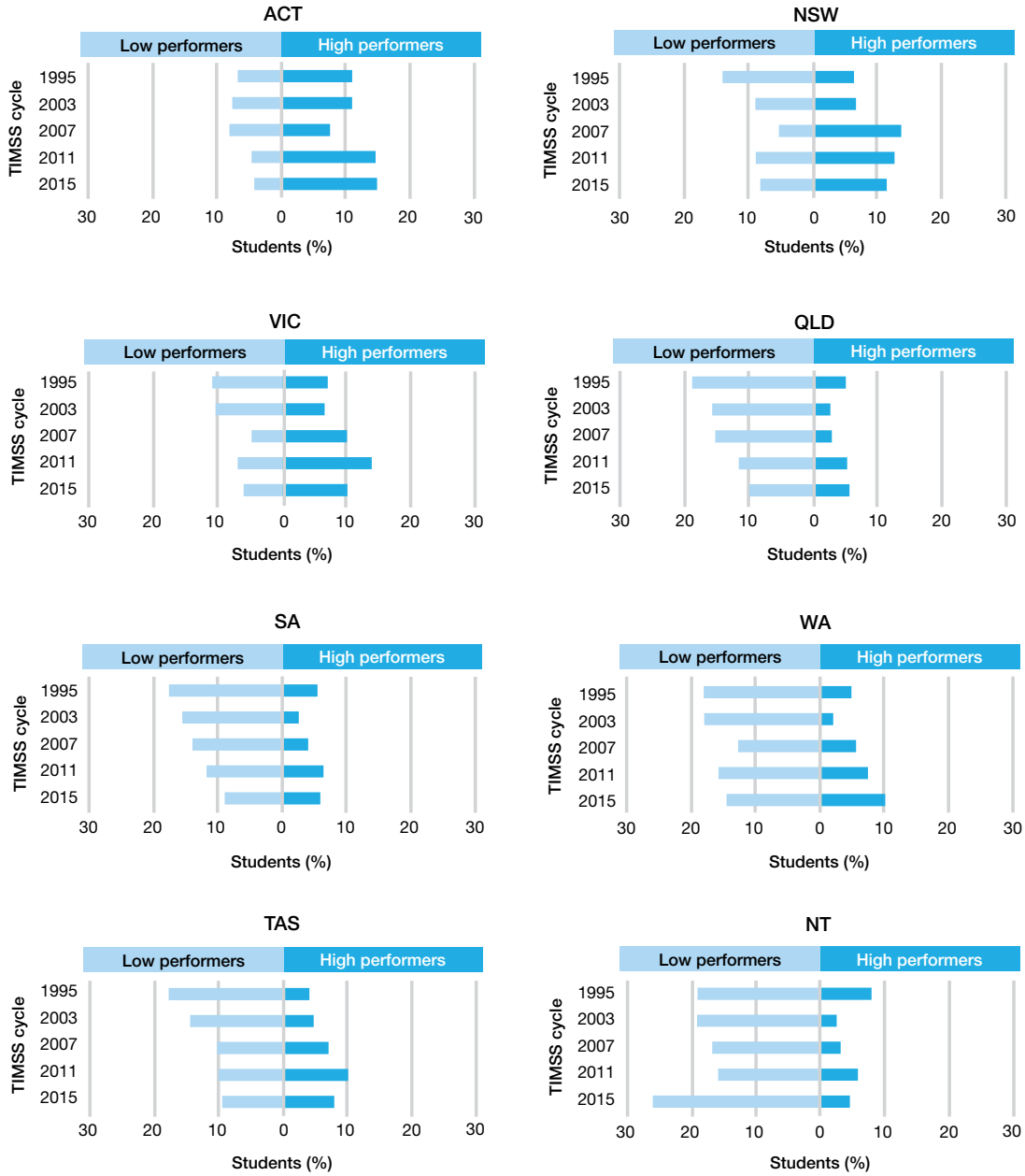


Differences between years				
	2011	2007	2003	1995
2015	-22	-17	-12	-23
2011		5	10	-2
2007			5	-7
2003				-12

Note: Read across the row to determine if the performance in the row year is significantly higher (↑) or significantly lower (↓) than the performance in the column year.

FIGURE 2.5 Trends in Year 4 mathematics achievement within Australia, 1995–2015, by jurisdiction (cont.)

- None of the differences at Year 4 between TIMSS 2011 and TIMSS 2015 were significant.
- New South Wales, Queensland, South Australia, Western Australia and Tasmania all had significantly higher average scores in 2015 than in 1995.



Note: The terms 'low performers' and 'high performers' refer, respectively, to the percentages of students who did not achieve the Low international benchmark and the percentages of students who achieved the Advanced international benchmark.

FIGURE 2.6 Percentages of high- and low-achieving students in Year 4 mathematics from TIMSS 1995 to TIMSS 2015, by jurisdiction

Figure 2.6 shows the percentage of students achieving the Advanced international benchmark in Year 4 mathematics, as well as the percentage of students not achieving the Low benchmark, for each Australian jurisdiction for all TIMSS cycles from 1995 through to 2015.

- Only in the Northern Territory was there a higher percentage of students who did not achieve the Low international benchmark in 2015 than in 1995. This reduction in the proportion of low-performing students was statistically significant in Queensland, South Australia and Tasmania, where the improvement was largest (from almost 20% in 1995 to around 10% in 2015).
- The percentage of students achieving the Advanced international benchmark has increased from 1995 to 2015 in all jurisdictions except the Northern Territory and South Australia. The gain (of around five percentage points) was statistically significant in New South Wales and Tasmania.

Australia's mathematics achievement for different demographic groups

Results for males and females

Previous TIMSS assessments have shown gender differences in mathematics achievement at Year 4 to be small on average, although the situation varies considerably from country to country.

	Female				Male					
Country	% of students	SE of %	Mean	SE	% of students	SE of %	Mean	SE	Difference (absolute value)	SE
Saudi Arabia	49	1.0	405	4.4	51	1.0	363	6.5	43	7.7
Oman	50	0.7	436	3.0	50	0.7	415	2.8	22	2.9
Jordan	46	2.4	399	3.3	54	2.4	379	4.9	20	5.8
South Africa (5)	48	0.8	384	3.8	52	0.8	368	4.4	15	4.2
Bahrain	50	0.7	459	1.7	50	0.7	443	2.3	15	2.5
Kuwait	51	2.0	359	5.4	49	2.0	347	5.6	12	6.2
Iran	50	0.9	437	4.5	50	0.9	426	4.5	10	6.3
Indonesia	48	0.6	403	4.0	52	0.6	393	3.9	10	2.7
Finland	48	0.8	540	2.3	52	0.8	531	2.6	9	2.9
Bulgaria	49	0.8	527	5.7	51	0.8	522	5.1	5	2.9
Norway (5)	49	0.9	551	2.6	51	0.9	547	3.1	4	2.9
Singapore	48	0.5	620	3.9	52	0.5	616	4.3	4	3.0
United Arab Emirates	48	2.2	453	3.9	52	2.2	450	3.4	3	5.4
Georgia	49	0.9	465	3.9	51	0.9	461	4.4	3	4.0
Serbia	48	0.8	520	3.7	52	0.8	517	4.7	3	4.7
Qatar	51	2.5	440	4.1	49	2.5	438	4.9	3	5.9
Lithuania	50	0.9	537	2.8	50	0.9	534	3.1	2	3.3
Kazakhstan	49	0.8	546	4.6	51	0.8	543	4.8	2	2.8
Morocco	48	0.7	378	3.5	52	0.7	377	3.9	1	2.8
Sweden	49	1.0	519	3.2	51	1.0	518	3.2	1	3.0
Russian Federation	49	0.9	564	3.7	51	0.9	564	3.7	1	2.8
Japan	50	0.5	593	2.0	50	0.5	593	2.5	0	2.3
Chile	49	1.7	458	2.8	51	1.7	459	3.0	1	3.2
Poland	50	0.8	534	2.3	50	0.8	536	2.7	1	2.5
Turkey	49	0.6	482	3.2	51	0.6	484	3.5	2	2.7
Northern Ireland	50	1.1	569	3.8	50	1.1	571	3.1	2	3.8
New Zealand	49	0.7	489	2.8	51	0.7	492	2.6	2	2.8
Germany	48	0.7	520	2.4	52	0.7	523	2.3	3	2.3
Ireland	47	1.5	545	2.6	53	1.5	549	2.9	4	3.4
Slovenia	49	0.8	518	2.1	51	0.8	522	2.4	4	2.6
Chinese Taipei	49	0.6	594	2.2	51	0.6	599	2.3	6	2.5
Belgium (Flemish)	50	0.9	543	2.4	50	0.9	549	2.4	6	2.4
Hungary	49	0.9	526	3.4	51	0.9	532	3.8	6	3.4
France	49	0.7	485	3.2	51	0.7	491	3.2	6	2.8
Denmark	49	0.8	536	3.1	51	0.8	542	3.0	6	2.8
England	51	0.7	543	3.0	49	0.7	549	3.3	6	2.9
Cyprus	49	0.7	520	2.9	51	0.7	526	3.1	6	2.7
United States	51	0.6	536	2.3	49	0.6	543	2.6	7	1.9
Czech Republic	49	0.9	525	3.0	51	0.9	532	2.5	7	3.2
Korea	48	0.5	604	2.3	52	0.5	612	2.5	7	1.9
Netherlands	50	0.9	526	1.8	50	0.9	534	2.2	8	2.2
Australia	49	1.0	513	3.1	51	1.0	522	3.9	9	3.5
Canada	49	0.5	506	2.5	51	0.5	515	2.6	9	2.1
Hong Kong	46	1.5	609	3.8	54	1.5	619	2.8	10	3.3
Portugal	49	0.8	536	2.4	51	0.8	547	2.5	11	2.2
Slovak Republic	48	0.9	493	3.0	52	0.9	504	2.6	11	2.6
Spain	49	0.9	499	2.7	51	0.9	511	2.7	12	2.4
Croatia	49	0.8	496	2.1	51	0.8	508	2.3	12	2.7
Italy	49	0.7	497	2.7	51	0.7	517	3.0	20	2.7
International average	49	0.2	505	0.5	51	0.2	505	0.5		

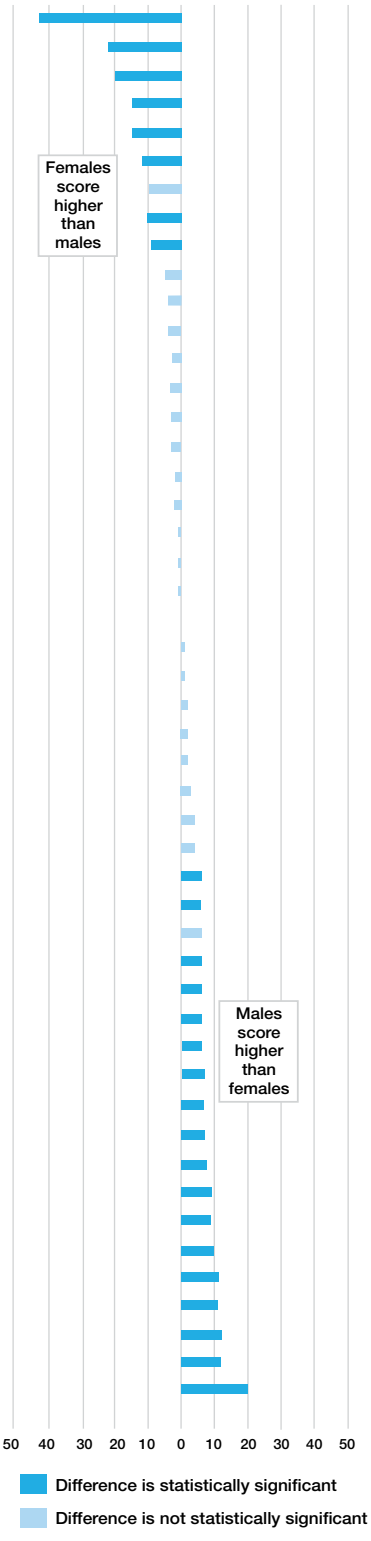


FIGURE 2.7 Sex differences in Year 4 mathematics achievement, by country

- Overall internationally, there was no achievement difference between female and male students (international average: 505 vs 505, respectively) at the Year 4 level.
- In 23 countries, there was no significant sex difference in mathematics achievement.
- Eighteen of the 26 remaining countries, including Australia, had significant differences favouring male students. These differences ranged in size from six score points in, for example, England, nine score points in Australia, through to 20 score points in Italy. There were fewer countries, on average, in which females outperformed males than in which males outperformed females. Where females did outperform males, the differences were generally larger. Eight countries had larger differences favouring female over male students (from nine score points in Finland through to 22 score points in Oman and 43 score points in Saudi Arabia).
- In Australia, both male and female students achieved at a significantly higher level than their respective international means.

Sex	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Female	49	513	3.1	270	9 22 36 25 8
Male	51	522	3.9	280	8 21 32 29 10

Below Low Low Intermediate High Advanced

Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 2.8 Mean scores and percentages of Australian students at the international benchmarks for Year 4 mathematics, by sex

- The difference between Australian male and female students at Year 4 was statistically significant.
- A slightly higher percentage of Australian male than female students achieved the High and Advanced benchmarks.
- A slightly higher percentage of Australian female than male students did not reach the Intermediate benchmark.

Trends in mathematics achievement by sex

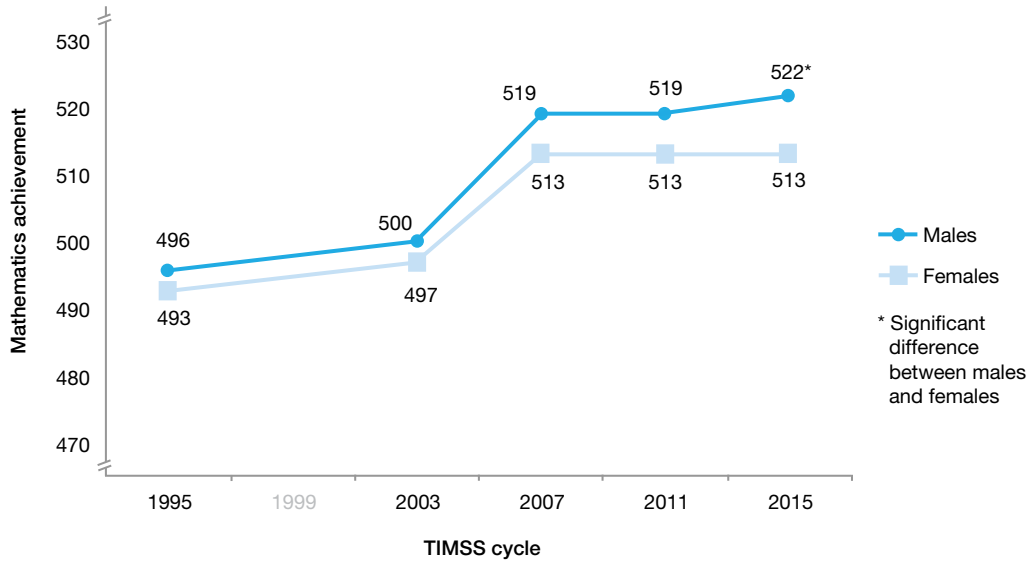


FIGURE 2.9 Trends in Year 4 mathematics achievement within Australia, 1995–2015, by sex

- Figure 2.9 shows the widening gap between the scores of males and females at Year 4 in Australia. This is the first time since 1995 that a statistically significant gender gap has been found at this year level in Australia.

Sex difference in mathematics achievement by jurisdiction

Jurisdiction	Female		Male		Difference (absolute value)	SE
	Mean	SE	Mean	SE		
NT	469	15.6	465	15.1	4	15.1
NSW	520	7.0	518	9.6	1	7.7
TAS	510	10.7	516	10.8	7	9.7
QLD	505	5.4	517	6.6	12	5.1
ACT	536	7.6	550	10.0	14	9.8
SA	502	9.2	518	8.7	15	7.8
WA	504	8.9	520	11.1	16	8.5
VIC	516	7.0	533	5.6	17	6.4

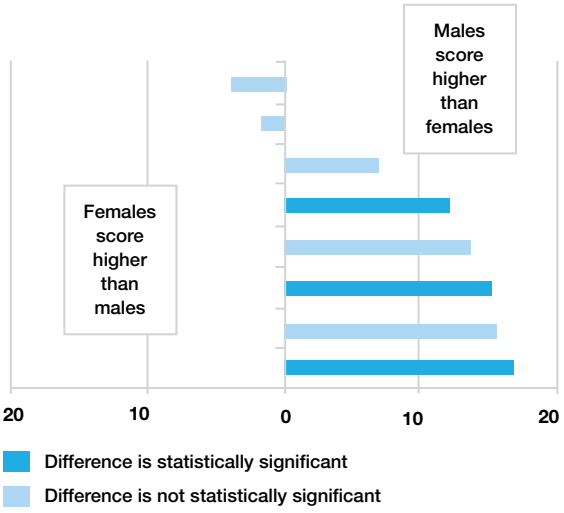
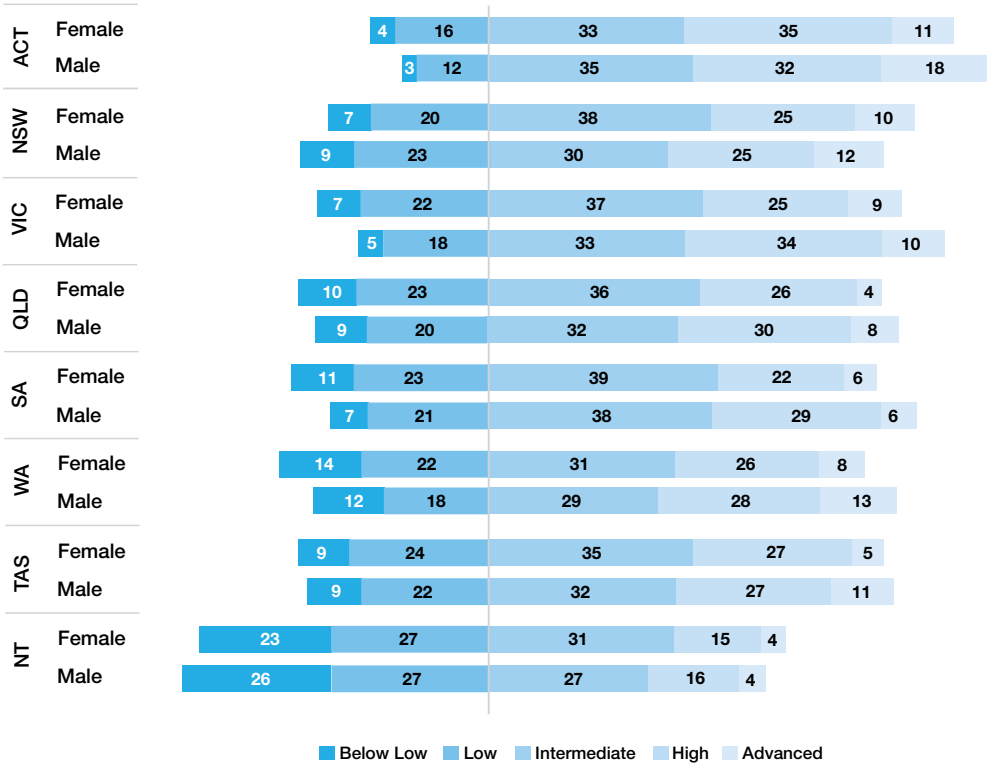


FIGURE 2.10 Sex differences in Year 4 mathematics achievement within Australia, by jurisdiction

- The gaps between the scores of females and males were significant only in Victoria, Queensland and South Australia, in favour of male students. In all other jurisdictions, the differences were not statistically significant.



Note: Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 2.11 Percentages of Australian students at the international benchmarks for Year 4 mathematics, by sex within jurisdiction

Focusing on the three jurisdictions with significant differences between male and female students:

- In Victoria, 44 per cent of male students reached the High and Advanced benchmarks compared to 34 per cent of female students; and at the other end of achievement, 30 per cent of female students compared to 22 per cent of male students were at or below the Low benchmark.
- In Queensland, 38 per cent of male students reached the High or Advanced benchmarks, compared to 31 per cent of female students. Thirty per cent of male students and 33 per cent of female students were at or below the Low benchmark.
- In South Australia, 35 per cent of male students reached the High or Advanced benchmarks, compared to 27 per cent of female students. Twenty-seven per cent of male students and 34 per cent of female students were at or below the Low benchmark.

Results for books in the home

This section presents Australian students' mathematics achievement according to the number of books in the home. For more information about this variable, please refer to the Reader's Guide.

Number of books in the home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Many books	16	548	4.4	269	4 14 29 35 17
Average number of books	57	529	2.6	253	5 18 35 31 10
A few books	26	474	4.4	264	18 31 34 14 3

Below Low Low Intermediate High Advanced

Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

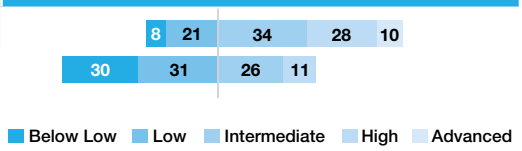
FIGURE 2.12 Mean scores and percentages of students at the international benchmarks for Year 4 mathematics, by number of books in the home

- The majority of Australian Year 4 students (57%) reported having an *average number of books* and only 16 per cent reported having *many books* at home.
- Students who have *many books* in the home were found to have attained the highest levels of mathematics achievement, scoring, on average, 19 score points higher than students with an *average number of books* in the home, and 74 score points higher than those who reported having a *few books* in the home.
- Of those students who reported having *many books* in the home, 17 per cent achieved the Advanced benchmark. The proportion of students achieving this highest benchmark fell to 10 per cent for students in the *average number of books* category and just three per cent of those with a *few books* in the home.
- Half of the students who reported having a *few books* in the home did not achieve the Intermediate benchmark, with 31 per cent of these achieving the Low benchmark and a further 18 per cent falling below the Low benchmark.
- In comparison, of the students who reported having *many books* in the home, 14 per cent achieved the Low benchmark and just four per cent failed to achieve even this very basic level.

Results for Indigenous students

This section presents Australian students' mathematics achievement according to Indigenous status. For more information about this variable, please refer to the Reader's Guide.

Indigenous background	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Non-Indigenous	96	520	2.9	270	
Indigenous	4	446	8.3	288	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 2.13 Mean scores and percentages of students at the international benchmarks for Year 4 mathematics, by Indigenous background

- Indigenous students attained an average score of 446 score points in mathematics, which is 74 score points lower than the average score for non-Indigenous students of 520.
- The mean score for Indigenous students is lower than the Intermediate international benchmark, while the average mathematics score for non-Indigenous students is almost at the High international benchmark (set at 550 points).
- One per cent of Indigenous students reached the Advanced benchmark compared to 10 per cent of non-Indigenous students.
- Of concern is that 61 per cent of Indigenous students compared to 28 per cent of non-Indigenous students did not achieve the Intermediate international benchmark, with 30 per cent of Indigenous students not reaching even the Low benchmark.

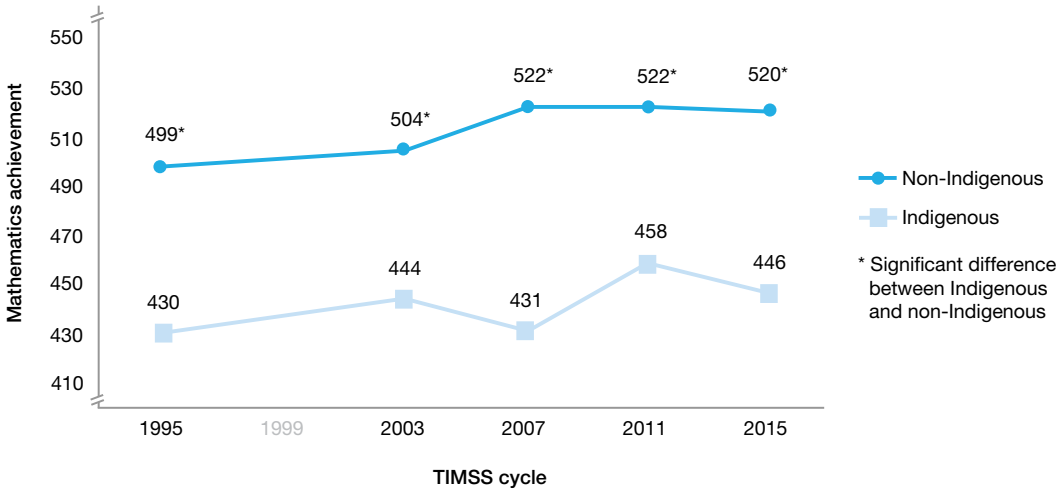


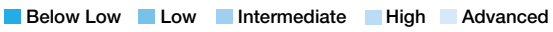
FIGURE 2.14 Trends in Year 4 mathematics achievement within Australia, 1995–2015, by Indigenous background

- While there has been some change over time for Indigenous students, due to large standard errors, none of these changes have been significant.
- The average score for non-Indigenous students has not changed for the past three cycles. From TIMSS 1995 the increase has been 21 score points.
- The gap in average mathematics performance of Indigenous and non-Indigenous Year 4 students has changed little over 20 years: from 69 score points in 1995 to 74 score points in 2015.

