Pacific Community
Communauté du Pacifique

Pacific Islands Literacy & Numeracy Assessment 2018

Regional Report

EQAP
Educational Quality and Assessment Programme

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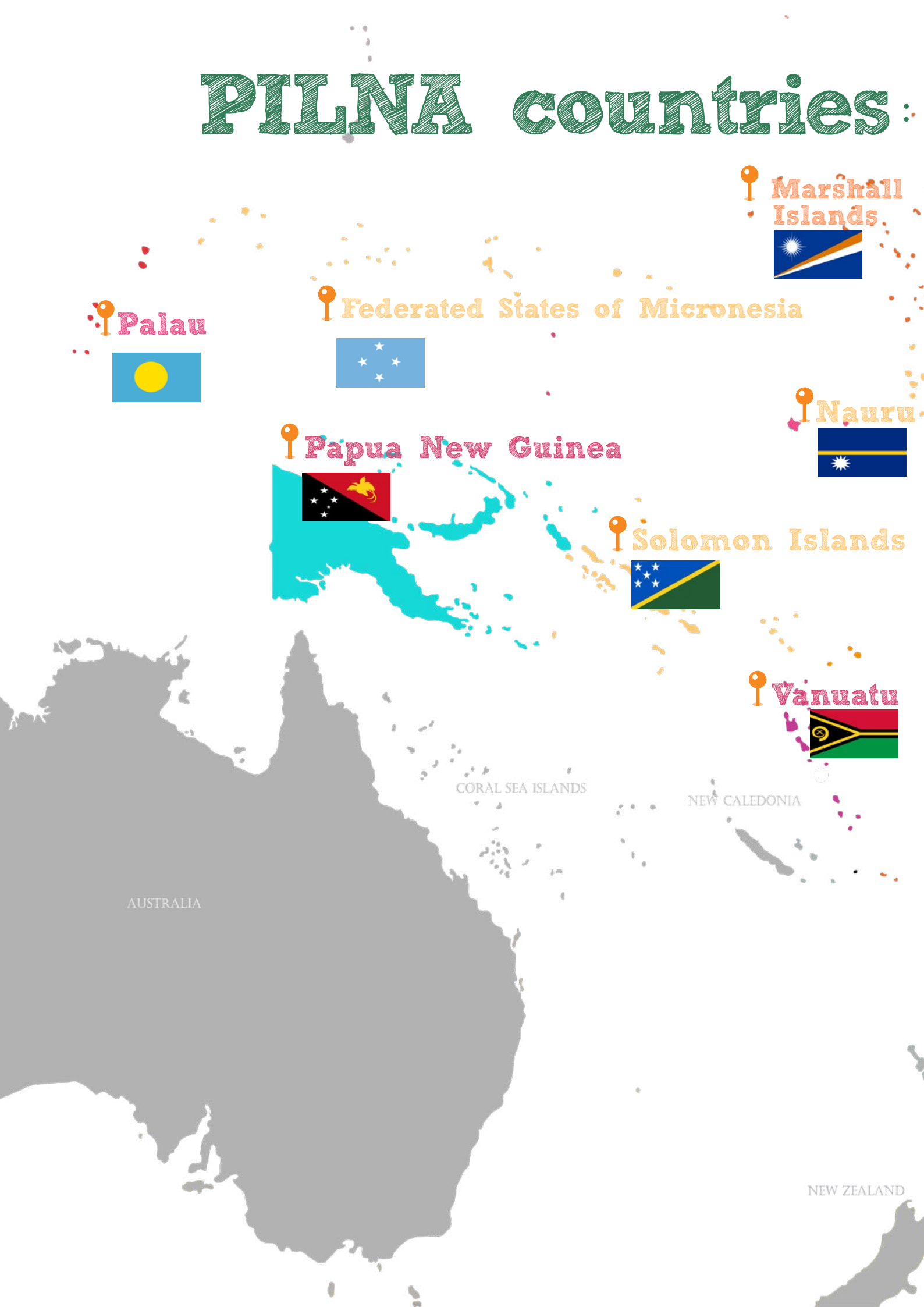
Ocean science, biodiversity, health, climate change, each play a fundamental role in driving our development, but **if the Pacific wants to be a leader** in these fields, **it will need future generations to be ready to take on this region's most pressing challenges**. **PILNA represents an essential tool for reaching this goal.**