Results for language spoken at home

This section presents Australian students' mathematics achievement according to whether a language other than English is spoken as the main language at home. For more information about this variable, please refer to the Reader's Guide.

Language spoken at home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
English	85	518	3.1	271	8 21 34 28 9
Other	15	518	6.6	288	9 23 33 24 11



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

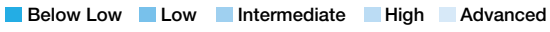
FIGURE 2.15 Mean scores and percentages of students at the international benchmarks for Year 4 mathematics, by language spoken at home

- While the majority of students tested in Year 4 spoke English 'always' or 'almost always' at home, there were around 15 per cent of students for whom this was not true.
- There were no significant differences in the average scores of the two groups.

Results for geographic location of the school

This section presents Australian students' mathematics achievement according to the geographic location of the school. For more information about this variable, please refer to the Reader's Guide.

Geographic location	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Metropolitan	69	526	3.2	267	7 20 33 30 11
Provincial	30	498	7.0	274	13 25 36 21 6
Remote	1	456	12.5	310	29 26 27 14 3



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 2.16 Mean scores and percentages of students at the international benchmarks for Year 4 mathematics, by geographic location

- Students attending school in remote areas make up only one per cent of the Year 4 TIMSS sample, while those attending school in metropolitan areas make up 69 per cent of the sample.
- Students attending schools in metropolitan areas achieved, on average, 29 score points higher than students attending schools in provincial areas, and 70 score points, on average, higher than students in remote schools. Students attending schools in provincial areas scored, on average, 41 score points higher than students attending schools in remote areas. All these differences are statistically significant.

- More than half (56%) of the students in remote schools did not reach the Intermediate international benchmark. More than half of these students performed below the Low international benchmark. In contrast, only 13 per cent of students from provincial schools and seven per cent of students from metropolitan schools were performing at a level below that of the Low international benchmark.
- The difference in achievement is even more evident at the higher end of the achievement spectrum. While some students from remote schools did achieve scores above the international mean score of 500, only three per cent achieved the Advanced international benchmark, compared to six per cent of students from provincial schools and 11 per cent of students from metropolitan schools.

Chapter 3

Year 8 mathematics

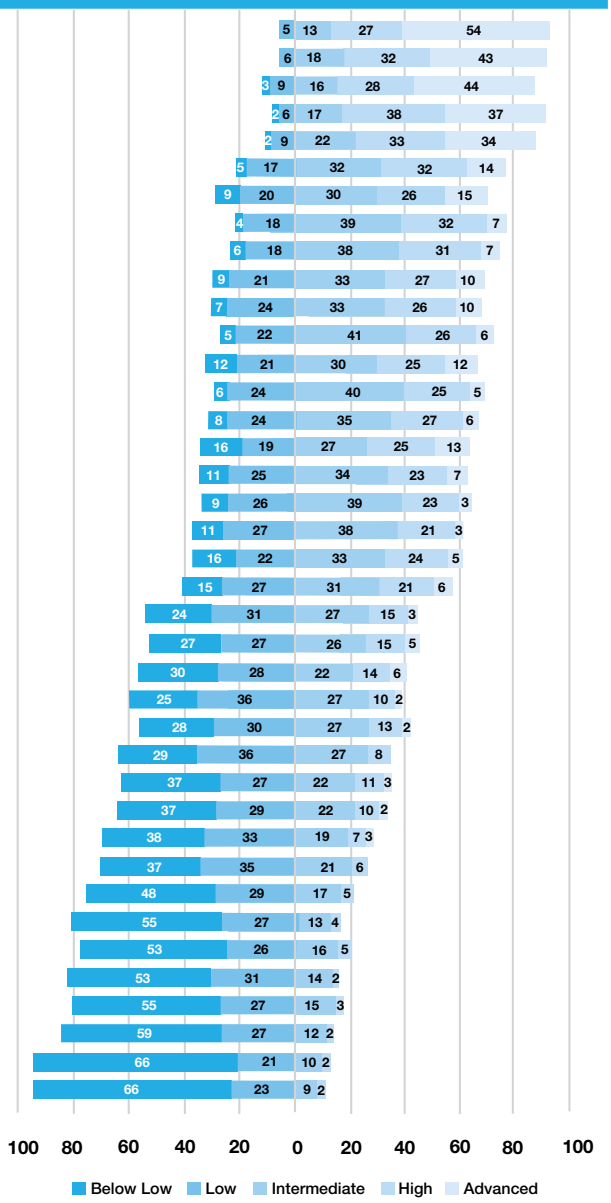
Australia's Year 8 mathematics results within the international context

Figure 3.1 (see page 28) shows the means, standard errors, gaps between the 5th and 95th percentiles and, to the right of the percentile gaps, the percentages of students in each country at the TIMSS benchmarks.

- Singapore, Korea, Chinese Taipei, Hong Kong and Japan recorded the highest achievement at Year 8, with average performance above the High international benchmark of 550. Singapore's score of 621 was significantly higher than the scores of all other countries, followed by Korea (606) and Chinese Taipei (599), whose scores were not significantly different to each other but were significantly higher than those of all other countries. These scores are all in the upper ranges of the High international benchmark, almost achieving an average at the Advanced international benchmark.
- Australian Year 8 students' average score of 505 score points was significantly higher than the scores for 21 other countries, such as Italy, New Zealand and Malaysia, and places average achievement at the Intermediate benchmark.
- Australia was significantly outperformed by 12 countries, including Canada, Ireland, England and the United States, as well as the top five East Asian countries mentioned above and the Russian Federation, Kazakhstan and Slovenia.
- Canada and Slovenia, both relatively high-achieving countries, had the smallest gap between high and low achievers (229 score points), while Turkey had the largest gap, of 345 score points. Australia's gap was about mid-range at 272 score points, similar to that of Singapore and the United States.
- The East Asian countries of Singapore, Chinese Taipei, Korea, Hong Kong and Japan have an impressive percentage of Year 8 students reaching the Advanced benchmark. In the top five countries, over one-third of Year 8 students achieved the Advanced benchmark, with over 50 per cent of Year 8 students in Singapore doing so.
- Kazakhstan (15%), the Russian Federation (14%), Israel (13%) and Hungary (12%) were the next best at reaching the Advanced benchmark, while 10 per cent of students in England and the United States achieved this standard.

- In all other countries, including Australia, the percentage of Year 8 students reaching the Advanced benchmark in mathematics was seven per cent or less. The international median was five per cent of students attaining this level. Sixty-four per cent of Australian students achieved at least the Intermediate international benchmark, which is the proficient standard for Australia. Of concern are the 36 per cent of Australian Year 8 students who were found to be achieving at or below the Low international benchmark (25% performed at the Low benchmark and a further 11% did not reach the Low benchmark).

	Country	Mean	SE	Gap 95th–5th percentiles
Achievement significantly higher than Australia's	Singapore	621	3.2	273
	Korea	606	2.6	283
	Chinese Taipei	599	2.4	320
	Hong Kong	594	4.6	262
	Japan	586	2.3	295
	Russian Federation	538	4.7	270
	Kazakhstan	528	5.3	304
	Canada	527	2.2	229
	Ireland	523	2.7	242
	United States	518	3.1	273
	England	518	4.2	260
	Slovenia	516	2.1	229
Achievement not different to Australia's	Hungary	514	3.8	305
	Norway (9)	512	2.3	230
	Lithuania	511	2.8	253
	Israel	511	4.1	332
	Australia	505	3.1	272
	Sweden	501	2.8	235
Achievement significantly lower than Australia's	Italy	494	2.5	247
	Malta	494	1.0	293
	New Zealand	493	3.4	288
	Malaysia	465	3.6	283
	United Arab Emirates	465	2.0	320
	Turkey	458	4.7	345
	Bahrain	454	1.4	264
	Georgia	453	3.4	299
	Lebanon	442	3.6	246
	Qatar	437	3.0	335
	Iran	436	4.6	308
	Thailand	431	4.8	294
	Chile	427	3.2	263
	Oman	403	2.4	316
	Kuwait	392	4.6	303
	Egypt	392	4.1	324
	Botswana (9)	391	2.0	278
	Jordan	386	3.2	307
	Morocco	384	2.3	265
	South Africa (9)	372	4.5	287
	Saudi Arabia	368	4.6	284



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 3.1 Mean scores and percentages of students at the international benchmarks for Year 8 mathematics, by country

Trends in mathematics performance across countries

In this section, different perspectives are provided on changes of scores over time. Figure 3.2 shows the trends for Australia for TIMSS 1995, 2003, 2007, 2011 and 2015, along with those for several other countries by way of comparison. Table 3.1 shows Australia's position relative to those of all participating countries in 2015, 2011, 2007, 2003 and 1995. Figure 3.3 shows changes between 1995 and 2015 in the percentages of students achieving the Advanced international benchmark, as well as the percentages of students not achieving the Low benchmark.

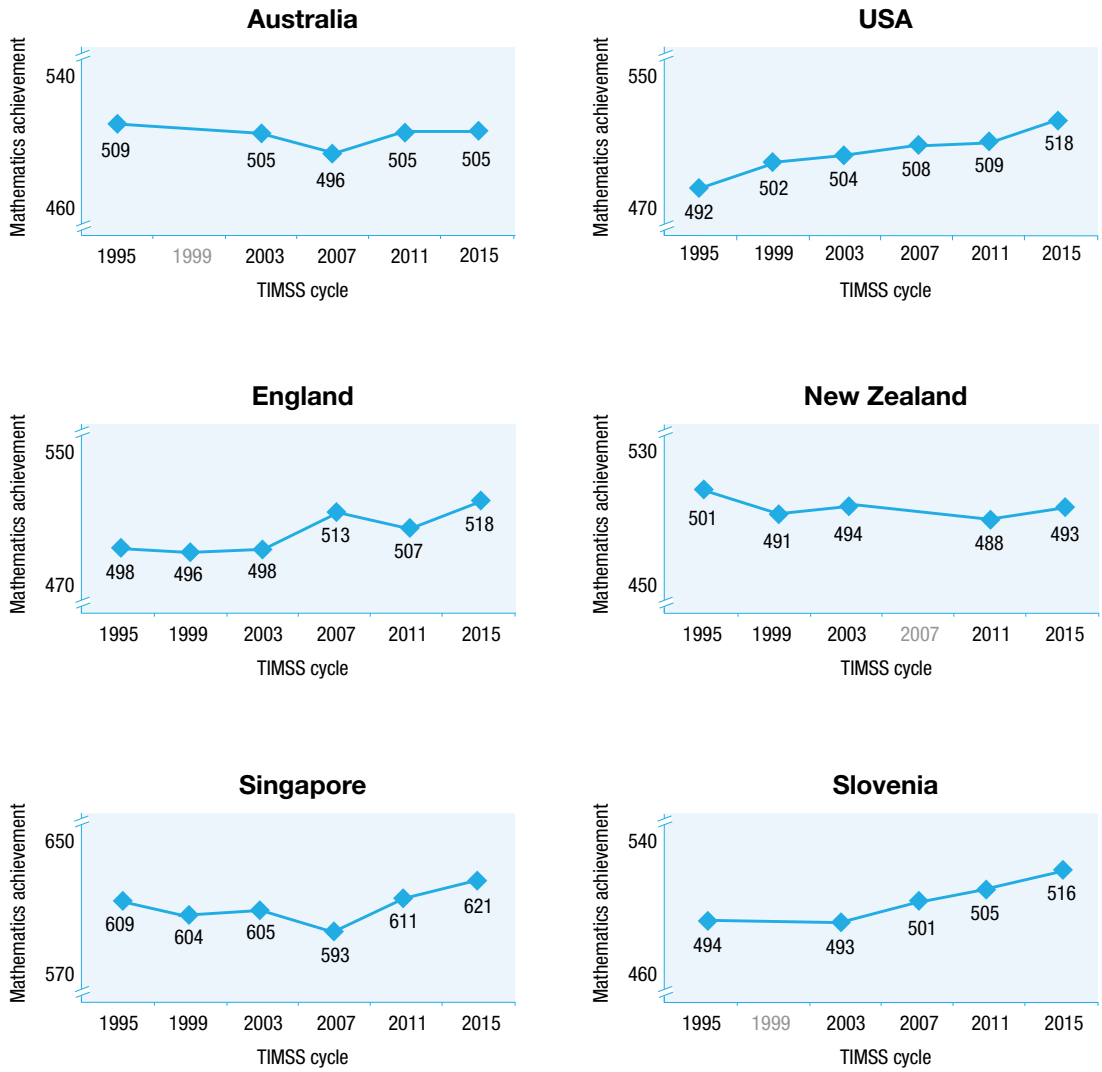


FIGURE 3.2 Trends in Year 8 mathematics achievement scores, 1995–2015, selected countries

- Australia's score at Year 8 was the same as in TIMSS 1995, with only a slight dip in scores in 2007 and then a recovery in 2011.
- The United States and England have improved over recent cycles so that their average performance is now significantly higher than that of Australia.
- Slovenia has improved slowly and steadily since 2003 – its score has progressed from lower than or equal to Australia's score to a level, in 2015, that is significantly higher than Australia's.

TABLE 3.1 Relative trends in Year 8 mathematics achievement, by country

Country	Position relative to Australia 2015	Position relative to Australia 2011	Position relative to Australia 2007	Position relative to Australia 2003	Position relative to Australia 1995
Singapore	↑	↑	↑	↑	↑
Korea	↑	↑	↑	↑	↑
Chinese Taipei	↑	↑	↑	↑	–
Hong Kong	↑	↑	↑	↑	↑
Japan	↑	↑	↑	↑	↑
Russian Federation	↑	↑	↑	•	•
Kazakhstan	↑	↓	–	–	–
Canada	↑	–	–	–	–
Ireland	↑	–	–	–	•
United States	↑	•	↑	•	↓
England	↑	•	↑	•	↓
Slovenia	↑	•	•	↓	↓
Hungary	•	•	↑	↑	↑
Norway (9)	•	–	–	–	–
Lithuania	•	•	•	•	↓
Israel	•	•	–	–	–
Australia					
Sweden	•	↓	•	•	↑
Italy	↓	•	↓	↓	–
Malta	↓	–	↓	–	–
New Zealand	↓	↓	–	•	•
Malaysia	↓	↓	↓	•	–
United Arab Emirates	↓	↓	–	–	–
Turkey	↓	↓	–	–	–
Bahrain	↓	↓	↓	↓	–
Georgia	↓	↓	↓	–	–
Lebanon	↓	↓	↓	↓	–
Qatar	↓	↓	–	–	–
Iran	↓	↓	↓	↓	↓
Thailand	↓	↓	↓	–	–
Chile	↓	↓	–	↓	–
Oman	↓	↓	↓	–	–
Kuwait	↓	–	–	–	–
Egypt	↓	–	↓	↓	–
Botswana (9)	↓	↓	–	–	–
Jordan	↓	↓	↓	↓	–
Morocco	↓	↓	–	–	–
South Africa (9)	↓	↓	–	–	–
Saudi Arabia	↓	↓	–	–	–

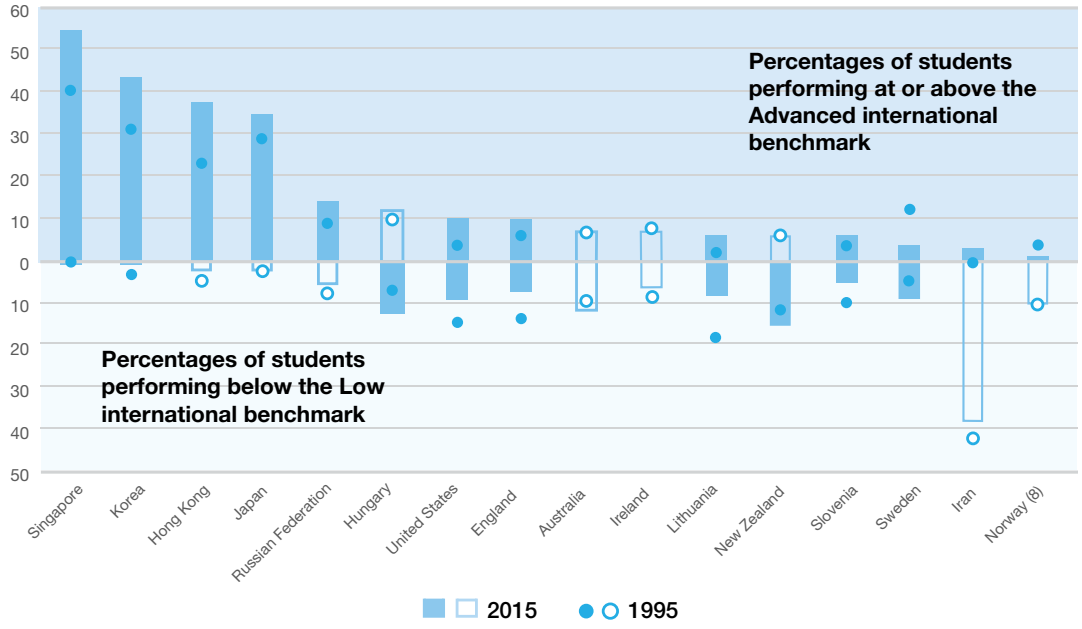
↑ Score significantly higher than Australia's.

↓ Score significantly lower than Australia's.

• Score not significantly different to that of Australia.

– Did not participate in this cycle.

- The scores of the United States, England and Slovenia were not significantly different to Australia's in 2011, but were significantly higher in 2015.
- Kazakhstan and Sweden scored significantly lower than Australia in 2011; in 2015, Sweden's score was not significantly different to Australia's, while that of Kazakhstan was significantly higher.
- In terms of trends since 1995, England, the United States and Slovenia scored lower than Australia in 1995, and in 2015 outperformed Australia. Lithuania scored significantly lower than Australia in 1995 and attained an equivalent level in 2015. The Russian Federation and Ireland both scored at an equivalent level to that of Australia in 1995 and outperformed Australia in 2015.



Note: A coloured bar and a coloured circle indicate that the difference in the percentages of students between TIMSS 1995 and TIMSS 2015 was significant.

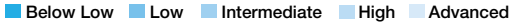
FIGURE 3.3 Percentages of high- and low-achieving students in Year 8 mathematics in TIMSS 1995 and TIMSS 2015, by country

- In the majority of countries (10 out of 16) that participated in both TIMSS 1995 and TIMSS 2015, the percentages of Year 8 students achieving the Advanced benchmark significantly increased over this time. Australia was one of the exceptions to this, with no significant change in the percentage of Australian Year 8 students achieving the Advanced benchmark over the past 20 years.
- In terms of achieving the Low international benchmark, seven of the 16 countries showed no significant difference, five countries showed a reduction in the numbers of students falling below the Low benchmark and four countries showed an increase in the percentages of students falling below the Low benchmark over the 20-year period. Australia was one of the countries for which there was no change in the percentage of students falling below the Low benchmark.

Mathematics performance in TIMSS 2015 for the Australian jurisdictions

- The spread of average scores across the jurisdictions was 65 score points, between the highest-performing jurisdictions, Victoria and the Australian Capital Territory, and the lowest-performing jurisdiction, the Northern Territory.
- Students in Victoria and the Australian Capital Territory significantly outperformed students in Queensland, Tasmania and the Northern Territory, but their results were not significantly different to those of students in Western Australia, New South Wales and South Australia.
- The average scores for Western Australia, New South Wales, South Australia, Queensland and Tasmania were not significantly different to each other but were significantly higher than that of the Northern Territory.
- No Australian jurisdictions had more than nine per cent of Year 8 students reaching the Advanced international benchmark. While this is very low compared to the 54 per cent of students in Singapore who achieved this level, it was a result similar to that of the majority of other countries.
- The jurisdiction with the highest percentage of students achieving the Advanced benchmark was Victoria, with nine per cent of Year 8 students, closely followed by Western Australia, with eight per cent. The Northern Territory had the lowest proportion of students at this level, with one per cent achieving the Advanced benchmark.
- Sixty per cent of students in the Northern Territory did not reach the Intermediate benchmark, which is the proficient standard for Australia. In the other Australian jurisdictions, this proportion ranged from 30 per cent in Victoria and the ACT to 39 per cent in Tasmania.
- Twenty-five per cent of students in the Northern Territory and between seven and 14 per cent in all other jurisdictions did not reach the Low benchmark.

Jurisdiction	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
ACT	516	4.5	250	7 23 35 28 7
VIC	516	5.1	262	7 23 36 24 9
WA	508	6.0	277	12 24 31 25 8
NSW	503	6.9	282	12 25 32 24 7
SA	498	9.1	280	14 25 34 22 6
QLD	498	5.7	249	11 27 36 22 4
TAS	493	8.4	280	14 26 33 23 4
NT	452	10.0	249	25 35 29 10
Australia	505	3.1	272	11 25 34 23 7



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 3.4 Mean scores and percentages of Australian students at the international benchmarks for Year 8 mathematics, by jurisdiction

TABLE 3.2 Multiple comparisons of Year 8 mathematics achievement, by jurisdiction

Jurisdiction	Mean	SE	ACT	VIC	WA	NSW	SA	QLD	TAS	NT
ACT	516	4.5		•	•	•	•	↑	↑	↑
VIC	516	5.1	•		•	•	•	↑	↑	↑
WA	508	6.0	•	•		•	•	•	•	↑
NSW	503	6.9	•	•	•		•	•	•	↑
SA	498	9.1	•	•	•	•		•	•	↑
QLD	498	5.7	↓	↓	•	•	•		•	↑
TAS	493	8.4	↓	↓	•	•	•	•		↑
NT	452	10.0	↓	↓	↓	↓	↓	↓	↓	

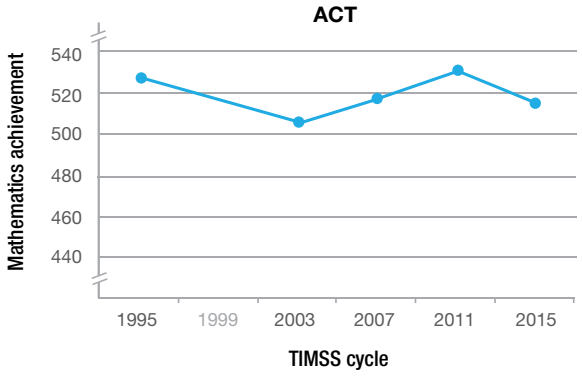
Note: Read across the row to compare a state/territory's performance with the performance of each jurisdiction listed in the column heading.

↑ Average performance statistically significantly higher than in comparison jurisdiction.

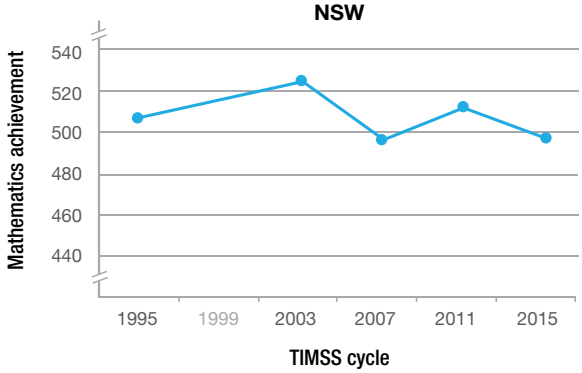
• No statistically significant difference from comparison jurisdiction.

↓ Average performance statistically significantly lower than in comparison jurisdiction.