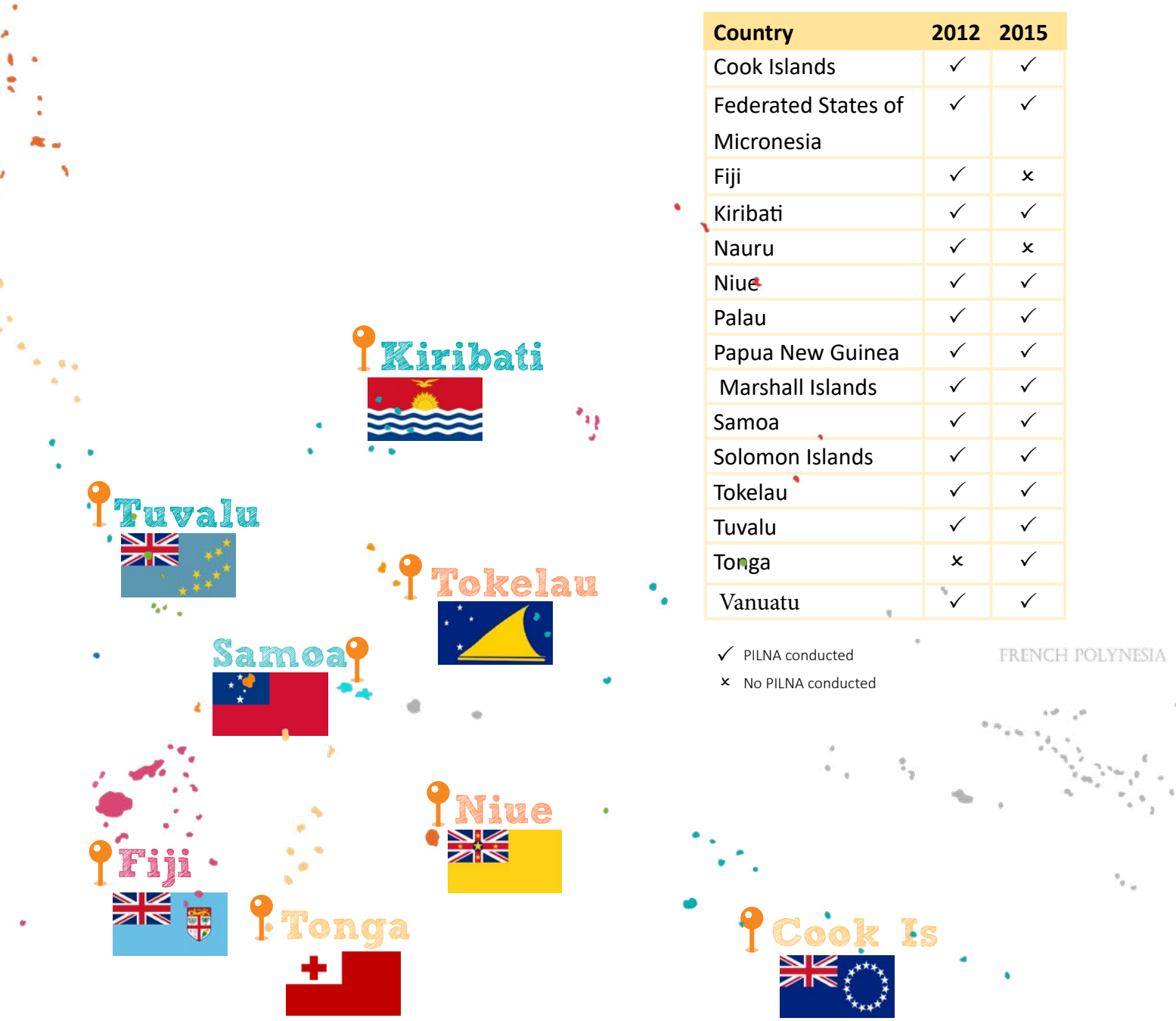
Dr Colin Tukuitonga
The Director-General
Pacific Community

PILNA countries:



The Pacific Islands Literacy and Numeracy Assessment, PILNA, was administered in 2018 in these 15 countries.

Country	2012	2015
Cook Islands	✓	✓
Federated States of Micronesia	✓	✓
Fiji	✓	×
Kiribati	✓	✓
Nauru	✓	×
Niue	✓	✓
Palau	✓	✓
Papua New Guinea	✓	✓
Marshall Islands	✓	✓
Samoa	✓	✓
Solomon Islands	✓	✓
Tokelau	✓	✓
Tuvalu	✓	✓
Tonga	×	✓
Vanuatu	✓	✓



✓ PILNA conducted

× No PILNA conducted

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Abbreviations

ACER	Australian Council for Educational Research
CCEM	Conference of Commonwealth Education Ministers
ECE	Early Childhood Education
EQAP	Educational Quality and Assessment Programme
FEdMM	Forum Education Ministers Meeting
FSM	Federated States of Micronesia
IRT	Item Response Theory
ISCED	International Standard Classification of Education
OECD	Organisation for Economic Co-operation and Development
PacREF	Pacific Regional Education Framework
PacSIMS	Pacific School Information Management System
PBEQ	Pacific Board for Education Quality
PILNA	Pacific Islands Literacy and Numeracy Assessment
PVs	Plausible Values
RMI	Republic of the Marshall Islands
SDGs	(United Nations) Sustainable Development Goals
SIS	Small Island States
UNDP	United Nations Development Programme
UNESCO	United Nations Education, Scientific and Cultural Organization

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Acknowledgements

The 2018 Pacific Islands Literacy and Numeracy Assessment (PILNA) was undertaken across 15 countries through the hard work and dedicated efforts of many individuals and organisations. Implementation would not have been possible without the support of the following people and organisations.

First of all, we are grateful to the Forum Ministers for Education for their ongoing support of PILNA and allowing the monitoring of student achievement in literacy and numeracy at the end of four and six years of primary schooling. It is envisaged that the evidence presented in this report will inform policy direction for improvement in student learning throughout the region.

The Pacific Community, through the Educational Quality and Assessment Programme, is grateful to the Australian Department of Foreign Affairs and Trade and the New Zealand Aid Programme for their financial and logistical support of the PILNA programme. We are also grateful for the support of the Australian Council for Educational Research in providing expertise and technical assistance in data analysis and reporting, and for contributing necessary guidance concerning project implementation. We extend our sincere gratitude to the ministries and departments of education in the participating countries: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu.

We are also immensely grateful to the PILNA National Coordinators in the fifteen countries for their tireless efforts, which enabled the seamless implementation of the PILNA project.

Thank you all for your valuable contribution to the 2018 regional assessment in literacy and numeracy.

Foreword

GOOD DATA is the roadmap to good policy and the Pacific Island Literacy and Numeracy Assessment (PILNA) is a perfect example of how an investment in data can lead to meaningful change for the Pacific. PILNA was developed by SPC's Educational Quality & Assessment Programme (EQAP) to provide a snapshot of how Pacific youth are faring in the skills essential to progress through school and life - reading, writing, numbers, operations, measurements and data. The 2018 assessment is the third to be conducted since 2012, and covers Year 4 and Year 6 students from across 15 Pacific Island countries.

PILNA is more than just a report card. With each iteration, we are better able to create a picture of our region's educational strengths and weaknesses. Each report contains a wealth of invaluable data, which is carefully analysed by educators across the Pacific. I am very pleased to see that our region's overall progress continues to be quite positive in many areas, however, there are two key findings which I think are worth extra attention.