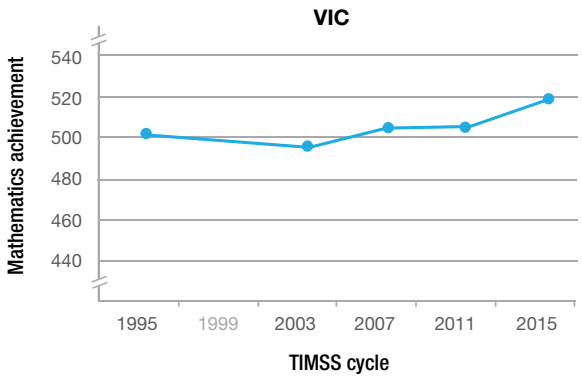
Trends for the Australian jurisdictions



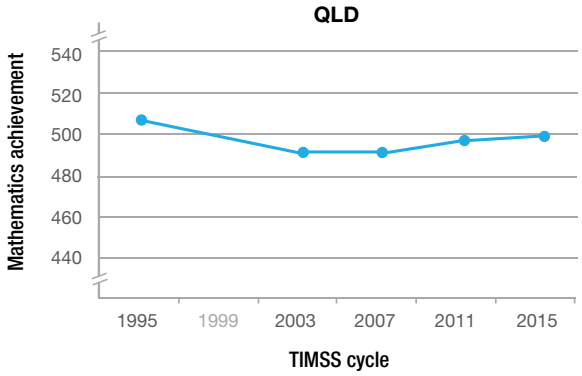
Differences between years				
	2011	2007	2003	1995
2015	-15	-2	10	-12
2011		13	25	4
2007			12	-10
2003				-21



Differences between years				
	2011	2007	2003	1995
2015	-15	3	-28 ↓	-10
2011		18	-13	6
2007			-31	-13
2003				18



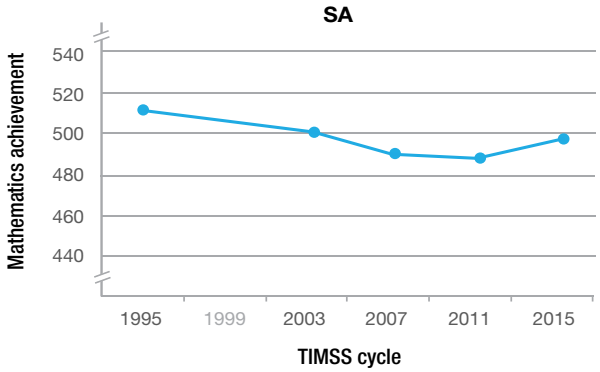
Differences between years				
	2011	2007	2003	1995
2015	12	13	22 ↑	16 ↑
2011		1	10	4
2007			9	3
2003				-5



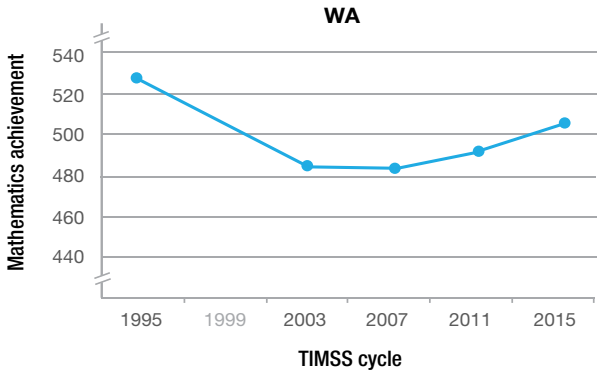
Differences between years				
	2011	2007	2003	1995
2015	1	8	8	-8
2011		6	7	-9
2007			0	-15
2003				-16

Note: Read across the row to determine if the performance in the row year is significantly higher (↑) or significantly lower (↓) than the performance in the column year.

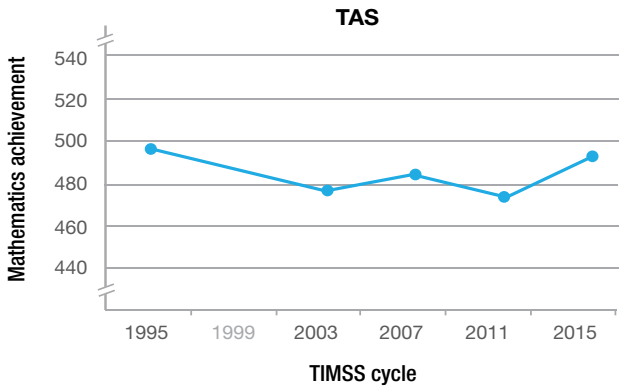
FIGURE 3.5 Trends in Year 8 mathematics achievement within Australia, 1995–2015, by jurisdiction



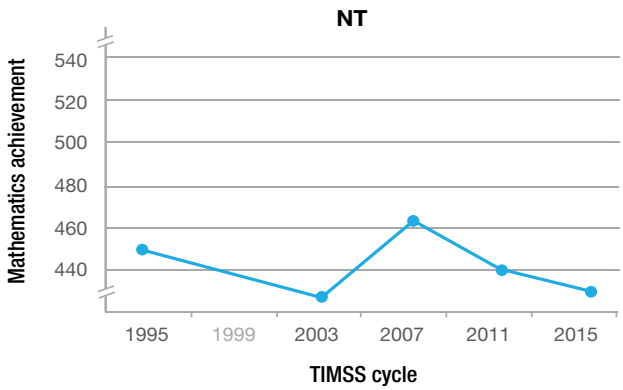
Differences between years				
	2011	2007	2003	1995
2015	10	8	-3	-14
2011		-2	-13	-24 ↓
2007			-11	-22 ↓
2003				-11



Differences between years				
	2011	2007	2003	1995
2015	14	23 ↑	20 ↑	-19 ↓
2011		8	6	-34 ↓
2007			-2	-42 ↓
2003				-40 ↓



Differences between years				
	2011	2007	2003	1995
2015	18	8	16	-3
2011		-11	-2	-21
2007			9	-11
2003				-20

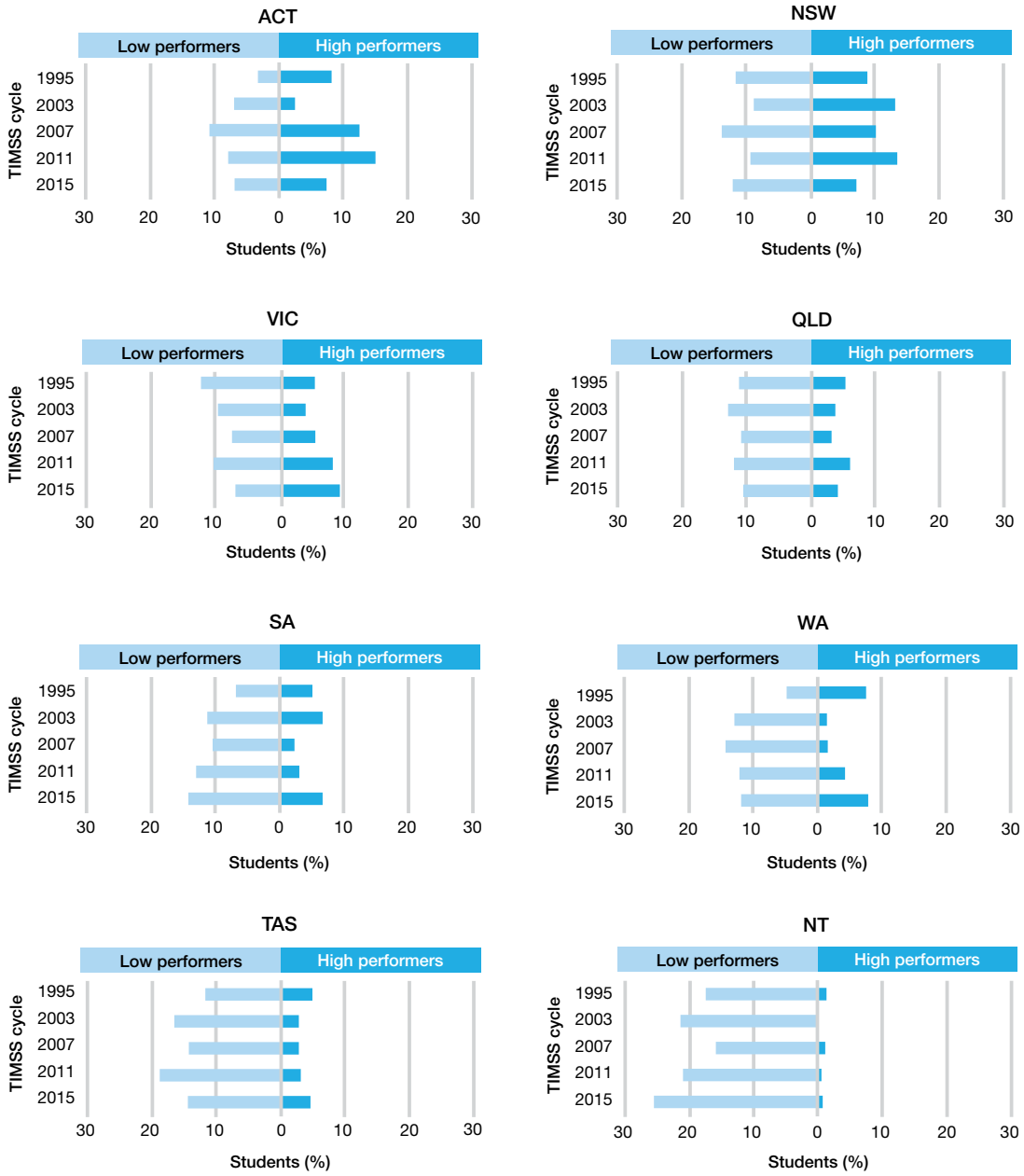


Differences between years				
	2011	2007	2003	1995
2015	-10	-31	3	-18
2011		-22	13	-9
2007			34	13
2003				-21

Note: Read across the row to determine if the performance in the row year is significantly higher (↑) or significantly lower (↓) than the performance in the column year.

FIGURE 3.5 Trends in Year 8 mathematics achievement within Australia, 1995–2015, by jurisdiction (cont.)

- None of the differences between TIMSS 2011 and TIMSS 2015 were significant.
- The only significant differences from TIMSS 1995 were for Victoria (significantly higher than in 1995) and Western Australia (significantly lower than in 1995).



Note: The terms 'low performers' and 'high performers' refer, respectively, to the percentages of students who did not achieve the Low international benchmark and the percentages of students who achieved the Advanced international benchmark.

FIGURE 3.6 Percentages of high- and low-achieving students in Year 8 mathematics from TIMSS 1995 to TIMSS 2015, by jurisdiction

Figure 3.6 shows the percentage of students achieving the Advanced international benchmark in Year 8 mathematics, as well as the percentage of students not achieving the Low benchmark, for each Australian jurisdiction for all TIMSS cycles from 1995 through to 2015.

- The percentages of students not achieving the Low international benchmark in Year 8 mathematics increased in most jurisdictions. The increase (of about seven percentage points) was statistically significant in South Australia and Western Australia. Victoria was the only state to reduce the proportion of students not achieving the Low international benchmark, with a statistically significant reduction from 12 per cent in 1995 to 7 per cent in 2015.
- There was very little change from 1995 to 2015 in the percentage of students achieving the Advanced international benchmark in Year 8 mathematics for any of the Australian jurisdictions. Victoria had the largest improvement (four percentage points) but it was not statistically significant.

Australia's mathematics achievement for different demographic groups

Results for males and females

Previous TIMSS assessments have shown gender differences in mathematics achievement at Year 8 to be small on average, although the situation varies considerably from country to country.

	Female				Male					
Country	% of students	SE of %	Mean	SE	% of students	SE of %	Mean	SE	Difference (absolute value)	SE
Oman	48	1.7	420	2.9	52	1.7	388	3.5	32	4.6
Botswana (9)	51	0.6	400	2.5	49	0.6	381	2.5	19	2.9
Jordan	50	2.6	395	4.0	50	2.6	376	5.4	19	7.0
Thailand	54	1.5	440	5.2	46	1.5	422	5.7	18	5.5
Bahrain	48	0.9	462	2.4	52	0.9	446	2.2	16	3.6
Saudi Arabia	51	1.6	375	5.1	49	1.6	360	7.1	14	8.2
United Arab Emirates	50	2.5	471	3.5	50	2.5	459	4.0	12	6.4
Malaysia	50	1.8	470	3.8	50	1.8	461	3.8	9	2.8
Singapore	49	0.6	626	3.4	51	0.6	616	3.8	9	3.5
Egypt	53	2.3	397	5.5	47	2.3	387	5.1	9	6.7
South Africa (9)	51	1.1	376	5.3	49	1.1	369	4.6	7	4.1
Kuwait	50	2.5	396	4.6	50	2.5	389	7.1	7	7.5
Qatar	50	3.0	440	3.2	50	3.0	434	4.5	7	4.9
Turkey	48	0.8	461	4.8	52	0.8	455	5.3	6	3.6
Kazakhstan	49	0.9	531	5.8	51	0.9	525	5.3	6	3.7
Iran	48	0.9	438	5.0	52	0.9	435	7.5	3	8.9
England	51	1.6	520	5.2	49	1.6	517	4.8	3	5.6
Malta	49	0.3	495	1.8	51	0.3	492	1.6	3	2.8
New Zealand	51	2.0	494	3.2	49	2.0	491	4.6	3	4.2
Japan	51	1.0	588	3.1	49	1.0	585	3.0	2	4.2
Morocco	46	0.7	385	2.3	54	0.7	384	2.6	2	2.0
Georgia	47	0.9	454	3.9	53	0.9	453	4.0	1	4.0
Chinese Taipei	49	0.8	599	2.6	51	0.8	599	3.0	0	2.8
Korea	47	0.5	605	2.6	53	0.5	606	3.1	1	2.7
Norway (9)	50	0.7	511	2.5	50	0.7	512	2.7	1	2.6
United States	50	0.6	517	3.3	50	0.6	519	3.2	2	2.0
Australia	51	1.6	504	3.8	49	1.6	506	3.5	2	4.0
Israel	49	1.2	510	4.3	51	1.2	512	4.8	2	3.9
Slovenia	48	0.7	515	2.4	52	0.7	518	2.5	2	2.4
Lebanon	53	1.6	441	3.7	47	1.6	444	4.5	3	3.9
Lithuania	50	0.8	510	3.4	50	0.8	513	3.1	3	3.4
Canada	51	1.0	525	2.0	49	1.0	530	2.7	4	2.0
Ireland	50	1.1	521	2.6	50	1.1	526	4.0	5	3.9
Hong Kong	47	2.1	591	4.7	53	2.1	597	6.0	5	5.7
Italy	49	0.8	491	3.0	51	0.8	498	2.8	7	2.8
Sweden	48	1.0	497	3.3	52	1.0	504	3.1	7	3.2
Hungary	50	0.9	510	4.3	50	0.9	519	4.0	9	3.4
Russian Federation	49	0.9	533	5.1	51	0.9	543	4.6	9	2.9
Chile	48	1.8	418	3.7	52	1.8	436	4.2	18	4.9
International average	50	0.2	483	0.6	50	0.2	480	0.7		

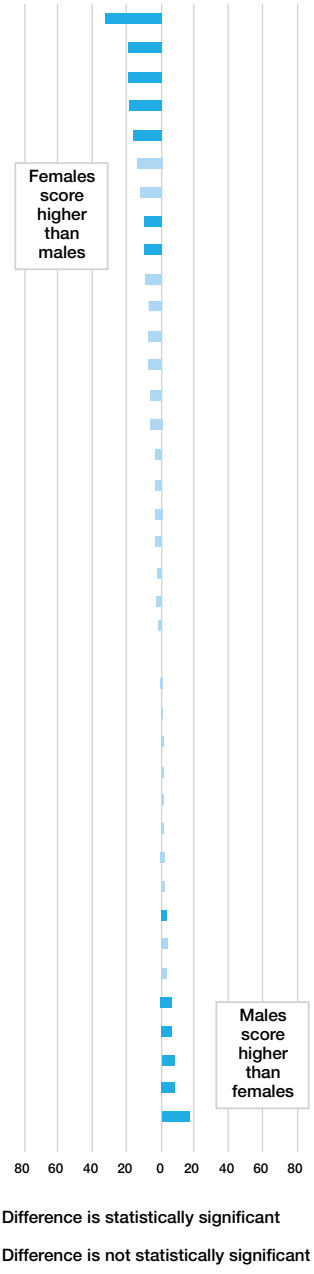
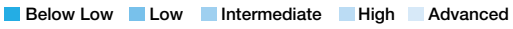


FIGURE 3.7 Sex differences in Year 8 mathematics achievement, by country

- On average internationally, there was no achievement difference between female and male students (international average: 483 vs 480, respectively) at Year 8 level, and there were only a handful of countries in which the differences for females and males were significant.
- There were no statistically significant female–male differences in 26 of the 39 countries that tested at Year 8, including Australia.
- In Singapore, Malaysia, Bahrain, Thailand, Jordan, Botswana and Oman, the differences were significantly in favour of females, ranging from nine score points in Singapore to a very large 32 score points in Oman.
- In Canada, Italy, Sweden, Hungary, the Russian Federation and Chile, males scored significantly higher (between four and 18 score points) than females.
- In Australia, both female and male students achieved at a significantly higher level than their respective international means.

Sex	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Female	51	504	3.8	269	10 26 34 24 7
Male	49	506	3.5	273	11 24 34 24 7



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 3.8 Mean scores and percentages of Australian students at the international benchmarks for Year 8 mathematics, by sex

- There was no significant difference between Australian male and female students at Year 8.
- The distribution of students across benchmark levels was the same for males and females at this year level.

Trends in mathematics achievement by sex

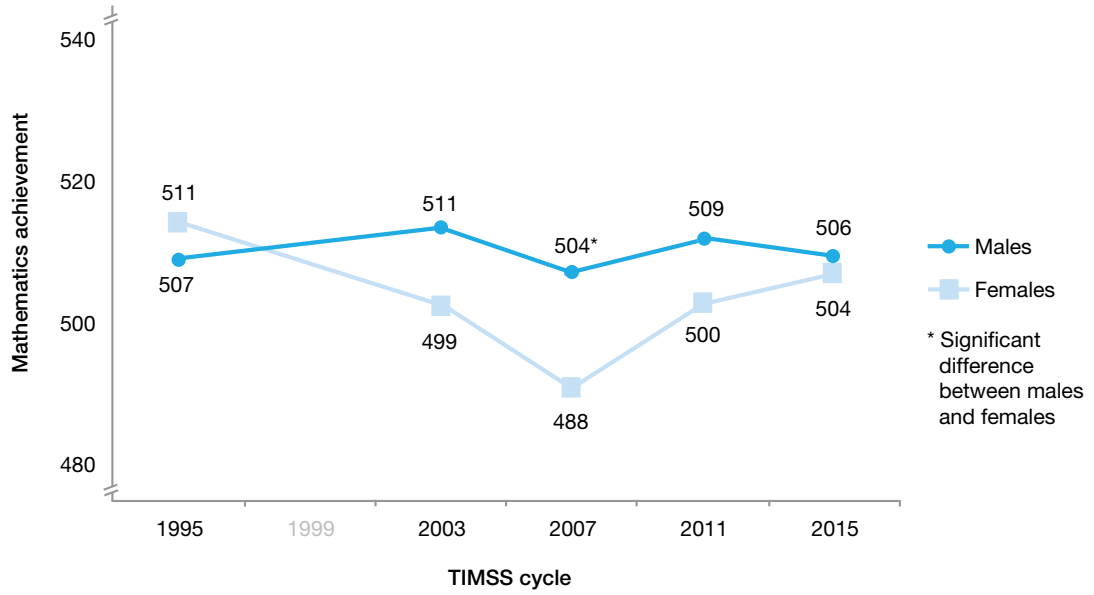


FIGURE 3.9 Trends in Year 8 mathematics achievement within Australia, 1995–2015, by sex

- The scores for Australian males have changed little over the 20 years since TIMSS 1995.
- Other than the poor result recorded in 2007, females' scores also have not varied widely over the past 20 years and are not significantly different to that of 1995.

Sex difference in mathematics achievement by jurisdiction

Jurisdiction	Female		Male		Difference (absolute value)	SE
	Mean	SE	Mean	SE		
VIC	519	7.4	514	5.7	5	8.7
NT	455	11.2	450	10.3	5	10.4
SA	500	11.0	497	9.6	3	9.6
WA	508	6.7	507	8.5	1	9.5
TAS	492	13.1	494	8.8	2	14.9
QLD	495	6.3	501	8.3	6	9.2
NSW	499	9.0	506	7.2	8	9.0
ACT	512	6.6	521	8.0	9	11.8

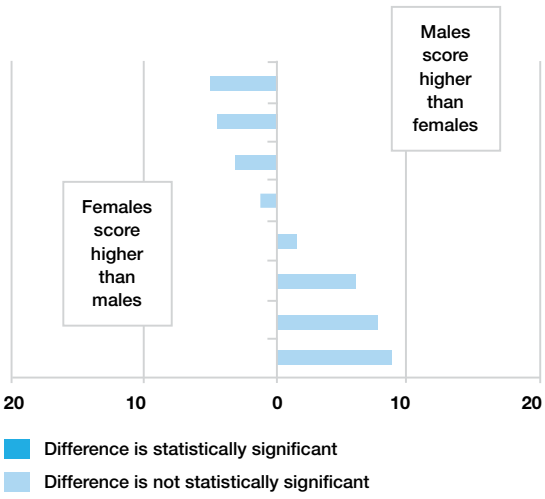
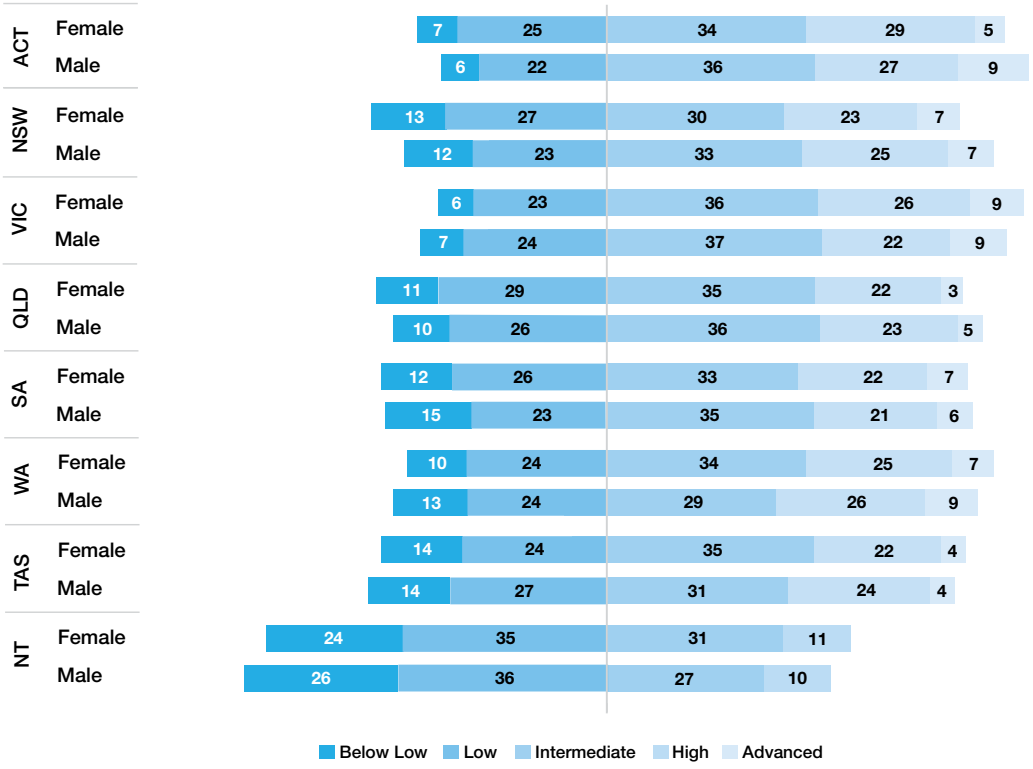


FIGURE 3.10 Sex differences in Year 8 mathematics achievement within Australia, by jurisdiction

- Given that there were no sex differences in mathematics at Year 8 for Australia as a whole, it seems likely that this would be reflected in the scores for the states and territories. This appears to be the case, as none of the differences that appear in Figure 3.10 are statistically significant.



Note: Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 3.11 Percentages of Australian students at the international benchmarks for Year 8 mathematics, by sex within jurisdiction

Results for books in the home

This section presents Australian students' mathematics achievement according to the number of books in the home. For more information about this variable, please refer to the Reader's Guide.

Number of books in the home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Many books	21	541	3.0	257	5 15 31 35 14
Average number of books	48	515	2.8	243	6 22 39 26 6
A few books	31	468	4.8	270	21 34 29 12 3

Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

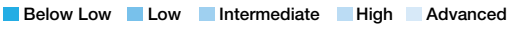
FIGURE 3.12 Mean scores and percentages of students at the international benchmarks for Year 8 mathematics, by number of books in the home

- At this year level, the 21 per cent of students who report *many books* in the home gained a substantial advantage, scoring on average 26 score points higher than the next category of students and around three-quarters of a standard deviation, 73 score points, higher than students with a *few books* in the home.
- Even having an *average number* – between 25 and 200 books in the home – has a substantial relationship with achievement, with students in this category scoring, on average, half a standard deviation, 47 score points, higher than the students with just a *few books* in the home.
- Around 20 per cent of students in the group who reported having *many books* in the home did not achieve the Intermediate benchmark, with 15 per cent achieving the Low benchmark and five per cent of students not achieving even this very basic level.
- In comparison, 55 per cent of the students who reported having a *few books* in the home did not achieve the Intermediate benchmark, with 34 per cent achieving the Low benchmark and 21 per cent not achieving even this very basic level.

Results for parental education

This section presents Australian students' mathematics achievement according to the level of parental education. For more information about this variable, please refer to the Reader's Guide.

Parental education	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Completed university degree	41	542	3.5	247	3 15 33 35 13
Completed post-secondary but not university	30	505	3.3	248	8 26 38 23 5
Completed upper secondary education	21	488	4.6	255	13 29 35 19 4
Did not complete upper secondary education	8	454	7.3	291	30 30 27 11 3



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

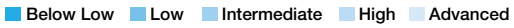
FIGURE 3.13 Mean scores and percentages of students at the international benchmarks for Year 8 mathematics, by parental education

- Students with at least one parent who holds a university degree had an average mathematics score a substantial 88 points higher than that of students whose parents did not complete secondary school, 54 score points higher than the average score for students for whom the highest level of parental education was completing secondary school and 37 score points higher than that of students whose parents completed a Technical and Further Education qualification. All differences are statistically significant.
- Around 13 per cent of students who had at least one parent complete a university degree reached the Advanced benchmark, compared to five per cent or fewer for all other groups.
- In comparison, almost two-thirds (59%) of students whose parents did not complete secondary school did not reach the Intermediate benchmark, compared to 18 per cent of students with parents holding university degrees.

Results for educational resources in the home

This section presents Australian students' mathematics achievement according to the number of educational resources in the home. For more information about this variable, please refer to the Reader's Guide.

Number of resources in the home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Many resources	23	548	3.1	247	3 13 31 37 15
Some resources	73	497	3.1	259	11 28 36 20 5
Few resources	4	439	10.6	298	36 32 22 7 3



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

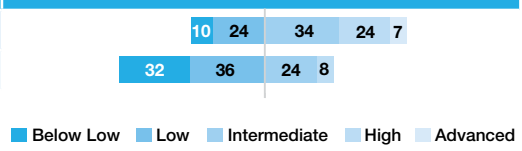
FIGURE 3.14 Mean scores and percentages of students at the international benchmarks for Year 8 mathematics, by educational resources in the home

- Australia had one of the highest proportions of students who had *many resources* at home, with 23 per cent of students in this category, similar to Sweden (also 23%), the United States (22%), Canada (21%), and England and New Zealand (both 19%). Only Korea and Norway had higher percentages of students in this category (37 and 29%, respectively).
- The proportion of Australian students with only a *few resources* at home (4%) was also quite low by international standards. The majority of Australian students (73%) fell into the middle category of *some resources*.
- Year 8 students who had *many resources* in the home performed at a significantly higher level than those who had *some resources*, who again performed at a significantly higher level than those who had *few resources*. Australian Year 8 students who had *many resources* performed, on average, 51 score points higher than those who had *some resources*, whose average achievement was 57 score points higher than those with *few resources* at home.
- The average achievement of those with *many resources* was 109 score points more than those with *few resources*, a difference that is greater than one standard deviation on the TIMSS Year 8 mathematics scale.
- About two-thirds (68%) of students with *few resources* at home did not reach the Intermediate international benchmark, compared to slightly more than a third (39%) of those with *some resources* and about a sixth (16%) of students with *many resources*.

Results for Indigenous students

This section presents Australian students' mathematics achievement according to Indigenous status. For more information about this variable, please refer to the Reader's Guide.

Indigenous background	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Non-Indigenous	95	508	3.0	268	
Indigenous	5	438	6.0	261	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 3.15 Mean scores and percentages of students at the international benchmarks for Year 8 mathematics, by Indigenous background

- At Year 8, Indigenous students achieved an average score of 438 score points, which was 70 score points less than the average score of non-Indigenous students of 508 score points.
- One per cent of Indigenous students achieved the Advanced benchmark, compared to seven per cent of non-Indigenous students.
- At the other end of the achievement spectrum, 32 per cent of Year 8 Indigenous students did not reach the Low benchmark, compared to 10 per cent of non-Indigenous students, while a total of 68 per cent of Indigenous students and 34 per cent of non-Indigenous students did not achieve the Intermediate benchmark.

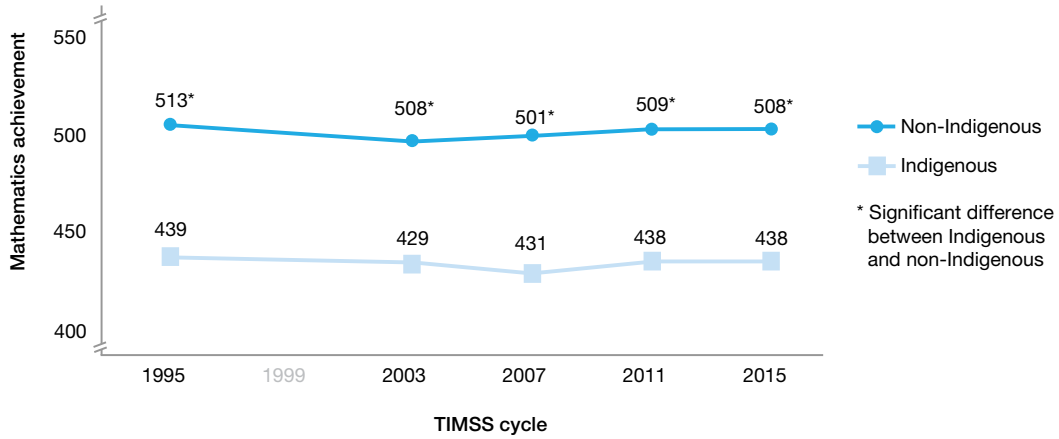


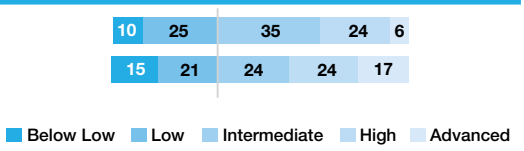
FIGURE 3.16 Trends in Year 8 mathematics achievement within Australia, 1995–2015, by Indigenous background

- For Year 8 Indigenous and non-Indigenous students, none of the differences between years are significant, that is, the 2015 score for Indigenous students, as for non-Indigenous students, is not significantly different to the score in any of the other years of testing.
- The difference between Indigenous and non-Indigenous students is significant, as it has been in each year of testing, at around 70 score points, and has not decreased in size over 20 years.

Results for language spoken at home

This section presents Australian students' mathematics achievement according to whether a language other than English is spoken as the main language at home. For more information about this variable, please refer to the Reader's Guide.

Language spoken at home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
English	93	505	2.7	264	
Other	7	518	9.9	330	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

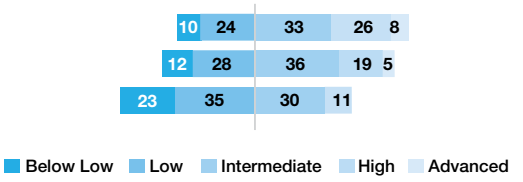
FIGURE 3.17 Mean scores and percentages of students at the international benchmarks for Year 8 mathematics, by language spoken at home

- It is difficult to generalise non-English speakers as either high or low achievers.
- A higher proportion of students who speak a language other than English at home achieved the Advanced benchmark (17% compared to 6% of English-speaking students), but a larger percentage of English-speaking students performed at the Intermediate benchmark.
- More students who spoke a language other than English at home did not reach the Low benchmark (15%), compared to 10 per cent of English-speaking students, but more English-speaking students (25% compared to 21%) achieved the Low benchmark, resulting in 35 per cent of both groups not achieving the Intermediate benchmark (the proficient standard for Australia).

Results for geographic location of the school

This section presents Australian students' mathematics achievement according to the geographic location of the school. For more information about this variable, please refer to the Reader's Guide.

Geographic location	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Metropolitan	71	510	4.0	272	
Provincial	29	494	4.9	267	
Remote	0	457	6.4	233	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 3.18 Mean scores and percentages of students at the international benchmarks for Year 8 mathematics, by geographic location

- The proportion of students attending remote schools make up less than one per cent of the Year 8 student sample; therefore, the level of uncertainty around statistics may be large. Around 71 per cent of students at this year level attend schools in metropolitan areas.
- Students attending schools in metropolitan areas achieved, on average, 16 score points higher than students attending schools in provincial areas, and 52 score points, on average, higher than students in remote schools.
- Students attending schools in provincial areas scored, on average, 36 score points higher than students attending schools in remote areas. All these differences are statistically significant.
- More than one-third (34%) of students in metropolitan areas, around two-fifths (40%) of students in provincial areas and almost two-thirds (59%) of students in remote areas did not achieve the Intermediate benchmark.
- Eight per cent of students in metropolitan areas achieved the advanced benchmark, compared to just five per cent of students in provincial areas and less than one per cent of students in remote areas.

Chapter

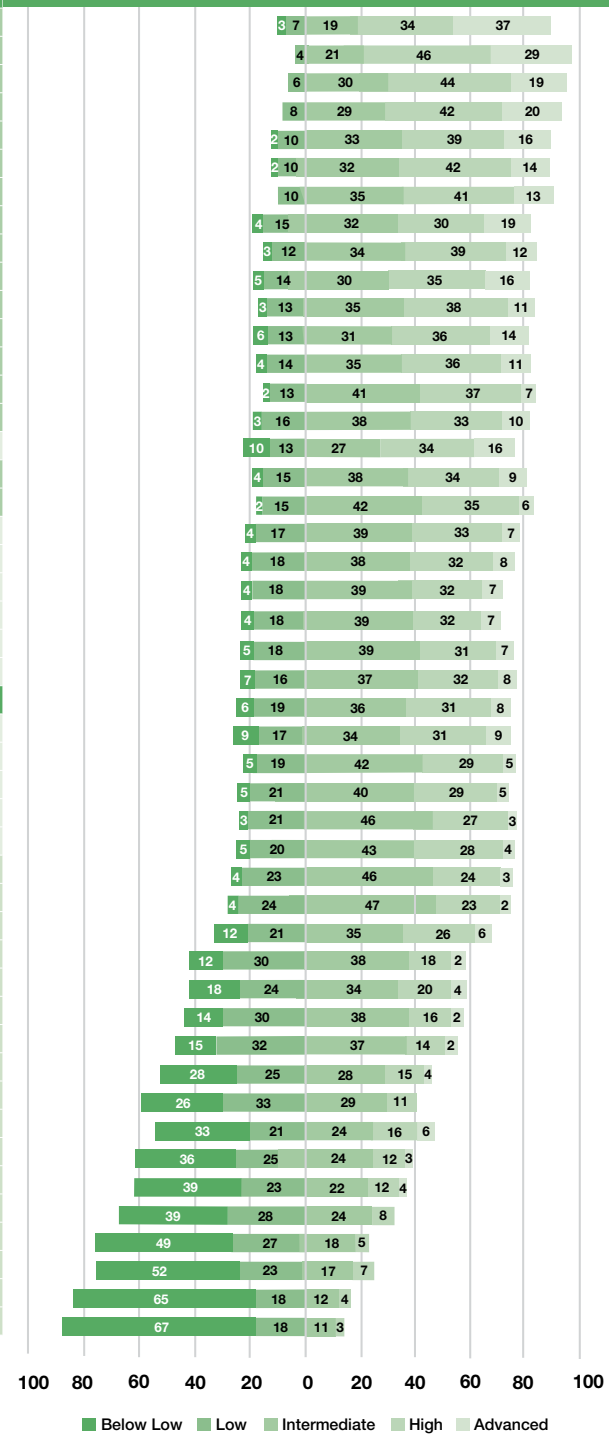
4 Year 4 science

Australia's Year 4 science results within the international context

Figure 4.1 (see page 48) shows the means, standard errors, gaps between the 5th and 95th percentiles and, to the right of the percentile gaps, the percentages of students in each country at the TIMSS benchmarks.

- Singapore and Korea were the top-performing countries of TIMSS 2015 in Year 4 science, scoring well in excess of the High international benchmark. The scores for these countries were not significantly different to each other but were significantly higher than those of all other countries.
- Australia's average score of 524 score points was significantly higher than the scores for 17 other countries, such as New Zealand, Portugal and France, and places average achievement at the higher end of the Intermediate benchmark.
- Australia's average score was significantly lower than the average scores for 17 other countries, including the United States and England, as well as the participating East Asian countries Singapore, Korea, Japan, Hong Kong and Chinese Taipei.
- This figure also shows that the range of achievement within countries is spread more widely than in mathematics at the same year level, with more than 400 score points separating highest and lowest in Kuwait (412), and almost 400 score points in Morocco (393), Saudi Arabia (379), Oman (389) and United Arab Emirates (394).
- Australia's gap between high and low achievers, of 251 score points, was mid-range, similar to that of Singapore (282 points). New Zealand also had a gap of 282 score points between high and low performers. As a comparison, the gap for students in the Netherlands, as in mathematics at Year 4, was the lowest, at 196 score points.
- In the highest-scoring country, Singapore, 37 per cent of students achieved the Advanced international benchmark. Korea, Japan and the Russian Federation also recorded substantial proportions (29, 19 and 20%, respectively) of students who achieved the Advanced benchmark.
- Korea showed exceptional performance, with 29 per cent of students achieving the Advanced benchmark but no students performing below the Low international benchmark.
- Eight per cent of Australian students achieved the Advanced international benchmark. Seventy-five per cent of Australian students achieved at least the Intermediate international benchmark, which is the proficient standard for Australia. Of concern are the 25 per cent of Australian Year 4 students who achieved at or below the Low international benchmark (19% performed at the Low benchmark and a further 6% did not reach the Low benchmark).

	Country	Mean	SE	Gap 95th–5th percentiles
Achievement significantly higher than Australia's	Singapore	590	3.7	282
	Korea	589	2.0	208
	Japan	569	1.8	212
	Russian Federation	567	3.2	225
	Hong Kong	557	2.9	231
	Chinese Taipei	555	1.8	226
	Finland	554	2.3	210
	Kazakhstan	550	4.4	280
	Poland	547	2.4	224
	United States	546	2.2	265
	Slovenia	543	2.4	228
	Hungary	542	3.3	270
	Sweden	540	3.6	242
	Norway (5)	538	2.6	209
	England	536	2.4	231
	Bulgaria	536	5.9	316
	Czech Republic	534	2.4	230
	Croatia	533	2.1	204
Achievement not different to Australia's	Ireland	529	2.4	230
	Germany	528	2.4	229
	Lithuania	528	2.5	228
	Denmark	527	2.1	227
	Canada	525	2.6	240
	Serbia	525	3.7	266
	Australia	524	2.9	251
	Slovak Republic	520	2.6	283
	Northern Ireland	520	2.2	230
	Spain	518	2.6	227
	Netherlands	517	2.7	196
	Italy	516	2.6	219
Achievement significantly lower than Australia's	Belgium (Flemish)	512	2.3	203
	Portugal	508	2.2	197
	New Zealand	506	2.7	282
	France	487	2.7	239
	Turkey	483	3.3	305
	Cyprus	481	2.6	248
	Chile	478	2.7	242
	Bahrain	459	2.6	345
	Georgia	451	3.7	288
	United Arab Emirates	451	2.8	394
	Qatar	436	4.1	362
	Oman	431	3.1	389
	Iran	421	4.0	333
	Indonesia	397	4.8	338
	Saudi Arabia	390	4.9	379
	Morocco	352	4.7	393
	Kuwait	337	6.2	412



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

Bulgaria recorded a mean scale score that, though not significantly different to Australia's, was higher than scores of other countries that significantly exceeded Australia's. Bulgaria's larger standard error accounts for the discrepancy.

FIGURE 4.1 Mean scores and percentages of students at the international benchmarks for Year 4 science, by country

Trends in science performance across countries

In this section, different perspectives are provided on changes of scores over time. Figure 4.2 shows the trends for Australia for TIMSS 1995, 2003, 2007, 2011 and 2015, along with those for several other countries by way of comparison. Table 4.1 shows Australia's position relative to those of all participating countries in 2015, 2011, 2007, 2003 and 1995. Figure 4.3 shows changes between 1995 and 2015 in the percentages of students achieving the Advanced international benchmark, as well as the percentages of students not achieving the Low benchmark.

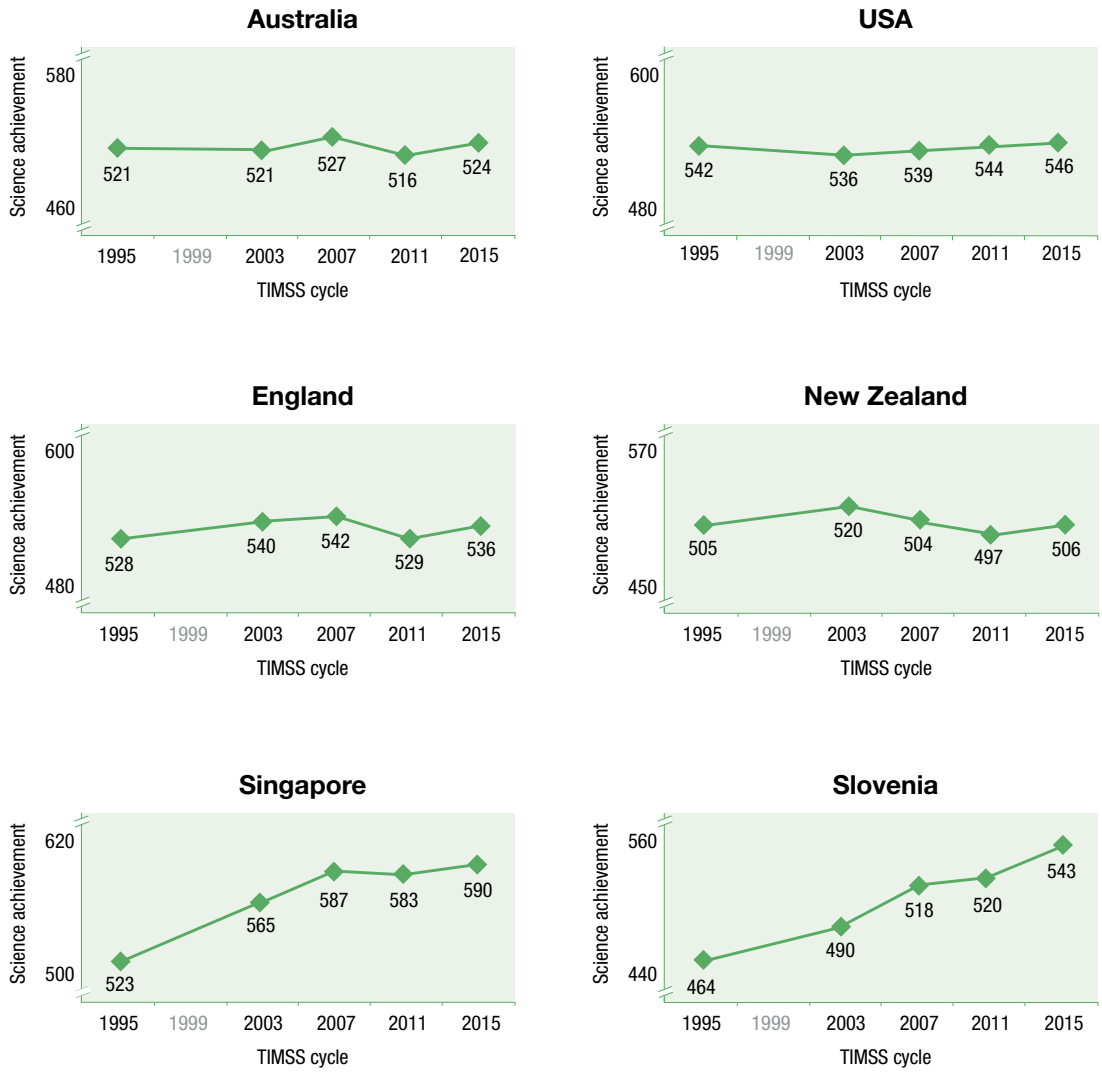


FIGURE 4.2 Trends in Year 4 science achievement scores, 1995–2015, selected countries

- Australia's 2015 Year 4 science score increased significantly from TIMSS 2011, but as this was a significant decline from TIMSS 2007 the overall change since TIMSS 1995 is not significant.
- Similarly, scores for students in the United States and New Zealand have not changed over time since TIMSS 1995.
- In contrast, Singapore's already high score in TIMSS 1995 has increased steadily from high to very high, while the score for Slovenia has shown further improvement after a small plateau in TIMSS 2011. Slovenia's performance has advanced from an average at the high end of the Low benchmark to the upper ranges of the Intermediate benchmark.

TABLE 4.1 Relative trends in Year 4 science achievement, by country

Country	Position relative to Australia 2015	Position relative to Australia 2011	Position relative to Australia 2007	Position relative to Australia 2003	Position relative to Australia 1995
Singapore	↑	↑	↑	↑	•
Korea	↑	↑	–	–	↑
Japan	↑	↑	↑	↑	↑
Russian Federation	↑	↑	↑	•	–
Hong Kong	↑	↑	↑	↑	↓
Chinese Taipei	↑	↑	↑	↑	–
Finland	↑	↑	–	–	–
Kazakhstan	↑	↓	–	–	–
Poland	↑	–	–	–	–
United States	↑	↑	↑	↑	↑
Slovenia	↑	•	↓	↓	↓
Hungary	↑	↑	•	•	↓
Sweden	↑	↑	•	–	–
Norway (5)	↑	–	–	–	–
England	↑	↑	↑	↑	•
Bulgaria	•	–	–	–	–
Czech Republic	↑	↑	↓	–	↑
Croatia	↑	•	–	–	–
Ireland	•	•	–	–	•
Germany	•	↑	•	–	–
Lithuania	•	•	↓	•	–
Denmark	•	↑	↓	–	–
Canada	•	–	–	–	–
Serbia	•	•	–	–	–
Australia					
Slovak Republic	•	↑	•	–	–
Northern Ireland	•	•	–	–	–
Spain	•	↓	–	–	–
Netherlands	•	↑	•	•	•
Italy	•	↑	•	•	–
Belgium (Flemish)	↓	↓	•	–	–
Portugal	↓	•	–	–	↓
New Zealand	↓	↓	↓	•	↓
France	↓	–	–	–	–
Turkey	↓	↓	–	–	–
Cyprus	↓	–	–	↓	↓
Chile	↓	↓	–	–	–
Bahrain	↓	↓	–	–	–
United Arab Emirates	↓	↓	–	–	–
Georgia	↓	↓	↓	–	–
Qatar	↓	↓	–	–	–
Oman	↓	↓	–	–	–
Iran	↓	↓	↓	↓	↓
Indonesia	↓	–	–	–	–
Saudi Arabia	↓	↓	–	–	–
Morocco	↓	↓	–	–	–
Kuwait	↓	↓	–	–	–

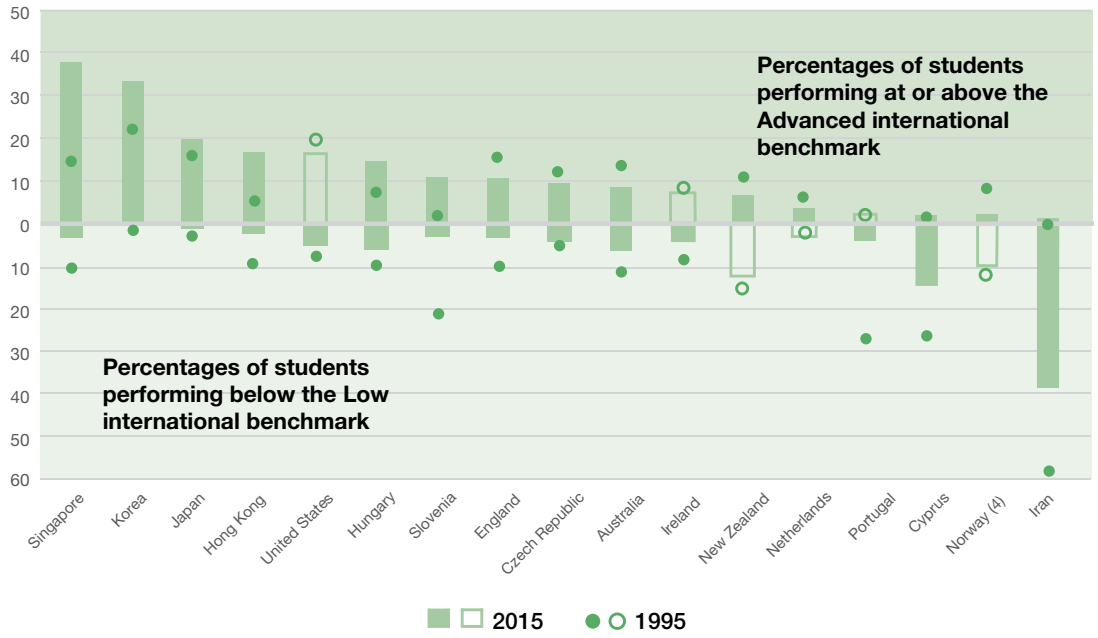
↑ Score significantly higher than Australia's.