The first is the significant gap which exists between boys and girls in numeracy and literacy. It is clear from the data that Pacific girls' ability to understand numeracy and literacy concepts far outpaces that of boys, a trend that has been visible in all three PILNA reports. A deeper dive into the data may give us better insight into what is causing this discrepancy, and perhaps provide some clues about how we can better approach education through a gender perspective.

The second finding is the ongoing challenge of critical thinking and problem solving skills. Mastering these skills will be fundamental for the future leaders of the Pacific. I am looking forward to seeing how the data around this issue is analysed, and how we can work with our members in developing responses to ensure our children are able to better apply critical thinking skills for the benefit of our region.

PILNA also represents an important contribution to the Pacific's efforts towards the Sustainable Development Goals. SDG 4.1 aims to have 'all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes'. The data which has been gathered in PILNA 2018 provides us with an invaluable insight into where the Pacific stands in regard to this goal, and will help guide our efforts towards effective education policies.

Ocean science, biodiversity, health, climate change, each play a fundamental role in driving our development, but if the Pacific wants to be a leader in these fields, it will need future generations to be ready to take on this region's most pressing challenges. PILNA represents an essential tool for reaching this goal.

I wish to thank the Pacific Ministers and ministries of Education, the schools, teachers, and students who continue to support PILNA. I also wish to acknowledge the New Zealand Government through the Ministry of Foreign Affairs and Trade Aid Programme and the Australian Aid Programme who have been an invaluable partners on this project.

Dr Colin Tukuitonga
The Director-General
Pacific Community

Executive Summary

The Pacific Islands Literacy and Numeracy Assessment (PILNA) is a measurement of regional standards based on a common scale; it is a regional collaborative model that is highly consensual among the participating countries, providing shared intellectual capital and value for money. PILNA provides data on literacy and numeracy skills of students who have completed four and six years of formal primary education. In 2018, 15 Pacific Island countries participated in the third administration of PILNA.

The Pacific region is one of the largest and most diverse regions in the world, yet many countries have identified common education challenges, particularly in literacy and numeracy. Each country recognises the right of the child to have access to good quality education – of which literacy and numeracy are an inherent part – regardless of gender, ethnicity, family background or socio-economic status.

The first administration of PILNA took place in 2012 and was intended to provide a one-time snapshot of literacy and numeracy achievement in the Pacific region. Based on the insights that emerged from the findings of PILNA 2012, the Forum Education Ministers Meeting (FEdMM) requested a 2015 administration of PILNA, and supported the development of a long-term regional assessment, structured to provide valid and reliable results over time.

This commitment of FEdMM is directly linked to the Pacific Regional Education Framework (PacREF), the United Nations Sustainable Development Goals (SDGs) and commitments made by the Commonwealth Council of Education Ministers (CCEM) in the Nadi Declaration. By providing a measure of the literacy and numeracy skills of students who have completed four and six years of basic education, PILNA addresses state priorities for the region under PacREF and targets identified in SDG 4 by providing evidence of education quality for governments, schools, communities and students in the region. Such evidence provides valuable information for stakeholders to develop interventions and policies, as well as to encourage political support and community awareness in order to improve the learning outcomes of young people in the Pacific region.

Key Findings

Growth has been noted in both literacy and numeracy over the three PILNA cycles (2012, 2015, 2018). The regional trend has seen a greater proportion of students reaching the highest proficiency levels in both literacy and numeracy over the three cycles. Similarly, the proportion of students who are not yet performing at the minimum expected levels in literacy at both Year 4 and Year 6 is decreasing, suggesting that efforts to address the needs of the lowest performing students are having a positive impact overall.

There are, however, still many students not achieving the minimum expected level in both numeracy and literacy. In literacy, 47% of Year 4 students did not meet the expected minimum proficiency level in PILNA 2018 and 37% of Year 6 students did not achieve it. In numeracy, 17% of students did not meet the minimum expected proficiency level both in Year 4 and Year 6. These results indicate that education systems need to continue to address the needs of the region's lowest performing students in the region.

Across the region, girls significantly outperformed boys in both literacy and numeracy. Similar numbers of boys and girls in Year 4 and Year 6 participated in PILNA 2018. At the regional level, girls outperformed boys in numeracy in both Year 4 and Year 6, although the difference in performance was minimal. In literacy, the differences by gender were much more pronounced. The proportion of boys achieving the minimum expected proficiency level in literacy was 15% lower than that of girls in Year 4 and 16% lower than that of girls in Year 6. Additionally, almost one in three boys in Year 6 are not yet meeting the minimum expectations for Year 4 in literacy.

Critical thinking and problem solving remain issues for students in both literacy and numeracy. Students in both Year 4 and Year 6 generally performed well on items requiring students to identify information from a text in the literacy assessment but performed less well on items that required critical thinking and interpretation of what they had read. In the numeracy assessment, students struggled with questions that required interpretation and reasoning. In both literacy and numeracy, the results suggest that students struggle when required to think critically in order to respond to questions.

In conclusion, PILNA 2018 has continued to build an evidence base on student learning outcomes in literacy and numeracy in the Pacific region. PILNA is an ongoing programme that can offer insights for education policy and practice and

can also support the monitoring of trends in students' acquisition of knowledge and skills in literacy and numeracy. The development of PILNA 2018, the methodology used, and the findings are reported in this regional report, as well as in individual country reports and a report covering the small island states (SIS). Each report draws conclusions from the findings and makes recommendations based on the evidence. In this way, PILNA addresses its ultimate aim, which is to support the improvement of numeracy and literacy skills of children in the Pacific region.

RECOMMENDATIONS

- Educational stakeholders are advised to review PILNA evidence and trends across the three PILNA cycles both regionally and nationally, and consider intervention strategies for students performing at the lower end of the proficiency scale, particularly in literacy.