↓ Score significantly lower than Australia's.

• Score not significantly different to that of Australia.

– Did not participate in this cycle.

- Slovenia and Croatia, which had the same score as Australia's in 2011, outperformed Australia in 2015.
- Spain, whose relative position was significantly lower than Australia's in 2011, has achieved a score in TIMSS 2015 that is not significantly different to that of Australia.
- Kazakhstan, which scored significantly lower than Australia in 2011, scored significantly higher than Australia in 2015.
- Australia's score has improved relative to Germany, Denmark, the Slovak Republic, Netherlands and Italy, all of which outperformed Australia in 2011.
- In terms of trends since 1995, Singapore and England had scores in TIMSS 1995 that were not statistically different to that of Australia, but both have improved their scores over the past 20 years to achieve at a significantly higher level than Australia's.
- Hong Kong, Slovenia and Hungary all scored at a significantly lower level than that of Australia in TIMSS 1995 but now significantly outperform Australia.



Note: A coloured bar and a coloured circle indicate that the difference in the percentages of students between TIMSS 1995 and TIMSS 2015 was significant.

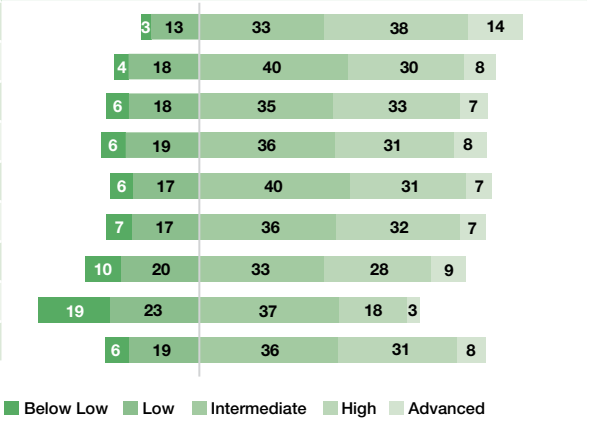
FIGURE 4.3 Percentages of high- and low-achieving students in Year 4 science in TIMSS 1995 and TIMSS 2015, by country

- In the majority of countries (14 out of 17) that participated in both TIMSS 1995 and TIMSS 2015, the percentages of students achieving the Low benchmark in Year 4 science significantly increased between 1995 and 2015.
- However, between the 1995 and 2015 cycles, only eight of the 17 countries managed significantly to increase the percentages of students who achieved the Advanced international benchmark. In six of the countries, including Australia, the percentages of students achieving the Advanced benchmark significantly decreased from 1995 to 2015.

Science performance in TIMSS 2015 for the Australian jurisdictions

- The Australian Capital Territory was the highest-performing jurisdiction.
- The spread of average scores across the jurisdictions was quite large, being 69 score points (almost three-quarters of a standard deviation) between the average scores of students in the Australian Capital Territory and those in the Northern Territory.
- The performance of students in the Australian Capital Territory was significantly higher than that of students in all other jurisdictions. Students in the Northern Territory performed significantly below students in all other jurisdictions.
- The jurisdiction with the highest percentage of students achieving the Advanced international benchmark was the Australian Capital Territory, in which 14 per cent of students achieved the highest level. In Western Australia nine per cent of students and in New South Wales and Victoria eight per cent of students achieved this benchmark. The Northern Territory had the lowest proportion of students at this level, with just three per cent achieving the Advanced benchmark.
- Forty-two per cent of students in the Northern Territory did not reach the Intermediate international benchmark, which is the proficient standard for Australia. In the other jurisdictions, this proportion ranged from 15 per cent in the Australian Capital Territory to 30 per cent in Western Australia.

Jurisdiction	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
ACT	549	7.0	235	3 13 33 38 14
VIC	527	4.9	231	4 18 40 30 8
TAS	525	9.4	243	6 18 35 33 7
NSW	524	6.4	252	6 19 36 31 8
SA	524	7.1	241	6 17 40 31 7
QLD	523	5.2	252	7 17 36 32 7
WA	516	7.5	274	10 20 33 28 9
NT	480	12.7	288	19 23 37 18 3
Australia	524	2.9	250	6 19 36 31 8



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 4.4 Mean scores and percentages of Australian students at the international benchmarks for Year 4 science, by jurisdiction

TABLE 4.2 Multiple comparisons of Year 4 science achievement, by jurisdiction

Jurisdiction	Mean	SE	ACT	VIC	TAS	NSW	SA	QLD	WA	NT
ACT	549	7.0		↑	↑	↑	↑	↑	↑	↑
VIC	527	4.9	↓		•	•	•	•	•	↑
TAS	525	9.4	↓	•		•	•	•	•	↑
NSW	524	6.4	↓	•	•		•	•	•	↑
SA	524	7.1	↓	•	•	•		•	•	↑
QLD	523	5.2	↓	•	•	•	•		•	↑
WA	516	7.5	↓	•	•	•	•	•		↑
NT	480	12.7	↓	↓	↓	↓	↓	↓	↓	

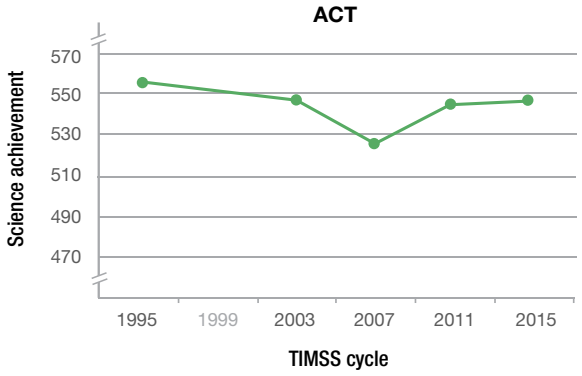
Note: Read across the row to compare a state/territory's performance with the performance of each jurisdiction listed in the column heading.

↑ Average performance statistically significantly higher than in comparison jurisdiction.

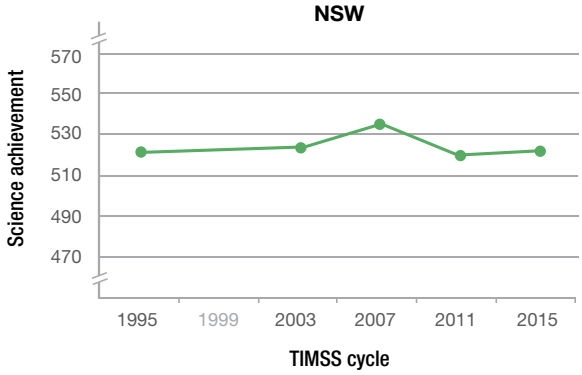
• No statistically significant difference from comparison jurisdiction.

↓ Average performance statistically significantly lower than in comparison jurisdiction.

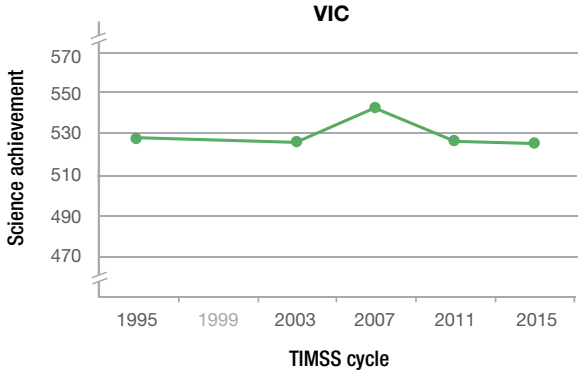
Trends for the Australian jurisdictions



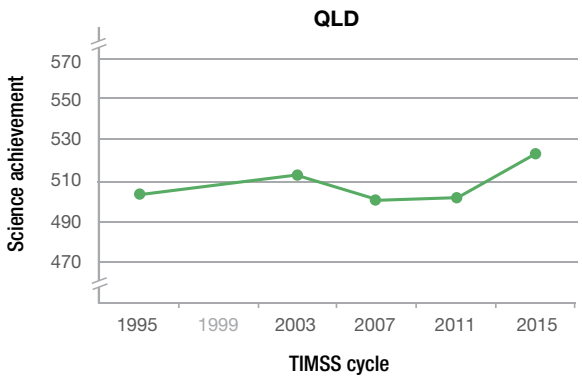
Differences between years				
	2011	2007	2003	1995
2015	2	22	2	-8
2011		19	-1	-10
2007			-20	-30 ↓
2003				-10



Differences between years				
	2011	2007	2003	1995
2015	2	-14	-2	1
2011		-16 ↓	-4	-1
2007			12	15
2003				3



Differences between years				
	2011	2007	2003	1995
2015	-2	-17	-1	-2
2011		-16	1	-1
2007			16	15
2003				-1

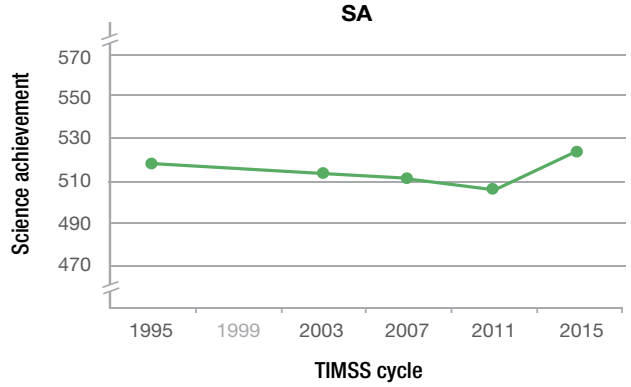


Differences between years				
	2011	2007	2003	1995
2015	23 ↑	23 ↑	10	20 ↑
2011		0	-12	-3
2007			-12	-3
2003				10

Note: Read across the row to determine if the performance in the row year is significantly higher (↑) or significantly lower (↓) than the performance in the column year.

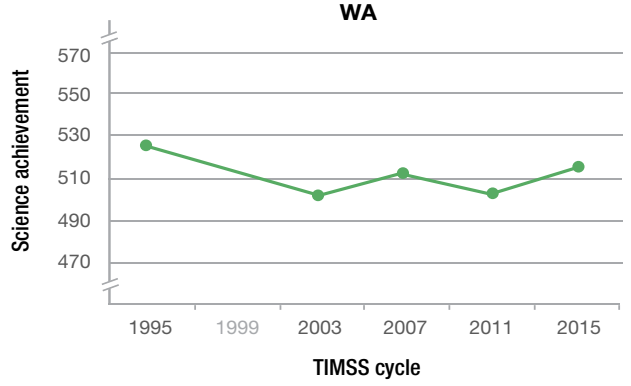
FIGURE 4.5 Trends in Year 4 science achievement within Australia, 1995–2015, by jurisdiction

SA



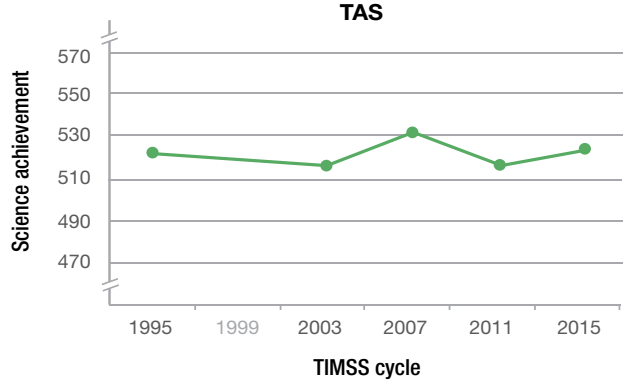
Differences between years				
	2011	2007	2003	1995
2015	18 ↑	12	9	5
2011		-6	-9	-13
2007			-3	-7
2003				-4

WA



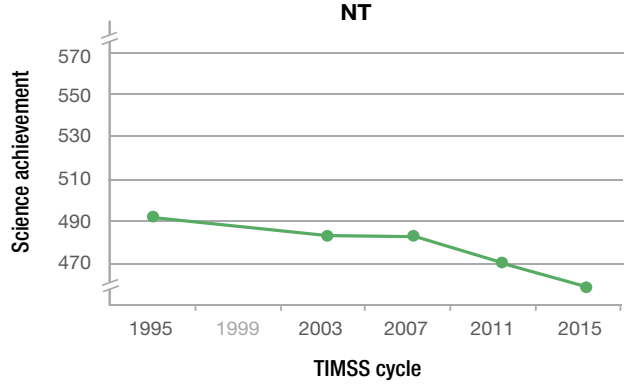
Differences between years				
	2011	2007	2003	1995
2015	14	4	14	-11
2011		-10	0	-25 ↓
2007			10	-15
2003				-25 ↓

TAS



Differences between years				
	2011	2007	2003	1995
2015	7	-8	7	2
2011		-15	0	-5
2007			16	10
2003				-5

NT

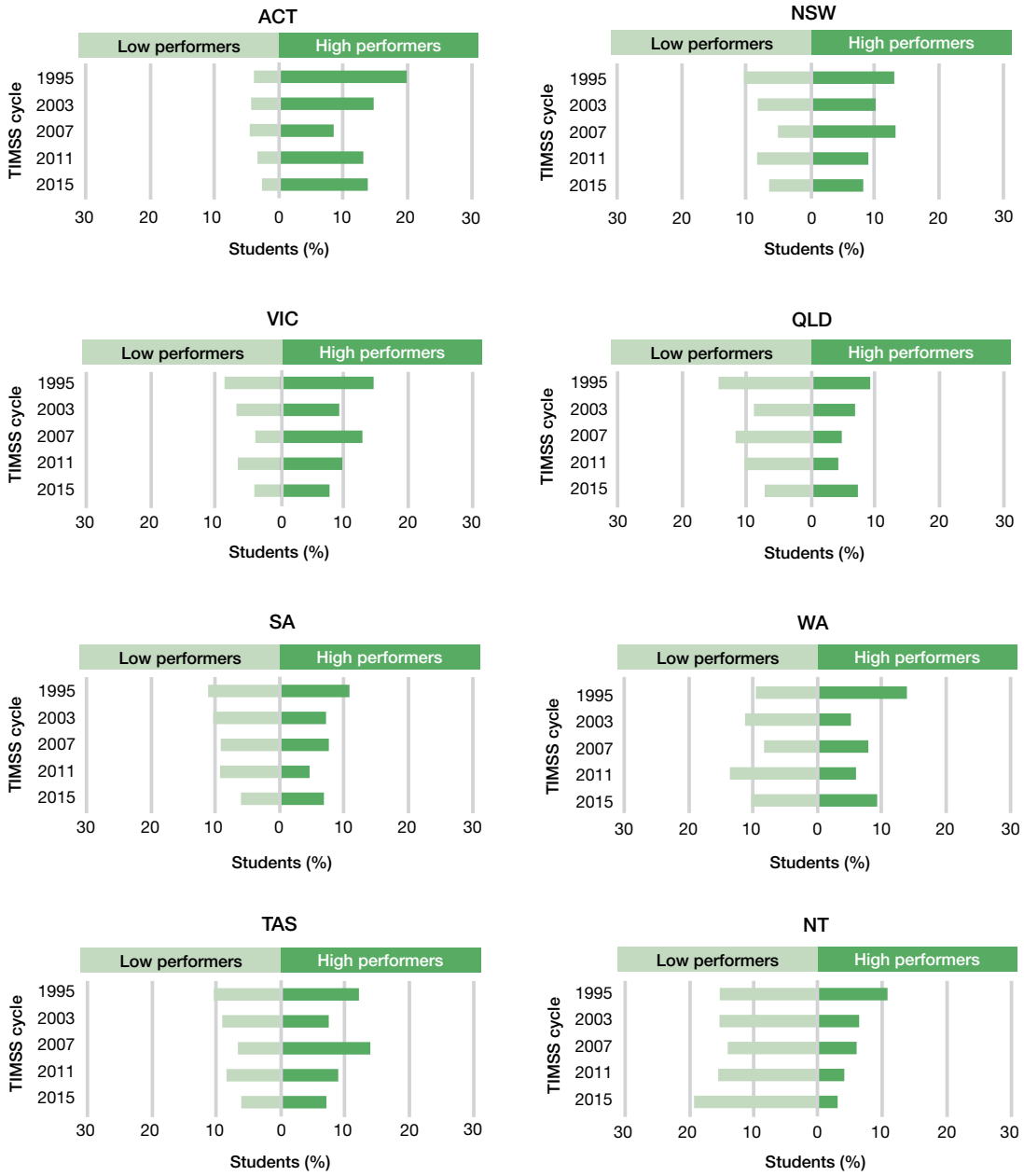


Differences between years				
	2011	2007	2003	1995
2015	-11	-23	-23	-32
2011		-12	-12	-21
2007			0	-9
2003				-9

Note: Read across the row to determine if the performance in the row year is significantly higher (↑) or significantly lower (↓) than the performance in the column year.

FIGURE 4.5 Trends in Year 4 science achievement within Australia, 1995–2015, by jurisdiction (cont.)

- Queensland and South Australia both significantly improved their scores in Year 4 science since TIMSS 2011, with increases of 23 score points and 18 score points, respectively.
- In terms of trends over 20 years, only Queensland showed a significant difference in performance between 1995 and 2015, an increase of 20 score points.



Note: The terms 'low performers' and 'high performers' refer, respectively, to the percentages of students who did not achieve the Low international benchmark and the percentages of students who achieved the Advanced international benchmark.

FIGURE 4.6 Percentages of high- and low-achieving students in Year 4 science from TIMSS 1995 to TIMSS 2015, by jurisdiction

Figure 4.6 shows the percentage of students achieving the Advanced international benchmark in Year 4 science, as well as the percentage of students not achieving the Low benchmark, for each Australian jurisdiction for all TIMSS cycles from 1995 through to 2015.

- The percentages of students not achieving the Low international benchmark decreased in most of the Australian jurisdictions over the 20-year period from 1995 to 2015. The decrease (of about seven percentage points) was statistically significant in Queensland.
- All jurisdictions experienced a decrease in the percentage of students achieving the Advanced international benchmark from 1995 to 2015. The decrease was statistically significant in New South Wales and the Northern Territory.

Australia's science achievement for different demographic groups

Results for males and females

Previous TIMSS assessments have shown gender differences in science achievement at Year 4 to be small on average, although the situation varies considerably from country to country.

	Female				Male					
Country	% of students	SE of %	Mean	SE	% of students	SE of %	Mean	SE	Difference (absolute value)	SE
Saudi Arabia	49	1.0	431	5.3	51	1.0	352	7.6	79	9.0
Bahrain	50	0.8	478	3.0	50	0.8	439	3.5	39	4.0
Oman	50	0.7	447	3.4	50	0.7	415	3.6	32	3.1
Kuwait	51	2.1	352	7.6	49	2.1	322	7.6	30	9.1
Qatar	51	2.5	448	4.7	49	2.5	424	6.0	24	7.2
United Arab Emirates	48	2.2	459	4.4	52	2.2	444	4.0	14	6.4
Finland	48	0.8	560	2.3	52	0.8	548	2.9	12	2.5
Iran	49	1.1	427	5.2	51	1.1	415	5.6	11	7.4
Morocco	48	0.8	358	4.7	52	0.8	347	5.7	10	4.9
Bulgaria	49	0.8	540	6.3	51	0.8	532	5.9	8	2.9
Sweden	49	1.0	544	4.1	51	1.0	536	3.5	8	2.7
Indonesia	48	0.7	401	5.2	52	0.7	393	5.3	8	4.2
Kazakhstan	49	0.8	552	4.5	51	0.8	547	4.7	5	2.7
Georgia	49	0.9	453	3.9	51	0.9	449	4.6	4	4.1
New Zealand	49	0.7	507	3.2	51	0.7	504	3.0	3	3.1
Lithuania	50	0.9	529	2.9	50	0.9	526	3.1	3	3.4
Serbia	48	0.8	526	3.6	52	0.8	523	4.9	3	4.6
Canada	49	0.5	526	2.8	51	0.5	524	3.0	2	2.2
Belgium (Flemish)	50	0.9	512	2.6	50	0.9	511	2.6	2	2.4
Poland	50	0.8	548	2.5	50	0.8	546	3.0	1	2.8
Turkey	49	0.6	484	3.3	51	0.6	483	4.0	1	3.1
Netherlands	50	0.9	517	2.8	50	0.9	517	3.0	1	2.4
Australia	49	1.0	524	3.3	51	1.0	523	3.4	1	3.4
England	51	0.7	536	3.0	49	0.7	536	2.6	1	2.8
Norway (5)	49	0.9	538	3.1	51	0.9	537	3.1	1	3.2
Singapore	48	0.5	591	3.7	52	0.5	590	4.2	0	2.8
Russian Federation	49	0.9	567	3.1	51	0.9	567	3.7	0	2.7
France	49	0.7	487	3.1	51	0.7	487	2.9	0	2.4
Northern Ireland	50	1.1	520	3.0	50	1.1	520	2.8	0	3.7
Cyprus	49	0.7	481	2.8	51	0.7	481	2.9	0	2.6
Chile	49	1.7	477	3.0	51	1.7	478	3.4	1	3.3
Germany	48	0.7	527	2.7	52	0.7	529	2.6	2	2.3
Croatia	49	0.8	532	2.7	51	0.8	534	2.2	2	2.8
United States	51	0.6	544	2.4	49	0.6	548	2.5	4	2.0
Denmark	49	0.8	525	2.5	51	0.8	529	2.6	4	2.8
Japan	50	0.5	567	2.0	50	0.5	571	2.3	4	2.4
Ireland	47	1.5	526	2.9	53	1.5	531	2.9	5	3.4
Spain	49	0.9	515	2.9	51	0.9	521	2.9	6	2.7
Slovenia	49	0.8	539	2.4	51	0.8	546	3.1	7	2.7
Portugal	49	0.8	504	2.5	51	0.8	512	2.4	7	2.2
Hungary	49	0.9	538	3.5	51	0.9	546	3.9	8	3.1
Czech Republic	49	0.9	530	2.8	51	0.9	538	2.7	8	2.6
Slovak Republic	48	0.9	516	3.2	52	0.9	524	2.7	8	2.7
Chinese Taipei	49	0.6	551	2.2	51	0.6	560	2.4	9	2.9
Italy	49	0.7	512	3.1	51	0.7	521	2.8	9	2.5
Hong Kong	46	1.5	551	3.9	54	1.5	561	3.3	10	3.9
Korea	48	0.5	584	2.3	52	0.5	595	2.3	11	2.4
International average	49	0.1	508	0.5	51	0.1	504	0.6		

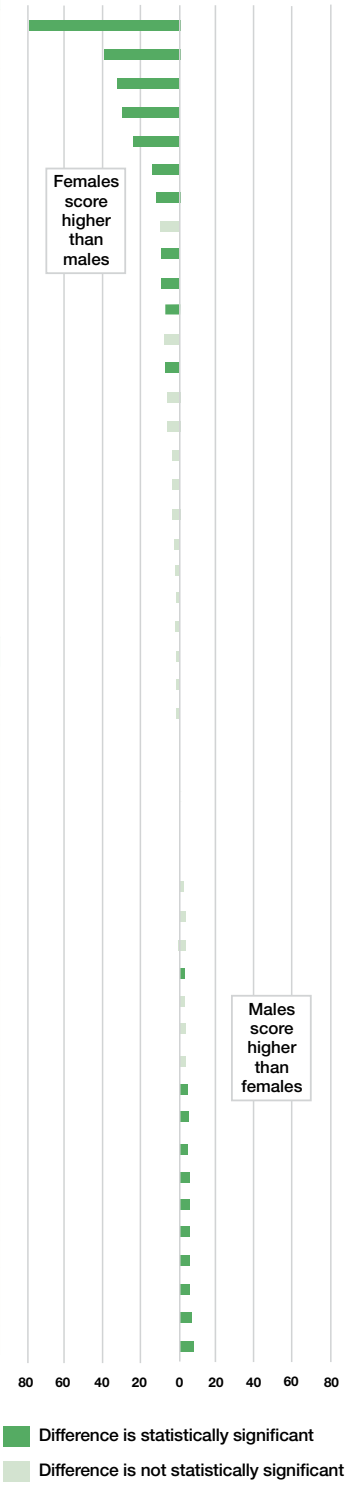


FIGURE 4.7 Sex differences in Year 4 science achievement, by country

- Internationally, while small, there was a significant difference in science achievement at Year 4 in favour of female students (international average: 508 vs 504 for male students).
- In 25 countries, including Australia, there was no significant sex difference in science achievement at Year 4.
- Eleven countries, including the United States, had significant differences favouring male students. These differences ranged in size from four score points in the United States through to 11 score points in Korea.
- There were also 11 countries in which females outperformed males, on average, but where this occurred the differences were generally larger. Seven countries had larger differences favouring female over male students (from 12 score points in Finland through to a massive 79 score points in Saudi Arabia).
- In Australia, both male and female students achieved at a significantly higher level than their respective international means.

Sex	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Female	49	524	3.3	245	6 19 38 31 8
Male	51	523	3.4	255	7 18 36 31 8

Below Low Low Intermediate High Advanced

Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 4.8 Mean scores and percentages of Australian students at the international benchmarks for Year 4 science, by sex

- The difference between Australian male and female students in Year 4 science was not statistically significant.
- The distribution of male and female students across the benchmarks was almost identical.

Trends in science achievement by sex

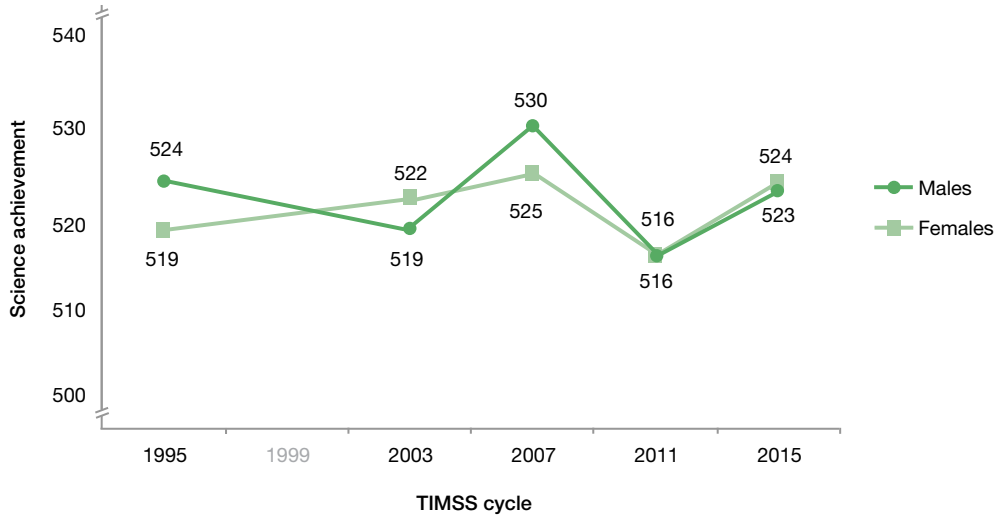


FIGURE 4.9 Trends in Year 4 science achievement within Australia, 1995–2015, by sex

- The scores for both female and male students have recovered from falls in TIMSS 2011, improving significantly since that cycle but showing no overall change since TIMSS 1995.

Sex difference in science achievement by jurisdiction

Jurisdiction	Female		Male		Difference (absolute value)	SE
	Mean	SE	Mean	SE		
NT	489	13.5	471	15.3	18	13.6
NSW	528	6.8	519	7.8	9	7.2
TAS	525	10.5	524	10.7	1	9.9
WA	517	7.4	516	9.4	1	7.7
QLD	523	5.9	524	5.8	2	5.6
ACT	548	8.2	550	7.9	3	8.1
SA	521	8.3	526	7.8	4	7.3
VIC	523	6.7	531	4.9	8	6.4

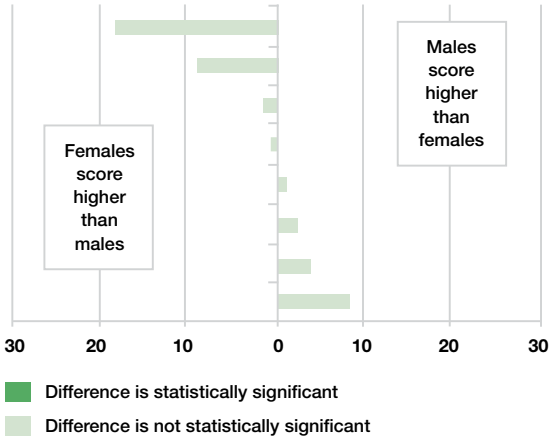
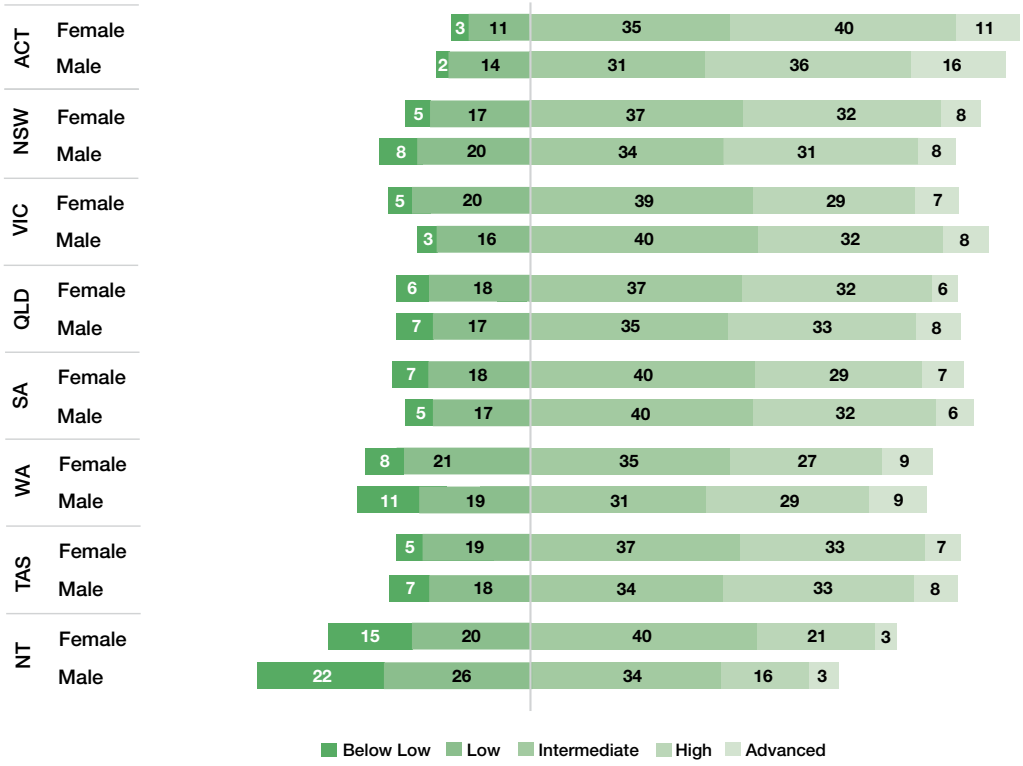


FIGURE 4.10 Sex differences in Year 4 science achievement within Australia, by jurisdiction

- Sex differences in Year 4 science were not significant in any jurisdiction.



Note: Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

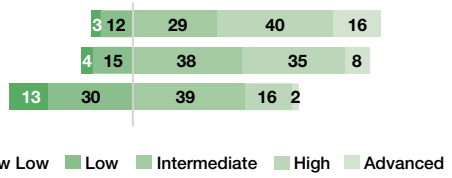
FIGURE 4.11 Percentages of Australian students at the international benchmarks for Year 4 science, by sex within jurisdiction

- In the Australian Capital Territory, 16 per cent of male students reached the Advanced benchmark compared to 11 per cent of female students; however, at the other end of achievement, 14 per cent of female students compared to 17 per cent of male students were at or below the Low benchmark.
- Reflecting the previous finding of no sex differences at jurisdictional level, the percentages of male and female students at each benchmark were similar in most jurisdictions.
- Of concern, as in Year 4 mathematics, are the 36 per cent of female students and 48 per cent of male students in the Northern Territory who failed to achieve the Intermediate benchmark. While this was much higher than in any other Australian jurisdiction, in Western Australia 29 per cent of females and 31 per cent of males did not achieve this minimum standard.

Results for books in the home

This section presents Australian students' science achievement according to the number of books in the home. For more information about this variable, please refer to the Reader's Guide.

Number of books in the home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Many books	16	554	4.4	249	
Average number of books	57	535	2.4	229	
A few books	26	484	3.8	241	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

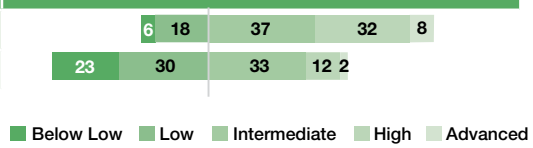
FIGURE 4.12 Mean scores and percentages of students at the international benchmarks for Year 4 science, by number of books in the home

- The majority of Australian Year 4 students (57%) reported having an *average number of books* and only 16 per cent reported having *many books* at home.
- Students who have *many books* in the home were found to have the highest levels of science achievement, scoring, on average, 19 score points higher than students with an *average number of books* in the home, and 70 score points higher than those who reported having a *few books* in the home.
- Of those students who reported having *many books* in the home, 16 per cent achieved the Advanced benchmark. The proportion of students achieving this highest benchmark fell to eight per cent for students in the *average number of books* category and just two per cent of those with a *few books* in the home.
- Forty-three per cent of the students who reported having a *few books* in the home did not achieve the Intermediate benchmark, with 30 per cent of these performing at the Low benchmark and a further 13 per cent falling below the Low benchmark.
- As a comparison, of the students who reported having *many books* in the home, 12 per cent achieved the Low benchmark and just three per cent failed to achieve even this basic level.

Results for Indigenous students

This section presents Australian students' science achievement according to Indigenous status. For more information about this variable, please refer to the Reader's Guide.

Indigenous background	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Non-Indigenous	96	526	2.8	245	
Indigenous	4	463	7.6	273	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 4.13 Mean scores and percentages of students at the international benchmarks for Year 4 science, by Indigenous background

- Indigenous students attained an average score of 463 score points in Year 4 science, which is 63 score points lower than the average score for non-Indigenous students of 526.
- The mean score for Indigenous students is at the high end of the Low international benchmark, while the average science score of non-Indigenous students is at the higher end of the Intermediate international benchmark.
- Two per cent of Indigenous students reached the Advanced benchmark compared to eight per cent of non-Indigenous students.
- Of concern is that 53 per cent of Indigenous students compared to 23 per cent of non-Indigenous students did not achieve the Intermediate international benchmark, with 23 per cent of Indigenous students not reaching even the Low benchmark.

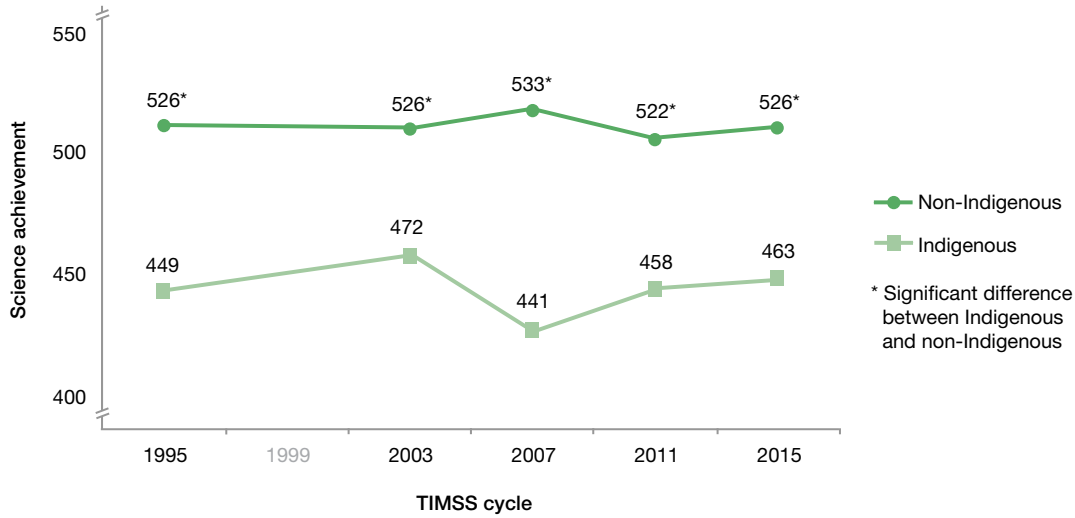


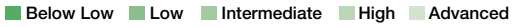
FIGURE 4.14 Trends in Year 4 science achievement within Australia, 1995–2015, by Indigenous background

- In terms of a 20-year trend in scores, there is no significant difference in the scores of either Indigenous or non-Indigenous students between TIMSS 1995 and TIMSS 2015.
- The gap in average science performance of Indigenous and non-Indigenous Year 4 students has changed little over 20 years: from 77 score points in 1995 to 63 score points in 2015.

Results for language spoken at home

This section presents Australian students' science achievement according to whether a language other than English is spoken as the main language at home. For more information about this variable, please refer to the Reader's Guide.

Language spoken at home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
English	85	527	2.8	246	6 17 36 33 8
Other	15	509	5.7	258	8 23 39 24 7



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

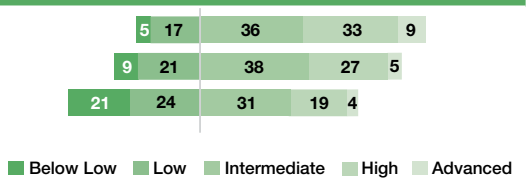
FIGURE 4.15 Mean scores and percentages of students at the international benchmarks for Year 4 science, by language spoken at home

- While the majority of students tested in Year 4 spoke English 'always' or 'almost always' at home, there were around 15 per cent of students for whom this was not true.
- Students who spoke English 'always' or 'almost always' at home scored significantly higher than students whose main language at home was not English.
- While these differences were not reflected at the Advanced benchmark, with around the same percentage of English speakers and other-language speakers performing at this level, it was more evident at other levels: 33 per cent of English-speaking students vs 24 per cent of students who spoke a language other than English performed at the High benchmark, and 23 per cent of English-speaking students compared to 31 per cent of students who spoke a language other than English performed at or below the Low benchmark.

Results for geographic location of the school

This section presents Australian students' science achievement according to the geographic location of the school. For more information about this variable, please refer to the Reader's Guide.

Geographic location	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Metropolitan	69	530	2.9	243	
Provincial	30	511	6.3	254	
Remote	1	478	10.4	289	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 4.16 Mean scores and percentages of students at the international benchmarks for Year 4 science, by geographic location

- Students attending school in remote areas make up only one per cent of the Year 4 TIMSS sample, while those attending school in metropolitan areas make up 69 per cent of the sample.
- Students attending schools in metropolitan areas achieved, on average, 19 score points higher than students attending schools in provincial areas, and 52 score points, on average, higher than students in remote schools.
- Students attending schools in provincial areas scored, on average, 33 score points higher than students attending schools in remote areas. All these differences are statistically significant.
- Almost half (45%) of the students in remote schools did not reach the Intermediate international benchmark. Twenty-one per cent of these students performed below the Low international benchmark. In contrast, only nine per cent of students from provincial schools and five per cent of students from metropolitan schools were performing at a level below that of the Low international benchmark.
- The difference in achievement is also evident at the higher end of the achievement spectrum. While some students from remote schools did achieve scores above the international mean score of 500, only four per cent of Year 4 students from remote schools achieved the Advanced international benchmark in science, compared to five per cent of students from provincial schools and nine per cent of students from metropolitan schools.

Chapter 5

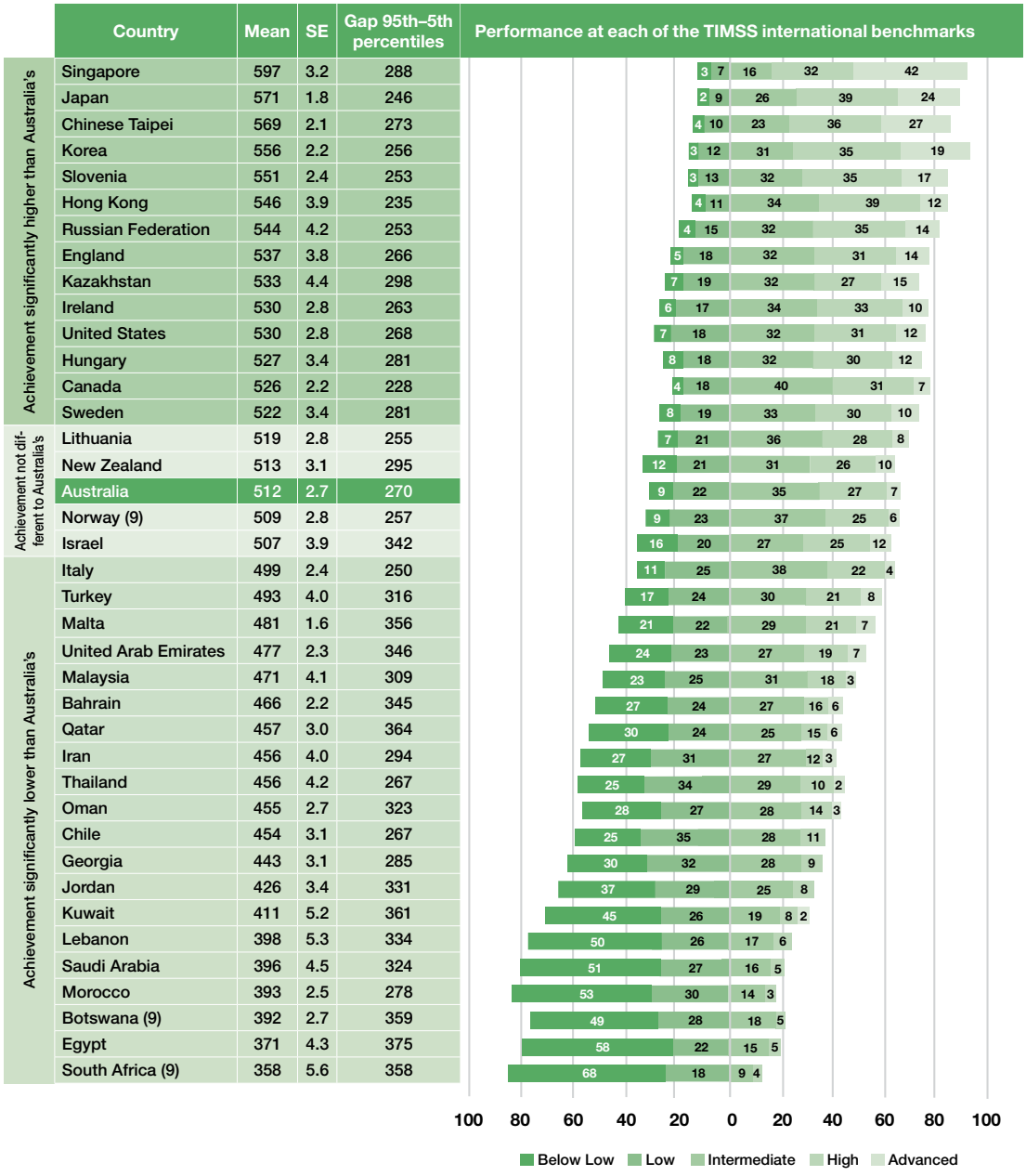
Year 8 science

Australia's Year 8 science results within the international context

Figure 5.1 (see page 66) shows the means, standard errors, gaps between the 5th and 95th percentiles and, to the right of the percentile gaps, the percentages of students in each country at the TIMSS benchmarks.

- Singapore had the highest achievement in Year 8 science. Singapore's score of 597 was significantly higher than those of all other countries, and it was followed by those for Japan (571) and Chinese Taipei (569), which were not significantly different to each other but were significantly higher than scores recorded by all other countries. In addition to these three high-performing countries, Korea (556) and Slovenia (551) also scored, on average, above the High international benchmark.
- Australian Year 8 students' average score of 512 score points in science was significantly higher than the scores for 20 other countries, such as Italy, Turkey and Malaysia, and places average achievement about halfway between the Intermediate and High benchmarks.
- Australia was significantly outperformed by 14 countries, including Canada, the United States, Ireland and England, as well as the top five countries mentioned above, along with Hong Kong, the Russian Federation, Kazakhstan, Hungary and Sweden.
- Canada, one of the higher-achieving countries, had the smallest gap between high and low achievers (228 score points), while Egypt had the largest gap, of 375 score points. Australia's gap was about mid-range at 270 score points, similar to that of the United States and smaller than the gap in Singapore.
- Singapore, in particular, had an impressive percentage of Year 8 students reaching the Advanced benchmark in science. Forty-two per cent of Year 8 Singaporean students achieved this standard. In Chinese Taipei more than one-quarter of students (27%), in Japan just under one-quarter of students (24%) and in Korea 19 per cent of students achieved this benchmark. Slovenia reported 17 per cent of students at the Advanced international benchmark.
- In Australia, just seven per cent of Year 8 students reached the Advanced benchmark in science. The international median was also seven per cent of students attaining this level. Australia's percentage of achievers at the Advanced benchmark was exceeded by New Zealand (10%), Sweden (10%), Ireland (10%), Hong Kong (12%), the United States (12%), Hungary (12%), Israel (12%), the Russian Federation (14%), England (14%) and Kazakhstan (15%).

- Sixty-nine per cent of Australian students achieved at least the Intermediate international benchmark, which is the proficient standard for Australia.
- However, just under one-third (31%) of Australian Year 8 students were found to be performing at or below the Low international benchmark (22% performed at the Low benchmark and a further 9% did not reach the Low benchmark).



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 5.1 Mean scores and percentages of students at the international benchmarks for Year 8 science, by country

Trends in science performance across countries

In this section, different perspectives are provided on changes of scores over time. Figure 5.2 shows the trends for Australia for TIMSS 1995, 2003, 2007, 2011 and 2015, along with those for several other countries by way of comparison. Table 5.1 shows Australia's position relative to those of all participating countries in 2015, 2011, 2007, 2003 and 1995. Figure 5.3 shows changes between 1995 and 2015 in the percentages of students achieving the Advanced international benchmark, as well as the percentages of students not achieving the Low benchmark.