- Education authorities in the PILNA countries and in EQAP are advised to include literacy items to reach students performing at the lower end of the proficiency scale.

- To make certain that results are available and used for targeted intervention, education authorities are advised to expand their dissemination approaches when reporting the results of the study, making certain that results reach the classroom for targeted intervention, as well as key stakeholder groups, such as teacher training institutions and national education sector programmes.

- Education stakeholders and EQAP are strongly encouraged to explore the PILNA data as they apply to gender differences.

- Education authorities are strongly encouraged to identify and adopt intervention strategies that improve the achievement of boys, especially in literacy.

- Education stakeholders and EQAP are strongly encouraged to continue the implementation of contextual questionnaires as part of a long-term assessment programme, including the addition of country-specific items.

- Education authorities and teacher training institutions are advised to review PILNA evidence, particularly as it relates to teacher self-efficacy and pedagogy, to support teachers in meeting the diverse needs of students.

- Education authorities and education stakeholders are strongly encouraged to utilise the PILNA coding data to support interventions that will lead to improved student achievement in literacy and numeracy.

- Regional and national education leaders and Forum education ministers are strongly encouraged to continue the use of the regional uniform metric as a way to track progress and trends in student learning outcomes.

- Education authorities in the PILNA countries and in EQAP are advised to expand and extend the regional uniform metric to capture the extremes of student performance.

- Regional education stakeholders are strongly encouraged to support an ongoing PILNA that has the power to provide robust evidence to policy-makers with richer data from which to develop policies and intervention strategies to improve student learning outcomes.

- Education stakeholders are advised to investigate ways in which the robust and valid data provided by PILNA can support the improvement of student learning outcomes.

1. Introduction to PILNA

1.1 The Pacific Context

THE Pacific region is one of the largest and most diverse regions of the world and the Pacific Ocean is the world's largest body of water. The region is home to some 9.7 million inhabitants, 90 per cent of whom live in Fiji, Papua New Guinea and Solomon Islands, while six countries have populations of less than 20,000 people (UNESCO 2015). The region is characterised by rapidly changing economic structures, high migration rates and high youth unemployment in many areas. As a result of climate change, Pacific Island environments have become increasingly fragile and prone to natural disasters (UNESCO 2015). Despite significant differences in geography, population and resources, there are many shared characteristics and common education challenges, particularly in literacy and numeracy.

Improving educational achievement in literacy and numeracy in Pacific Island countries has been identified as a shared goal by a range of stakeholders. They recognise the right of the child to have access to good quality education – of which literacy and numeracy are an inherent part – regardless of gender, background, ethnicity, family background or socio-economic status. Pacific leaders are cognisant of international studies that have highlighted the relationship between literacy and numeracy skills and full participation in society (OECD 2014; Altinok 2012; Duncan, et. al. 2007; Lewin 2007). More critically, Pacific leaders are looking at ways to reverse the global trend of many young people, especially the disadvantaged, leaving school without the skills to engage in everyday society and secure employment (UNESCO 2012). Pacific Island stakeholders understand that literacy and numeracy are foundation skills necessary to participate in all aspects of everyday life.

The Pacific Islands Literacy and Numeracy Assessment (PILNA) represents a shared goal of understanding student learning outcomes across the region. It provides evidence to support governments in developing policies to improve educational achievement. Despite the varying size of education systems, the hundreds of spoken languages and dialects, and the variety of cultures, PILNA is a programme that successfully uses a regional approach to contribute to improving the achievement of Pacific children's literacy and numeracy skills.

1.2 Regional Benchmarks for Literacy and Numeracy

The 2006 Pacific Regional Benchmarks for Literacy and Numeracy were used as the basis for developing the 2012 and 2015 cycles of PILNA. The benchmarks were derived from the curriculum skill components and learning outcomes that were determined to be common across the national curricula in 15 Pacific Island countries. In 2016, after a number of countries had made revisions to their primary curricula, it became necessary to review the benchmarks for students in Years 2, 4, 6 and 8.

The benchmarks were reviewed and revised during a workshop with English language and mathematics curriculum advisors from 15 Pacific Island countries. The resulting 2016 Pacific Regional Benchmarks, Appendix A, form the basis of the 2018 PILNA and will be used in future administrations. They encompass common learning outcomes in literacy and numeracy and outline the knowledge, skills, understanding, values and capacities that Pacific students should have the opportunity to learn and develop in order to effectively participate in society.

The Pacific definition for literacy[1] is:

"The knowledge and skills necessary to empower a person to communicate through any form of language in their society and the wider world, with respect to all aspects of everyday life."

The Pacific definition for numeracy is:

"The knowledge and skills necessary to empower a person to be able to use mathematical processes, as well as the language of mathematics, for a variety of purposes, with respect to everyday life."

1. Refer to the 2016 Regional Benchmarks for literacy and numeracy , Appendix A.

1.3 The Purpose of PILNA

The overarching purpose of PILNA as a long-term Pacific-wide regional assessment is to generate cognitive and contextual data that can be used to facilitate ongoing collaborative efforts to monitor and improve learning outcomes for children in Pacific Island countries.

The PILNA programme represents a commitment by Pacific Island governments and development partners to monitor the outcomes of education systems by measuring student achievement on a regular basis and within an agreed common framework. By building capacity through collaborative involvement of country representatives, the PILNA programme helps to strengthen learning assessments, standards and policies, while also supporting improvement in teaching and learning across the Pacific region.

Countries have agreed to focus on six guiding principles to achieve the purpose of PILNA.

1. Assessment methodologies and types of data: The PILNA programme continues to improve its assessment methodologies to provide reliable and valid cognitive and contextual data at the regional and country level.

2. PILNA content: The skills and concepts that form the content of PILNA are guided by the definitions and indicators outlined in the 2016 Pacific Regional Benchmarks for Literacy and Numeracy.