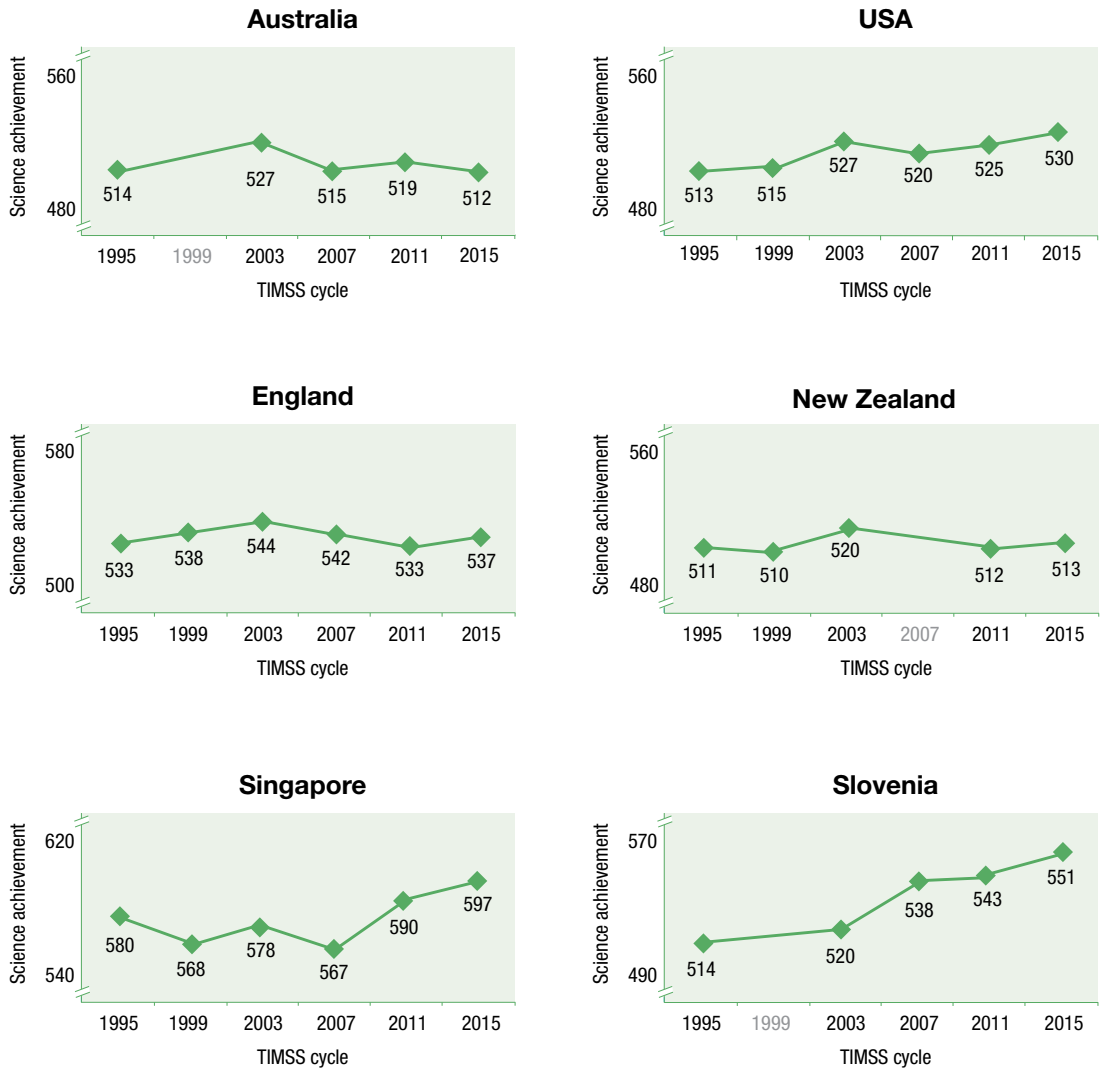


FIGURE 5.2 Trends in Year 8 science achievement scores, 1995–2015, selected countries

- Australia's score in Year 8 science was basically the same as in TIMSS 1995. There was an improvement in 2003 but this was followed by a decline in 2007 – scores have not fluctuated much since then.
- The growth in achievement in Slovenia over the 20 years since TIMSS 1995 is impressive. Achievement has improved at every cycle. Slovenia's score was the same as Australia's in 1995, but in 2015 Slovenia was one of the top-five-performing countries.
- Singapore also has experienced some ups and downs, but has improved its already high score to attain an average achievement level heading towards that of the Advanced international benchmark.
- Scores in the United States since TIMSS 1995 – when its score was the same as Australia's – have fallen only once since then, in TIMSS 2007, and otherwise are significantly higher than in TIMSS 1995. The United States' score has ended up significantly higher than Australia's in 2015.

TABLE 5.1 Relative trends in Year 8 science achievement, by country

Country	Position relative to Australia 2015	Position relative to Australia 2011	Position relative to Australia 2007	Position relative to Australia 2003	Position relative to Australia 1995
Singapore	↑	↑	↑	↑	↑
Japan	↑	↑	↑	↑	↑
Chinese Taipei	↑	↑	↑	↑	–
Korea	↑	↑	↑	↑	↑
Slovenia	↑	↑	↑	•	•
Hong Kong	↑	↑	↑	↑	•
Russian Federation	↑	↑	↑	↓	•
England	↑	↑	↑	↑	↑
Kazakhstan	↑	↓	–	–	–
Ireland	↑	–	–	–	•
United States	↑	•	•	•	•
Hungary	↑	•	↑	↑	↑
Canada	↑	–	–	–	–
Sweden	↑	•	•	•	↑
Lithuania	•	•	•	•	↓
New Zealand	•	•	–	•	•
Australia					
Norway (9)	•	–	–	–	–
Israel	•	•	–	–	–
Italy	↓	↓	↓	↓	–
Turkey	↓	↓	–	–	–
Malta	↓	–	↓	–	–
United Arab Emirates	↓	↓	–	–	–
Malaysia	↓	↓	↓	↓	–
Bahrain	↓	↓	↓	↓	–
Qatar	↓	↓	–	–	–
Iran	↓	↓	↓	↓	↓
Thailand	↓	↓	↓	–	–
Oman	↓	↓	↓	–	–
Chile	↓	↓	–	↓	–
Georgia	↓	↓	↓	–	–
Jordan	↓	↓	↓	↓	–
Kuwait	↓	–	↓	–	–
Lebanon	↓	↓	↓	↓	–
Saudi Arabia	↓	↓	–	–	–
Morocco	↓	↓	–	–	–
Botswana (9)	↓	↓	–	–	–
Egypt	↓	–	↓	↓	–
South Africa (9)	↓	↓	–	–	–

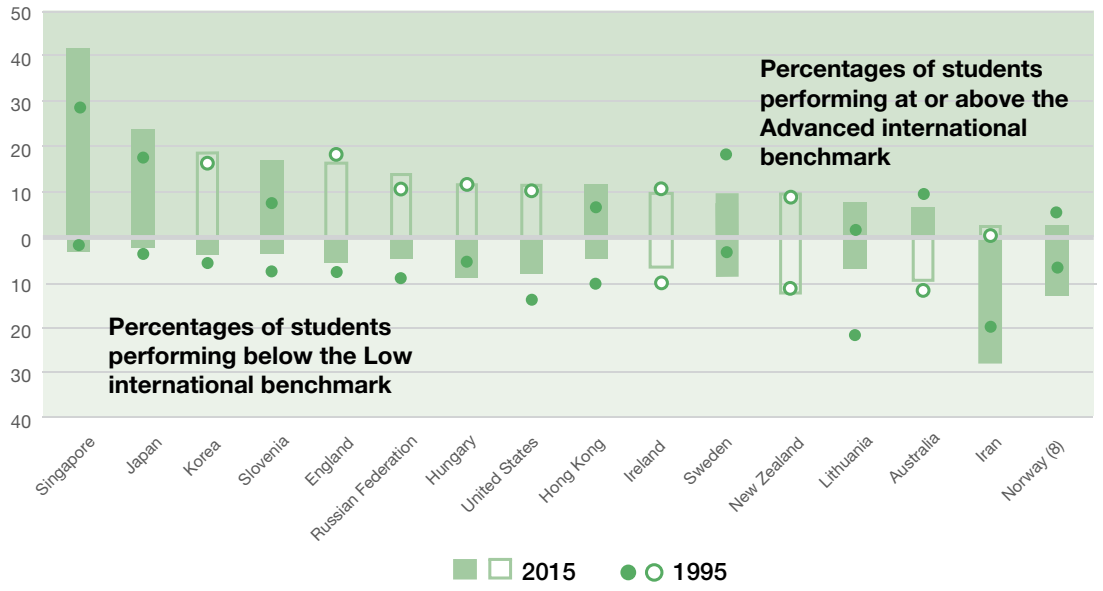
↑ Score significantly higher than Australia's.

↓ Score significantly lower than Australia's.

• Score not significantly different to that of Australia.

– Did not participate in this cycle.

- The United States, Hungary and Sweden recorded scores not significantly different to Australia's in TIMSS 2011, but attained scores significantly higher than Australia's in TIMSS 2015.
- Slovenia, the Russian Federation, Ireland, the United States and Hong Kong scored at an equivalent level to that of Australia in 1995 and outperformed Australia in 2015.
- Lithuania was outperformed by Australia in TIMSS 1995 but scored at an equivalent level in TIMSS 2015.



Note: A coloured bar and a coloured circle indicate that the difference in the percentages of students between TIMSS 1995 and TIMSS 2015 was significant.

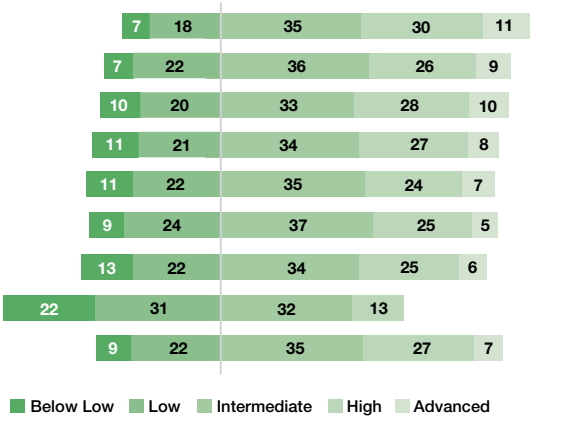
FIGURE 5.3 Percentages of high- and low-achieving students in Year 8 science in TIMSS 1995 and TIMSS 2015, by country

- In five of the 16 countries that participated in both TIMSS 1995 and TIMSS 2015 (Singapore, Japan, Slovenia, Hong Kong and Lithuania), the percentages of Year 8 students achieving the Advanced international benchmark in science significantly increased over the 20 years.
- In three countries, including Australia (Sweden and Norway were the others), the percentages of students achieving the Advanced benchmark actually declined over the 20 years. In Australia, the proportion declined from 10 per cent to seven per cent.
- In terms of achieving the Low international benchmark, three of the 16 countries showed no significant difference, eight countries showed a reduction in the number of students falling below the Low benchmark and five countries reported an increase in the percentages of students falling below the Low benchmark over the 20-year period. Australia was one of the countries for which there was no change in the percentage of students falling below the Low benchmark.

Science performance in TIMSS 2015 for the Australian jurisdictions

- The Australian Capital Territory was the highest-performing jurisdiction. Its students performed significantly higher, on average, than students in all jurisdictions except Victoria and Western Australia.
- The spread of average scores across the jurisdictions was quite large, being 64 score points between the average scores of students in the Australian Capital Territory and those in the Northern Territory.
- Students in the Northern Territory performed significantly below students in all other jurisdictions.
- The jurisdiction with the highest percentage of students achieving the Advanced international benchmark was the Australian Capital Territory, in which 11 per cent of students achieved the highest level. Ten per cent of Western Australian and nine per cent of Victorian students achieved this benchmark. The Northern Territory had the lowest proportion of students at this level, with just one per cent achieving the Advanced benchmark.
- Fifty-three per cent of students in the Northern Territory did not reach the Intermediate international benchmark in science at Year 8, which is the proficient standard for Australia. In the other jurisdictions, this proportion ranged from 24 per cent in the Australian Capital Territory to 34 per cent in Tasmania.

Jurisdiction	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
ACT	528	4.6	270	7 18 35 30 11
VIC	518	4.1	257	7 22 36 26 9
WA	518	5.7	282	10 20 33 28 10
NSW	511	6.1	277	11 21 34 27 8
SA	507	8.3	283	11 22 35 24 7
QLD	507	5.6	257	9 24 37 25 5
TAS	503	8.0	281	13 22 34 25 6
NT	463	11.9	264	22 31 32 13
Australia	512	2.7	270	9 22 35 27 7



In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 5.4 Mean scores and percentages of Australian students at the international benchmarks for Year 8 science, by jurisdiction

TABLE 5.2 Multiple comparisons of Year 8 science achievement, by jurisdiction

Jurisdiction	Mean	SE	ACT	VIC	WA	NSW	SA	QLD	TAS	NT
ACT	528	4.6		•	•	↑	↑	↑	↑	↑
VIC	518	4.1	•		•	•	•	•	•	↑
WA	518	5.7	•	•		•	•	•	•	↑
NSW	511	6.1	↓	•	•		•	•	•	↑
SA	507	8.3	↓	•	•	•		•	•	↑
QLD	507	5.6	↓	•	•	•	•		•	↑
TAS	503	8.0	↓	•	•	•	•	•		↑
NT	463	11.9	↓	↓	↓	↓	↓	↓	↓	

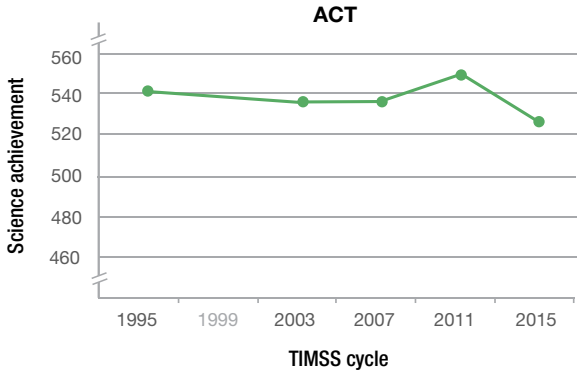
Note: Read across the row to compare a state/territory's performance with the performance of each jurisdiction listed in the column heading.

↑ Average performance statistically significantly higher than in comparison jurisdiction.

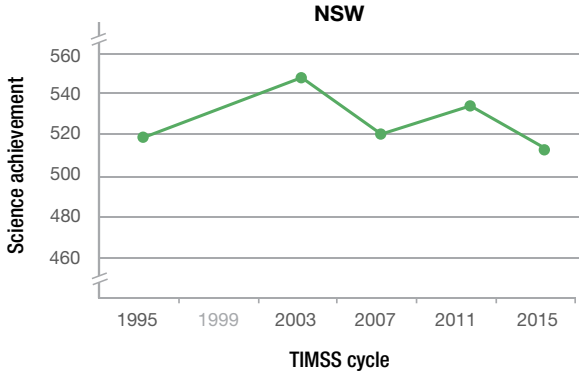
• No statistically significant difference from comparison jurisdiction.

↓ Average performance statistically significantly lower than in comparison jurisdiction.

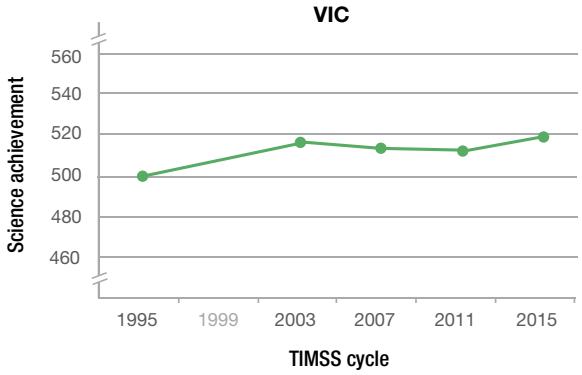
Trends for the Australian jurisdictions



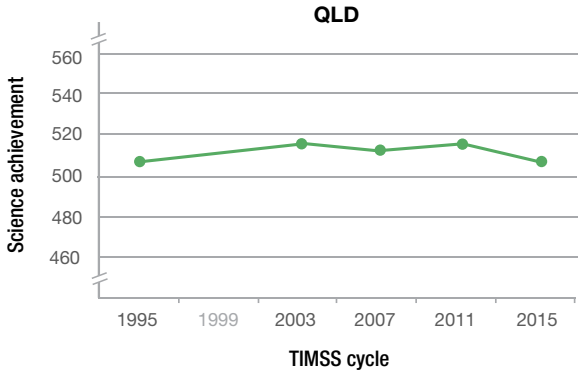
Differences between years				
	2011	2007	2003	1995
2015	-23 ↓	-10	-10	-15
2011		13	13	8
2007			0	-5
2003				-5



Differences between years				
	2011	2007	2003	1995
2015	-21	-10	-36 ↓	-8
2011		11	-16	13
2007			-26	2
2003				29 ↑



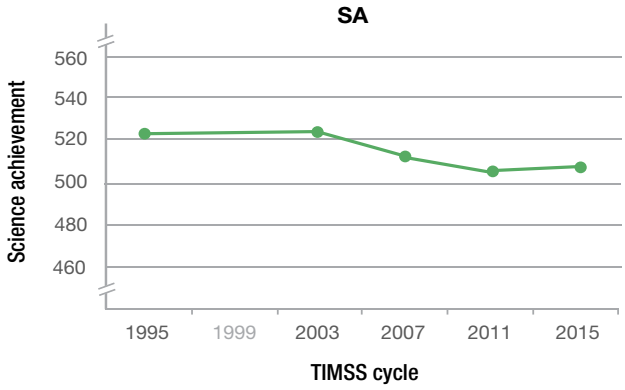
Differences between years				
	2011	2007	2003	1995
2015	6	5	3	19 ↑
2011		0	-3	13
2007			-3	13
2003				16



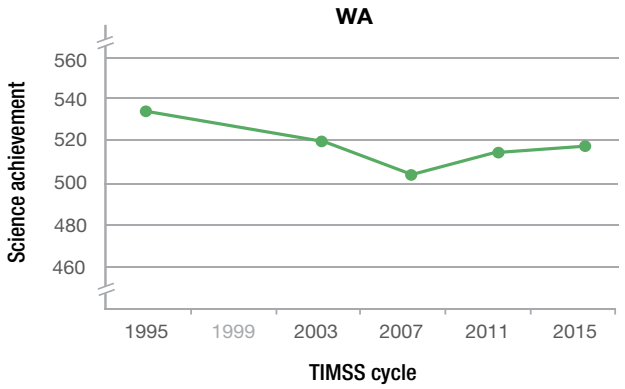
Differences between years				
	2011	2007	2003	1995
2015	-9	-6	-9	0
2011		3	0	9
2007			-3	6
2003				8

Note: Read across the row to determine if the performance in the row year is significantly higher (↑) or significantly lower (↓) than the performance in the column year.

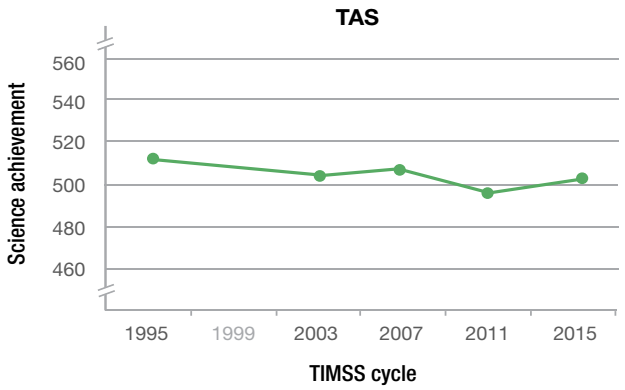
FIGURE 5.5 Trends in Year 8 science achievement within Australia, 1995–2015, by jurisdiction



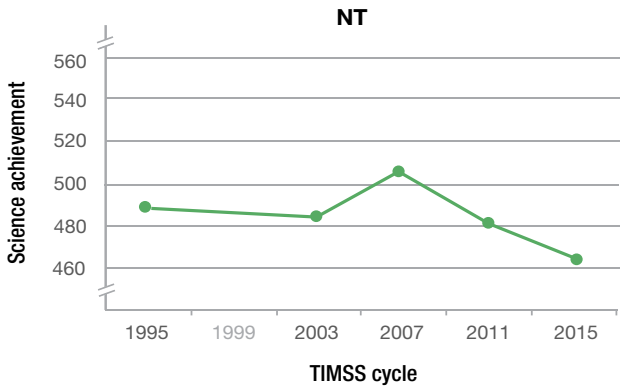
Differences between years				
	2011	2007	2003	1995
2015	1	-5	-17	-16
2011		-6	-18	-18 ↓
2007			-12	-11
2003				1



Differences between years				
	2011	2007	2003	1995
2015	3	11	-3	-16
2011		8	-6	-19
2007			-14	-27 ↓
2003				-13



Differences between years				
	2011	2007	2003	1995
2015	7	-4	-1	-10
2011		-11	-8	-17
2007			3	-7
2003				-10

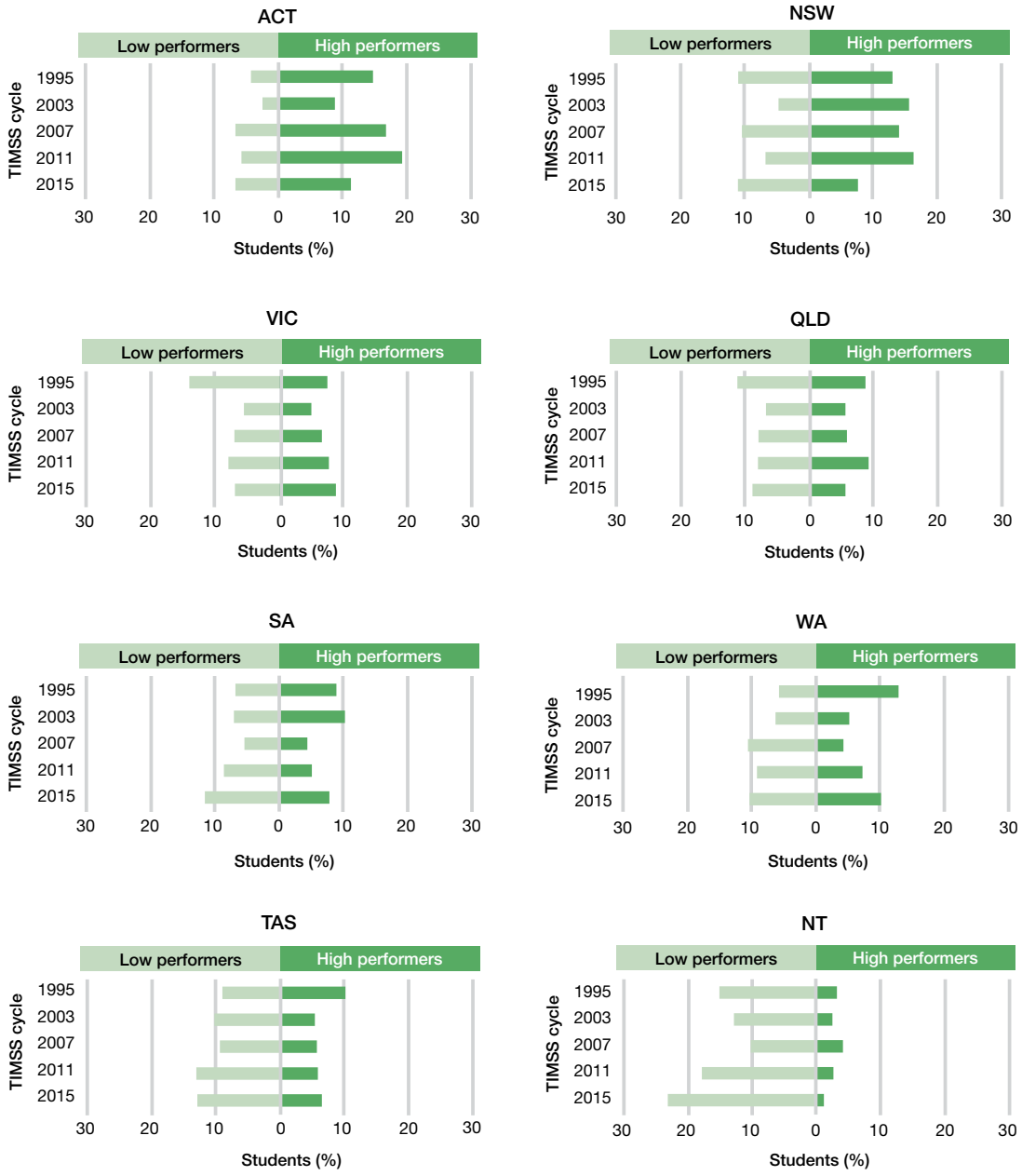


Differences between years				
	2011	2007	2003	1995
2015	-18	-39 ↓	-19	-24
2011		-21	-1	-6
2007			20	15
2003				-5

Note: Read across the row to determine if the performance in the row year is significantly higher (↑) or significantly lower (↓) than the performance in the column year.

FIGURE 5.5 Trends in Year 8 science achievement within Australia, 1995–2015, by jurisdiction (cont.)

- The only change from TIMSS 2011 to TIMSS 2015 was a significant decline in the scores for the Australian Capital Territory.
- The only significant difference from TIMSS 1995 was for Victoria, which scored significantly higher in TIMSS 2015 than in TIMSS 1995.



Note: The terms 'low performers' and 'high performers' refer, respectively, to the percentages of students who did not achieve the Low international benchmark and the percentages of students who achieved the Advanced international benchmark.

FIGURE 5.6 Percentages of high- and low-achieving students in Year 8 science from TIMSS 1995 to TIMSS 2015, by jurisdiction

Figure 5.6 shows the percentage of students achieving the Advanced international benchmark in Year 8 science, as well as the percentage of students not achieving the Low benchmark, for each Australian jurisdiction for all TIMSS cycles from 1995 through to 2015.

- The percentages of students not achieving the Low international benchmark increased in five of the Australian jurisdictions over the 20-year period from 1995 to 2015. The increase (of about five percentage points) was statistically significant in South Australia and Western Australia. Of the remaining jurisdictions, only Victoria reported a statistically significant drop (of seven percentage points) in the proportion of students who did not achieve the Low international benchmark.
- Most jurisdictions (except Victoria) experienced a decrease in the percentage of students achieving the Advanced international benchmark from 1995 to 2015. However, this was not statistically significant for any jurisdiction.

Australia's science achievement for different demographic groups

Results for males and females

Previous TIMSS assessments have shown gender differences in science achievement at Year 8 to be small on average, although the situation varies considerably from country to country.

	Female				Male					
Country	% of students	SE of %	Mean	SE	% of students	SE of %	Mean	SE	Difference (absolute value)	SE
Saudi Arabia	51	1.6	423	4.9	49	1.6	368	8.0	55	9.5
Bahrain	48	0.9	492	3.2	52	0.9	442	3.4	50	5.0
Kuwait	50	2.5	434	5.1	50	2.5	387	8.2	47	8.7
Oman	48	1.7	478	2.9	52	1.7	433	3.6	45	4.4
Jordan	50	2.6	447	4.0	50	2.6	405	5.3	41	6.7
United Arab Emirates	50	2.5	492	3.5	50	2.5	461	4.4	31	6.7
Qatar	50	3.0	471	3.6	50	3.0	441	5.2	30	6.0
Botswana (9)	51	0.6	403	3.3	49	0.6	381	3.1	22	3.3
Thailand	54	1.5	465	4.4	46	1.5	445	5.2	20	4.8
Turkey	48	0.8	503	4.1	52	0.8	484	4.5	19	3.1
Egypt	53	2.3	377	5.9	47	2.3	364	5.4	13	7.6
Lebanon	53	1.6	403	4.9	47	1.6	393	6.7	10	4.7
Malaysia	50	1.8	476	4.0	50	1.8	466	4.8	10	3.5
South Africa (9)	51	1.1	362	6.7	49	1.1	353	5.5	9	5.1
Malta	49	0.3	485	2.2	51	0.3	477	2.2	8	3.1
Morocco	46	0.7	397	2.3	54	0.7	390	3.4	7	3.0
Kazakhstan	49	0.9	536	5.2	51	0.9	530	4.5	6	3.9
Israel	49	1.2	510	4.1	51	1.2	504	4.7	6	4.1
Iran	48	0.9	459	4.4	52	0.9	454	6.6	5	8.0
Slovenia	48	0.7	553	2.8	52	0.7	549	2.7	4	2.7
Ireland	50	1.1	531	2.8	50	1.1	529	3.9	2	3.7
England	51	1.6	537	4.7	49	1.6	536	4.5	1	5.2
Japan	51	1.0	571	2.2	49	1.0	570	2.5	1	3.1
Lithuania	50	0.8	520	3.3	50	0.8	519	3.4	1	3.7
New Zealand	51	2.0	513	3.2	49	2.0	512	4.3	1	4.2
Georgia	47	0.9	444	3.3	53	0.9	443	3.9	1	3.7
Sweden	48	1.0	523	4.2	52	1.0	522	3.5	1	3.4
Singapore	49	0.6	596	3.3	51	0.6	597	4.0	1	3.7
Chinese Taipei	49	0.8	568	2.3	51	0.8	571	2.6	3	2.6
Korea	47	0.5	554	2.2	53	0.5	557	2.8	3	2.7
Norway (9)	50	0.7	507	3.1	50	0.7	511	3.2	4	2.9
Russian Federation	49	0.9	542	4.6	51	0.9	546	4.3	4	3.0
Canada	51	1.0	524	2.2	49	1.0	529	2.7	5	2.3
Australia	51	1.6	510	3.4	49	1.6	515	3.0	5	3.4
United States	50	0.6	527	3.1	50	0.6	533	3.0	5	2.0
Italy	49	0.8	494	3.0	51	0.8	504	2.6	10	2.7
Hong Kong	47	2.1	540	4.2	53	2.1	551	4.9	10	4.6
Chile	48	1.8	448	3.6	52	1.8	460	4.1	12	4.8
Hungary	50	0.9	519	3.9	50	0.9	535	3.6	17	3.2
International average	50	0.2	491	0.6	50	0.2	481	0.7		

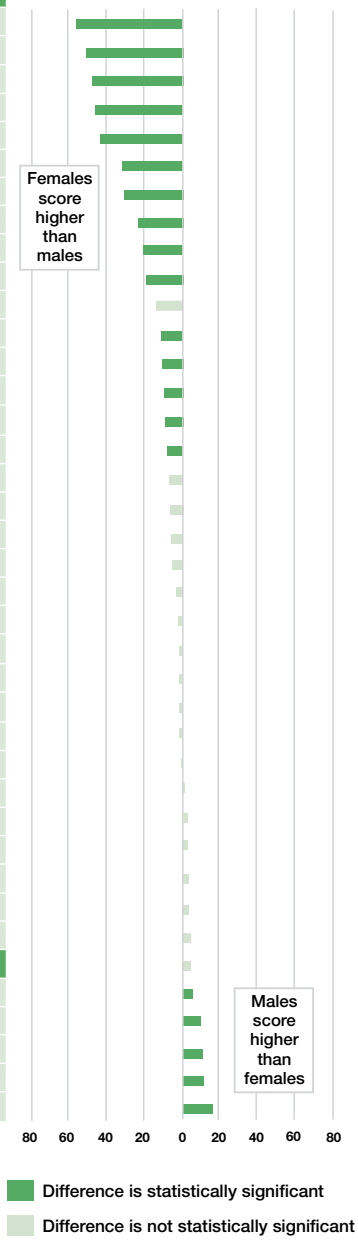


FIGURE 5.7 Sex differences in Year 8 science achievement, by country

- As found in TIMSS 2011, on average internationally, female students significantly outperformed male students in Year 8 science (491 vs 481, respectively).
- Females achieved significantly higher average scores than males in 15 of the 39 countries that tested at Year 8, including many of the countries located in the Middle East. The significant differences in favour of females ranged from 55 score points in Saudi Arabia to seven score points in Morocco.
- In contrast, males scored at a significantly higher level in just five countries, and the magnitude of these differences was much smaller. In the United States, Italy, Hong Kong, Chile and Hungary, males scored significantly higher (between five and 17 score points) than females.
- In Australia, both female and male students achieved at a significantly higher level than their respective international means.

Sex	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Female	51	510	3.4	264	9 22 36 25 7
Male	49	515	3.0	275	9 21 34 27 8

Below Low Low Intermediate High Advanced

Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 5.8 Mean scores and percentages of Australian students at the international benchmarks for Year 8 science, by sex

- The difference between Australian female and male average scale scores (which were 510 and 515, respectively) was not significant.
- A slightly higher proportion of Australian male students than female students (35% vs 32%) achieved the High and Advanced benchmarks.
- Just under one-third of Australian male and female students (30 and 32%, respectively) did not reach the Intermediate benchmark.

Trends in science achievement by sex

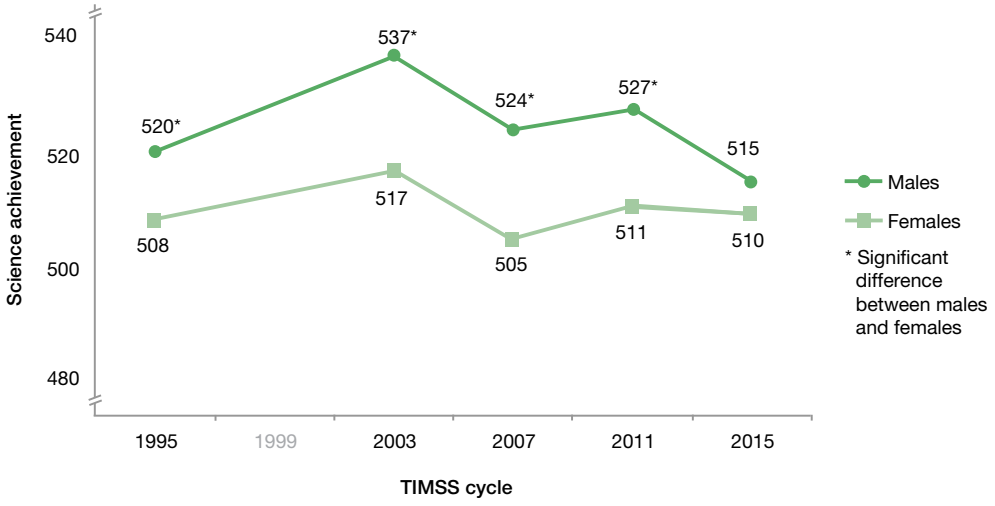


FIGURE 5.9 Trends in Year 8 science achievement within Australia, 1995–2015, by sex

- The score for Australian males increased significantly from TIMSS 1995 to TIMSS 2003, but since then has declined to where it is in TIMSS 2015, not significantly different to the level achieved 20 years ago.
- The score for Australian females has varied similarly to that of males, although not to the same extent, with an end result that is not significantly different to the TIMSS 1995 result.

Sex difference in science achievement by jurisdiction

Jurisdiction	Female		Male		Difference (absolute value)	SE
	Mean	SE	Mean	SE		
NT	467	12.5	461	12.1	7	10.0
WA	518	6.3	517	8.2	1	8.9
SA	508	10.8	507	8.6	0	10.3
VIC	518	6.0	519	4.3	1	6.7
TAS	501	12.2	506	8.8	5	14.1
QLD	504	5.9	510	8.1	6	8.5
ACT	523	6.5	532	7.9	9	11.4
NSW	505	8.4	517	6.0	12	8.4

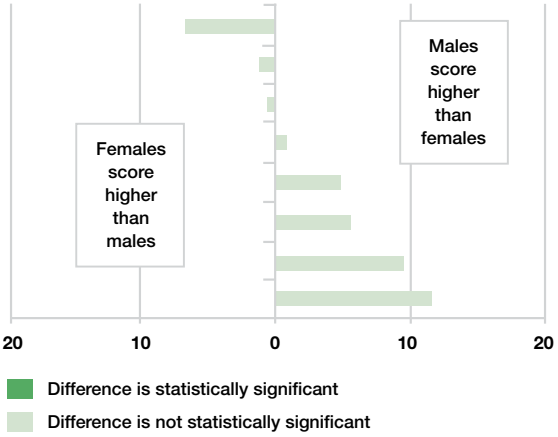
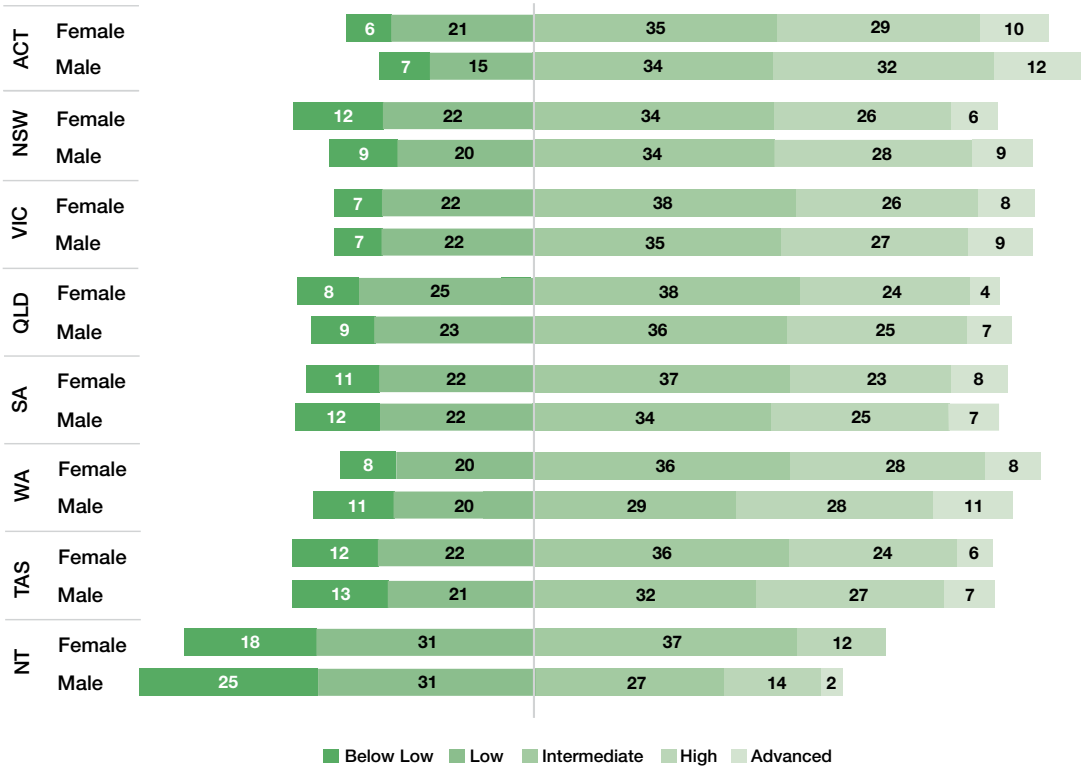


FIGURE 5.10 Sex differences in Year 8 science achievement within Australia, by jurisdiction

- Given that there were no sex differences in science at Year 8 for Australia as a whole, it seems likely that this would be reflected in the scores for the states and territories. This appears to be the case, as none of the differences that appear in Figure 5.10 are statistically significant.



Note: Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 5.11 Percentages of Australian students at the international benchmarks for Year 8 science, by sex within jurisdiction

- Given that there were no significant sex differences by jurisdiction, none of the differences in the percentages at benchmarks are likely to be significant.
- Half of the female students and 56% of the male students in the Northern Territory did not achieve the Intermediate benchmark. In several other jurisdictions, the proportions not achieving this basic level were also worrying – around one-third of both male and female students in Tasmania, South Australia and Queensland, and of female students in New South Wales.

Results for books in the home

This section presents Australian students' science achievement according to the number of books in the home. For more information about this variable, please refer to the Reader's Guide.

Number of books in the home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Many books	21	556	3.0	252	3 12 28 39 18
Average number of books	48	523	2.4	239	5 19 40 29 7
A few books	31	468	3.9	266	20 33 33 13 2

Below Low Low Intermediate High Advanced

Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

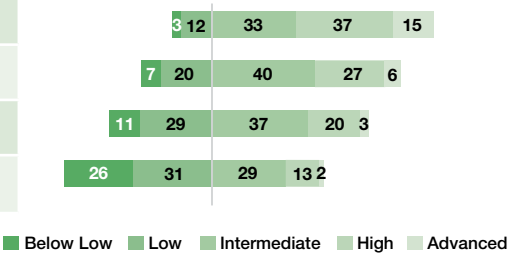
FIGURE 5.12 Mean scores and percentages of students at the international benchmarks for Year 8 science, by number of books in the home

- At this year level, the 21 per cent of students who report *many books* in the home gained a substantial advantage, scoring on average 33 score points higher than the next category of students and more than three-quarters of a standard deviation, 88 score points, higher than students with a *few books* in the home.
- Even having an *average number*, between 25 and 200 books, in the home has a substantial relationship with achievement, with these students scoring, on average, half a standard deviation, 55 score points, higher than the students with just a *few books* in the home.
- Around 15 per cent of students in the group who reported having *many books* in the home did not achieve the Intermediate benchmark, with 12 per cent of students achieving the Low benchmark and three per cent not achieving even this very basic level.
- However, 33 per cent of the students who reported having a *few books* in the home achieved only the Low benchmark, with 20 per cent of students not achieving even this basic level.

Results for parental education

This section presents Australian students' science achievement according to the level of parental education. For more information about this variable, please refer to the Reader's Guide.

Parental education	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Completed university degree	41	551	3.2	239	
Completed post-secondary but not university	30	515	2.9	248	
Completed upper secondary education	21	494	4.1	251	
Did not complete upper secondary education	8	458	6.8	288	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

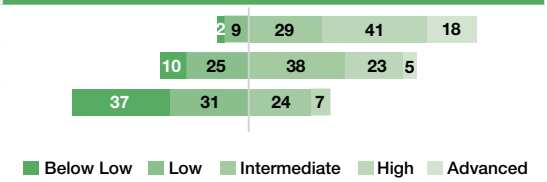
FIGURE 5.13 Mean scores and percentages of students at the international benchmarks for Year 8 science, by parental education

- Students with at least one parent with a university degree had an average science score a substantial 93 score points higher than that of students whose parents did not complete secondary school, 57 score points higher than the average score for students for whom the highest level of parental education was completion of secondary school and 36 score points higher than that of students whose parents completed a Technical and Further Education qualification. All differences were statistically significant.
- Around 15 per cent of students who had at least one parent complete a university degree reached the Advanced benchmark, compared to six per cent or fewer for all other groups.
- More than half (57%) of students whose parents did not complete secondary school did not reach the Intermediate benchmark, compared to 15 per cent of students with parents holding university degrees.

Results for educational resources in the home

This section presents Australian students' science achievement according to the number of educational resources in the home. For more information about this variable, please refer to the Reader's Guide.

Number of resources in the home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Many resources	23	562	2.8	235	
Some resources	73	503	2.5	253	
Few resources	4	429	8.4	270	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

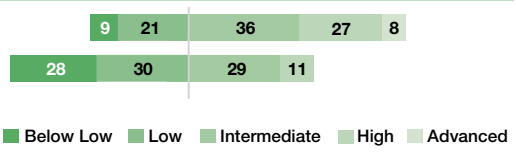
FIGURE 5.14 Mean scores and percentages of students at the international benchmarks for Year 8 science, by educational resources in the home

- Australia had one of the highest proportions of students who had *many resources* at home, with 23 per cent of students in this category, similar to Sweden (also 23%), the United States (22%), Canada (21%), and England and New Zealand (both 19%). Only Korea and Norway had higher percentages of students in this category (37 and 29%, respectively).
- The proportion of Australian students with only a *few resources* at home (4%) was also quite low by international standards. The majority of Australian students (73%) fell into the middle category of *some resources*.
- Year 8 students who had *many resources* in the home performed at a significantly higher level than those who had *some resources*, who again performed at a significantly higher level than those who had *few resources*. Australian Year 8 students who had *many resources* performed, on average, 59 score points higher than those who had *some resources*, whose average achievement was 73 score points higher than those with *few resources* at home.
- The average achievement of those with *many resources* was 133 score points more than those with *few resources*, a difference that is one and one-third standard deviations on the TIMSS Year 8 science scale.
- About two-thirds (69%) of students with *few resources* at home did not reach the Intermediate benchmark, compared to slightly more than a third (34%) of those with *some resources* and about a tenth (12%) of students with *many resources*.

Results for Indigenous students

This section presents Australian students' science achievement according to Indigenous status. For more information about this variable, please refer to the Reader's Guide.

Indigenous background	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Non-Indigenous	95	515	2.6	265	
Indigenous	5	453	6.6	277	



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

FIGURE 5.15 Mean scores and percentages of students at the international benchmarks for Year 8 science, by Indigenous background

- At Year 8 in science, Indigenous students achieved an average score of 453, which is 62 score points less than the average score for non-Indigenous students of 515 score points.
- Year 8 Australian Indigenous students' average science score was also significantly lower than the international scale average of 500 points.
- One per cent of Indigenous students achieved the Advanced benchmark, compared to eight per cent of non-Indigenous students.
- At the other end of the achievement spectrum, 28 per cent of Year 8 Indigenous students did not reach the Low benchmark, compared to nine per cent of non-Indigenous students, while a total of 58 per cent of Indigenous students and 30 per cent of non-Indigenous students did not achieve the Intermediate benchmark.

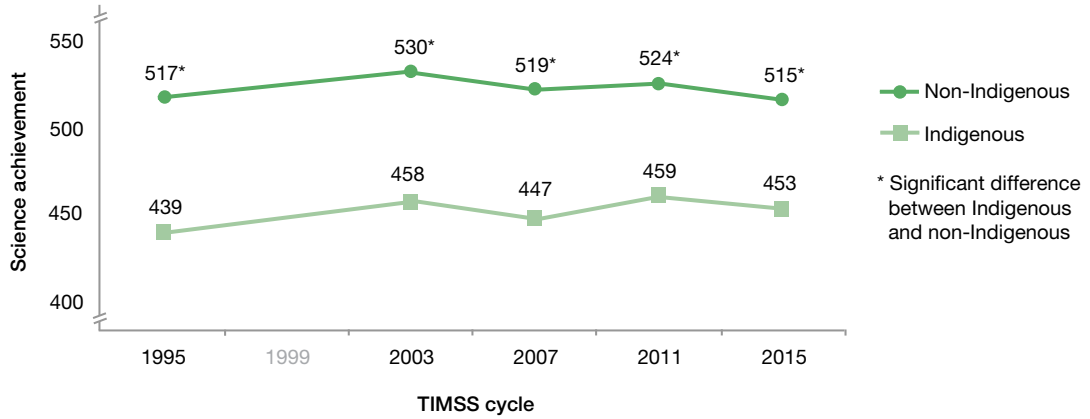


FIGURE 5.16 Trends in Year 8 science achievement within Australia, 1995–2015, by Indigenous background

- The only significant difference in scores between any TIMSS cycle is that non-Indigenous students' scores have declined significantly between TIMSS 2003 and TIMSS 2015.
- The difference between Indigenous and non-Indigenous students is significant, as it has been in each year of testing, and has not decreased measurably over 20 years.

Results for language spoken at home

This section presents Australian students' science achievement according to whether a language other than English is spoken as the main language at home. For more information about this variable, please refer to the Reader's Guide.

Language spoken at home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
English	93	514	2.4	263	8 22 36 26 7
Other	7	498	8.6	317	18 22 25 25 9

Below Low Low Intermediate High Advanced

Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader's Guide for more information.

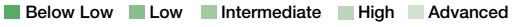
FIGURE 5.17 Mean scores and percentages of students at the international benchmarks for Year 8 science, by language spoken at home

- Students who spoke mainly English at home achieved an average scale score that was a statistically significant 16 points higher than that for students who did not speak English at home ‘always’ or ‘almost always’.
- However, it is difficult to generalise non-English speakers as either high or low achievers. Around the same proportion of non-English-speaking students achieved the Advanced benchmark (9% compared to 7% of English-speaking students) and High benchmark (25% vs 26%, respectively), but larger proportions of English-speaking than non-English-speaking students performed at the Intermediate benchmark.
- More students who spoke a language other than English at home did not reach the Low benchmark – 18 per cent, compared to eight per cent of English-speaking students – and the same proportion of each group achieved the Low benchmark, resulting in 41 per cent of students who spoke a language other than English at home and 30 per cent of English-speaking students not achieving the Intermediate benchmark (the proficient standard for Australia).

Results for geographic location of the school

This section presents Australian students’ science achievement according to the geographic location of the school. For more information about this variable, please refer to the Reader’s Guide.

Geographic location	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks
Metropolitan	71	516	3.5	267	9 21 35 28 8
Provincial	29	504	4.3	273	11 24 37 22 7
Remote	0	468	7.0	250	18 36 31 15



Note: In cases in which the proportion of students in a benchmark band is 1% or less, the numeric label will not appear on the band. This convention has been used for all figures about benchmarks in the chapter.

Due to rounding, some percentages in the figure may not match to totals in the text. See the Reader’s Guide for more information.

FIGURE 5.18 Mean scores and percentages of students at the international benchmarks for Year 8 science, by geographic location

- The proportion of students attending remote schools makes up less than one per cent of the Year 8 student sample; therefore, the level of uncertainty around statistics may be large. Around 71 per cent of students at this year level attend schools in metropolitan areas.
- Students attending schools in metropolitan areas achieved, on average, 11 score points higher than students attending schools in provincial areas, and 48 score points, on average, higher than students in remote schools. Students attending schools in provincial areas scored, on average, 37 score points higher than students attending schools in remote areas. All these differences are statistically significant.
- Around one-third of students in metropolitan and provincial areas (30 and 35%, respectively) and more than half (53%) of students in remote areas did not achieve the Intermediate benchmark.
- Eight per cent of students in metropolitan areas achieved the Advanced benchmark, compared to seven per cent of students in provincial areas and less than one per cent of students in remote areas.

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