3. Monitoring purpose of PILNA: The data generated from PILNA enable the monitoring of student learning in literacy and numeracy. Additionally, PILNA enables collection of background data on students, teachers and schools at regional and country levels.

4. Recognition of the value of good literacy and numeracy skills: The PILNA programme promotes the importance of literacy and numeracy skills as building blocks for children's future learning opportunities. It also empowers citizens to communicate effectively, to make informed decisions and to take active control of their future.

5. Intervention as the added value for countries: The PILNA programme adds value for countries by enabling them to use regional and country-level data as evidence of student learning achievement for the development of targeted intervention strategies.

6. Collaboration among stakeholders for good quality data: The PILNA programme is designed in such a way as to enable a range of data collection with strict adherence to technical standards. Collaboration among organisations and governments is a critical feature of PILNA administrations.

1.4 PILNA 2018

PILNA was first administered in 2012 as a one-time snapshot to gauge the levels of literacy and numeracy in 14 Pacific Island countries.[2] The 2012 results were presented to the Forum Education Ministers Meeting (FEdMM). The findings provided an insight into student achievement in literacy and numeracy across the region, and the results were such that FEdMM requested a 2015 administration of PILNA. A total of 13 countries participated in the 2015 administration.[3] The ministers also recommended exploring the possibility of developing a long-term regional assessment, structured to provide valid and reliable results over time, in order to support existing efforts to improve educational outcomes.

In 2018, a third cycle of PILNA was administered with 15 countries participating.[4] Students in Year 4 and Year 6 (or their equivalent school year based on each country's education system) participated.[5] Data were collected on students' literacy and numeracy outcomes, along with background data from students, teachers and principals/head teachers.

This commitment of FEdMM is directly linked to the United Nations Sustainable Development Goals (SDGs), which outline a global commitment to a 15-year agenda to tackle poverty through initiatives that encompass the environmental, social and economic dimensions of sustainable development (UNDP 2015). SDG 4 specifically focuses on the quality of education and provides a framework for PILNA.

PILNA addresses targets identified in SDG 4 by providing governments, schools, communities and students with a measure of the literacy and numeracy skills of students who have completed four and six years of basic education. This valuable information enables stakeholders to develop interventions and policies. It also encourages political support and raises community awareness about the necessity to improve the learning outcomes of young people in the Pacific.

2. The 14 countries that took part in PILNA 2012 are: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tuvalu and Vanuatu.
3. Thirteen countries participated in PILNA 2015: Cook Islands, Federated States of Micronesia, Kiribati, Marshall Islands, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu.
4. The 15 countries that took part in PILNA 2018 are: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu.
5. Depending on a country's education system, Years 3 and 5 or Years 5 and 7 are equivalent levels of schooling to Years 4 and 6.

1.5 Outline of the Regional Report

This chapter describes the purpose and context of PILNA.

CHAPTER 2 provides an overview of` the methodological framework, data analysis and the development of a common scale and proficiency benchmarks. All results are presented at the regional level and on a regional scale.

CHAPTER 3 addresses the performance of Year 4 and Year 6 students in numeracy. It begins by presenting general information on student participation, followed by a discussion of students' overall numeracy performance in the region. This is followed by a picture of achievement in the numeracy domain and subscales, or strands, of the domain. For numeracy, these strands are numbers, operations, measurement and geometry, and chance and data. The chapter then explores performance by gender.

CHAPTER 4 addresses the performance of Year 4 and Year 6 students in literacy. It begins by discussing students' overall literacy performance in the region, and then provides a picture of achievement in the literacy domain and subscales, or strands, of the domain. For literacy, these strands are reading and writing. The chapter then explores performance by gender.

The results for Chapter 3 and Chapter 4 are presented in the following formats:

- proficiency level tables and bar graphs;
- tables of descriptive statistics for the domain and strand scores;
- and box plots[6].

See the next page for an explanation on how to read and interpret box plots.

CHAPTER 5 explores student attitudes and student contexts and their relationships to student learning outcomes. It begins with an exploration of access to and participation in early childhood education programmes by students. The chapter then provides information about caregiver involvement in students' education, the resources available to students at home and finally student attitudes towards reading, writing, mathematics and school in general.

CHAPTER 6 discusses characteristics of teachers, teaching practice and their classrooms. It also explores teacher qualifications and professional knowledge, instructional support, teacher practice and self-efficacy.

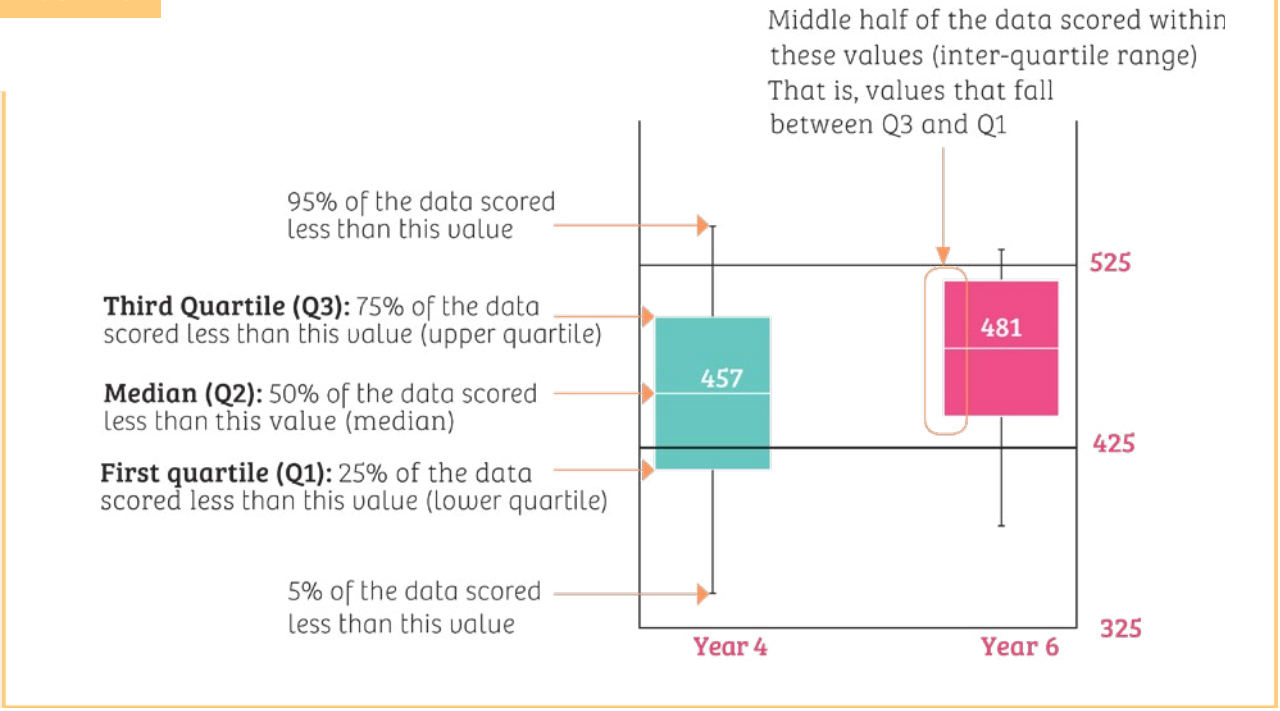
CHAPTER 7 explores characteristics of school leaders, the institutional environment of the school and the language used for classroom instruction.

CHAPTER 8 summarises the major conclusions of PILNA 2018. It also provides recommendations for potential next steps for future cycles.

6. A box plot is sometimes referred to as a box and whisker plot

BOX PLOT

FIGURE 1.1



A BOX plot summarises a large amount of data graphically, displaying the distribution of data along a scale. Box plots have the advantage of enabling users to compare a number of datasets or subgroups within a dataset at one time on a common scale, making differences between them readily apparent.

Figure 1.1 shows two box plots based on PILNA data for the literacy domain for Years 4 and 6. Each of the box plots has four parts – two adjoining boxes in the middle, and a whisker[6] extending from each side of the middle boxes. We could imagine that all data points (for example, the scores for all students in Year 4) are lined up in order from smallest to largest, then divided into four equal groups. We refer to the boundaries between those four equal parts of the distribution as the quartiles, since they define the location of the four quarters of the distribution.

The boundaries are referred to as Q1, Q2 and Q3 and are defined below:

Q1 – the boundary between the lowest quarter and the second quarter. It marks the score that is one quarter or 25% of the way along the ordered scores, and so is sometimes referred to as the 25th percentile.

Q2 – the boundary between the two middle quarters – this middle point of the distribution also has a special name, the median, and is sometimes referred to as the 50th percentile.

Q3 – the boundary between the third quarter and the highest scoring quarter, also referred to as the 75th percentile.

Box plots display the two middle quarters in two boxes, with their boundary (the median) being labelled as a particular score point. Above and below those boxes are two 'whiskers', which are single lines extending upwards from the third quartile, and downwards from the first quartile. This particular version of the box plot uses whiskers that extend upwards from the 75th percentile (Q3) to the 95th percentile, and downwards from the 25th percentile (Q1) to the 5th percentile. This means that the highest and lowest 5% of scores are not included in the representation. This can be useful, since outliers can distort data representations of this kind. The box plot, therefore, captures the middle 90% of the distribution, omitting only the extreme values at each end.

In the example above, the whiskers tell us a very low literacy domain score for our sample of Grade 4 and 6 students (only 5% of scores are lower) and a very high literacy domain score for Year 4 and 6 students (only 5% of scores are higher). In Figure 1.1, 90 per cent of the scores in literacy for Country X range between 335 points and 540 points for Year 4 and 380 points and 530 points for Year 6. Only the very few extreme scores lie outside these ranges.

Q2 and Q3 define the edges of the box component of the box plot. The line through the middle of the box is the median score for the entire dataset. Half of the scores lie

above this point, and half lie below. In Fig. 1.1, the median score for Year 4 is 457 points and the median score for Year 6 is 481 points. The top of the box is at Q3, and the bottom of the box is at Q1. These scores mark the top and bottom scores for the middle half of the dataset (the two middle quarters). In the example, the third quartile (Q3) for Year 4 is 490 points and Q1 for Year 6 is 515 points, while the first quartile (Q1) for Year 4 is 420 points, and for Year 6 is 445 points.

It is important to note that each pair of adjacent quartiles surrounds 25% of the dataset. If one side of the box is longer than the other, it does not mean that side contains more data. Rather, it means the same number of scores are spread out over a greater part of the score scale.

Why is a box plot useful?

A box plot is useful as it tells the reader the spread and mid-point of a dataset. Using the box plot for Year 4 in Figure 1.1 as an example, the box plots tell us that Country X has Year 4 students who achieved domain scores of 540 points which is at Level 7 of the literacy scale (see Table 2.5), and that only the highest-performing 5% of students scored higher. However, the median for Year 4 is 457 points, which is classified as Level 3 proficiency. The box plot tells us that, on average, students in Country X are not performing at the expected level for Year 4. It also tells us that students below the top quarter of the population have scores that are clustered across a smaller point score range. However, students below the lower quartile have a wider range of scores (as depicted by the longer whisker below Q1).

In addition, putting two box plots side by side allows for the comparison of the distribution between two groups (e.g. between Year 4 and Year 6 in Figure 1.1). Figure 1.1 shows that the range of scores for Year 4 is much wider than the range for Year 6, such that some Year 4 students achieved higher scores than Year 6 students. Figure 1.1 also shows that, while the spread of scores for Year 6 is narrower compared to that of Year 4, some students still lag behind the majority of their peers.

2. Methodological Framework

2.1 Enhancements to PILNA for 2018

PILNA is a high-quality learning assessment programme that evolves and improves from cycle to cycle. For the 2018 cycle, enhancements to PILNA included:

- alignment to the revised Pacific Regional Benchmarks for Literacy and Numeracy (2016);
- strengthened sampling structures and pre-assessment registration of students;
- full implementation of contextual data collection tools;
- strengthened and expanded coding of cognitive results;
- analysis of Year 4 and Year 6 results as individual datasets;
- division of level 8 on the numeracy scale into two levels, 8a and 8b; and
- incorporation of language features into writing.

Following the 2015 PILNA cycle, curriculum experts from 15 Pacific Island countries came together to review and renew the Pacific Regional Benchmarks for Literacy and Numeracy that were developed in 2006. In that process, the literacy benchmarks descriptors were updated. These changes are evident in the 2018 PILNA literacy instruments and the reporting of literacy results. The numeracy benchmarks were also revised to both refine the descriptors and as well to include more specificity with respect to geometry, measurement, data and probability. These changes are reflected in the 2018 PILNA numeracy instruments, the level descriptors for numeracy and the reporting of the numeracy results.

Work began in early 2017 to develop and implement the sampling frame for PILNA 2018 to be as robust as possible, taking into account the key sampling variables identified by those countries from which samples were drawn. The number of schools to be included in each sampled country in PILNA 2018 was increased from 93 to 120. Through the sampling process, 25 Year 4 and 25 Year 6 students were identified at each sampled school to participate in the PILNA administration. Five of the largest countries were sampled, while 10 countries conducted a census administration. Students from all countries were pre-registered to capture school, teacher and demographic data from national systems wherever possible.

Contextual questionnaires for students, teachers and head teachers/principals were piloted during the 2015 PILNA administration, then further refined and tested in the 2017 field trial. As part of the 2018 PILNA administration, all participating students, their teachers and the principals or head teachers of their schools responded to questionnaires. These provide a rich set of data to understand the context that underpins the cognitive results.

Coding of student results was introduced to the PILNA programme during the 2015 main study and further refined for 2018, with all cognitive items coded to capture student responses. The implementation of coding in each country-level coding session brought a different approach to looking at student work and identifying the common misconceptions and errors made by students. The reporting of the coding data allows classroom teachers to engage with the results and use them to inform their practice.

Greater precision in the analysis and reporting of student cognitive results was achieved in the 2018 PILNA cycle with the addition of year level as a variable. In 2015, Years 4 and 6 were analysed as a single entity, allowing construction of the common regional metric against which PILNA results can be measured. The addition of the year level variable provides more detail on how the results spread out across the scale, particularly at the upper end of the scale for Year 6 and the lower end of the scale for Year 4.

With the separation of Year 4 and Year 6 analyses, the Year 6 results showed a large percentage of students clustered toward the high end of the scale. An examination of the data at the top of the scale showed that a sub-division of level 8 was possible, differentiating between those students just meeting the threshold for level 8 numeracy skills and those students well above that threshold. The subdivision of the level allows for reporting on the specific skills and knowledge achieved by each of those student groups.

Language features, a difficult entity to assess in isolation across multiple languages with different structures, has been incorporated into the writing portion of PILNA through the use of a set of analytic scoring rubrics. This allows students to demonstrate their capacity to use language features in context through writing, a much more authentic approach to assessing those skills.

2.2 Data Collection Instruments

Consistent with a high-quality learning assessment programme, two data collection components were developed for PILNA 2018: a cognitive component (literacy and numeracy assessments) and a contextual component (student, teacher and head teacher/principal background

questionnaires). Each component is discussed here from a methodological perspective.

The **cognitive component** is designed to collect achievement data on student learning outcomes in literacy and numeracy at Year 4 and 6 (or equivalent school year based on a country's education system). These instruments were based on the 2016 Pacific Regional Benchmarks for Literacy and Numeracy. The 2018 cognitive instruments are the culmination of work that began with the first PILNA administration in 2012.

For PILNA 2012, assessment instruments were designed to provide reliable and valid data on the achievement in literacy and numeracy of students who had completed Years 4 and 6 based on the Regional Benchmarks for Literacy and Numeracy. After PILNA 2012, reviews of the data and the instruments were undertaken, which led to the development of the 2015 instruments, including several enhancements. Following the 2015 administration, a long-term plan for PILNA was developed to ensure that the wide-scale assessment programme would be both sustainable and continue to be responsive to the needs of the region's education systems. A full field trial was conducted in 2017, including all instruments and procedures. The results of that field trial informed the refinement of the PILNA 2018 main survey.

The **contextual component** includes the collection of background and contextual data from students, teachers and head teachers/principals. The contextual data, in conjunction with the achievement data, provide information about associations with student learning outcomes. This information enables a more in-depth understanding of the observed test outcomes (student learning outcomes), and the implications of these outcomes for designing improvement strategies. It is recognised as best practice for international large-scale assessments to collect contextual information.

At the PILNA Steering Committee meeting in 2018, the committee identified research areas that guided the development of the questionnaires. These research areas were divided into the following five topic areas as a framework for reporting:

1. early learning experiences,
2. teacher qualifications and professional knowledge,
3. school and classroom contexts,
4. home contexts, and
5. language of instruction.

The overall methodology of PILNA provides an analysis of data including the Pacific regional benchmarks, student performance on PILNA 2018, and student performance of countries in the region as a whole. An analysis of background data collected from students, teachers and head teachers/principals links learning outcomes to Pacific education contexts. It is important to note that country-to-country comparison is NOT a component of the programme, as explicitly directed by the PILNA Steering Committee.

2.3 Sampling

Given the variations that exist across the region, from small education systems to large education systems, and hundreds of spoken languages and dialects, PILNA uses a sampling design that accommodates regional complexities.

The PILNA Sampling Framework[7] is designed to meet the regional and national objectives of obtaining accurate estimates of student learning outcomes. The framework draws on the best practices of international large-scale surveys, such as the Trends in International Mathematics and Science Study, and the Programme for International Student Assessment.

The framework supports the following objectives of the PILNA survey:

- to enable comparisons across similarly defined populations from other parts of the region, as well as to make comparisons over time;
- to support the accurate assessment and monitoring of learning outcomes of Pacific Island children using world class materials and good quality, standardised procedures; and
- to support the development of a body of expertise and experience in conducting high quality survey work that can inform other national initiatives.

The international target population for the PILNA 2018 main study is defined as the following:

YEAR 4 POPULATION – This includes all students who have completed approximately four years of formal schooling, counting from the first year of International Standard Classification of Education (ISCED)[8] Level 1. For most Pacific countries, the target year is Year 4 (towards the end of the fourth grade of schooling). For Northern Pacific countries, which have a different school year, the target year is Grade 5 (at the beginning of the fifth grade of schooling). In Papua New Guinea the equivalent target year is Grade 3 (towards the end of four years of formal schooling).

7. *See EQAP (2018). PILNA Sampling Framework. Suva, Fiji: EQAP-SPC.*
8. *The International Standard Classification of Education (ISCED) is a statistical framework for organising information on education. It is maintained by UNESCO.*

YEAR 6 POPULATION – This includes all students who have completed approximately six years of formal schooling, counting from the first year of ISCED Level 1. For most Pacific countries, the target year is Year 6. For Northern Pacific countries, the target year is Grade 7. In Papua New Guinea the equivalent target year is Grade 5.

Schools may be excluded from the survey, mainly for practical reasons, such as increased survey costs or difficult survey conditions. Examples of school-level exclusions are:

- schools in very remote locations,
- very small schools, and
- international schools (offering a curriculum other than the prescribed national curriculum).

The objectives of the survey regionally are to produce both high quality and comparable outcomes across countries. To meet these objectives, certain standards with respect to matters such as sample size and the extent of exclusions are documented and agreed upon between EQAP and participating countries in advance of the administration.

The expected response rate for the main survey study is benchmarked at more than 85% of sampled schools. If the response rate is below 85% then a pre-determined, systematic use of substitute schools is implemented. Each sampled school has two substitute schools assigned to it. The main study student response rate is also benchmarked at more than 85% of all sampled students across responding schools. This response rate includes students from substitute schools.

Countries took more ownership of the national sampling processes in PILNA 2018. With the aim of building capacity on sampling and establishing stronger networks between countries and EQAP, each country was requested to appoint a national sampling officer. All sampling activities executed at the country level are the responsibility of the sampling officer. These activities include defining the target population for the national Y4 and Y6 cohort and formulating criteria for exclusion that are applicable to country context. Countries also played an instrumental role in data quality and data integrity checks. The network of national sampling officers and EQAP improves communication and data sharing.

A detailed discussion of the sampling design for PILNA 2018 is presented in the PILNA 2018 Technical Report.

Table 2.1 shows the number of students who participated in the numeracy PILNA test in 2018 by year level and by country.

Table 2.2 shows the number of students who participated in the literacy PILNA test in 2018 by year level and by country.

TABLE 2.1 Students who participated in the PILNA 2018 numeracy test by year level and by country

COUNTRY	YEAR 4	YEAR 6	TOTAL
Cook Islands	262	252	514
Fiji	3517	3443	6960
FSM	1232	1189	2421
Kiribati	2607	2464	5071
Nauru	157	112	269
Niue	35	30	65
Palau	251	249	500
Papua New Guinea	2228	2208	4436
Marshall Islands	840	812	1652
Samoa	2284	2227	4511
Solomon Islands	1937	1851	3788
Tokelau	30	43	73
Tonga	2393	2941	5334
Tuvalu	217	173	390
Vanuatu	2076	1886	3962
TOTAL	20,066	19,880	39,946

TABLE 2.2 Students who participated in the PILNA 2018 literacy test by year level and by country

COUNTRY	YEAR 4	YEAR 6	TOTAL
Cook Islands	251	258	509
Fiji	3455	3383	6838
FSM	1254	1184	2438
Kiribati	2625	2513	5138
Nauru	139	111	250
Niue	35	31	66
Palau	252	251	503
Papua New Guinea	2307	2241	4548
Marshall Islands	829	815	1644
Samoa	2262	2241	4503
Solomon Islands	2123	1878	4001
Tokelau	30	42	72
Tonga	2389	2962	5351
Tuvalu	216	183	399
Vanuatu	2071	1864	3935
Total	20,238	19,957	40,195

2.4 Translation

In line with the definition of literacy in the regional benchmarks, PILNA countries were given the opportunity to consider their individual language policies and the language of instruction/testing at both Year 4 and Year 6 level. Nine countries opted for translated versions of the PILNA instruments, so the instruments were translated from English into the nine target languages as agreed. Table 2.3 shows the countries and the target language of testing for the instrument translations.

TABLE 2.3 Target language for translation and documents that were translated

	COUNTRY	TARGET LANGUAGE	TRANSLATED INSTRUMENTS AND INSTRUCTIONS
1	Cook Islands	Cook Islands Maori	i. Y4 numeracy and test supervisor's instructions ii. Y4 literacy and test supervisor's instructions iii. Student questionnaire and test supervisor's instructions
2	Kiribati	Te Kiribati	i. Y4 numeracy and test supervisor's instructions ii. Y4 literacy and test supervisor's instructions iii. Student questionnaire and test supervisor's instructions
3	Niue	Vagahau Niue	i. Y4 numeracy and test supervisor's instructions ii. Y4 literacy and test supervisor's instructions iii. Y6 numeracy and test supervisor's instructions iv. Y6 literacy and test supervisor's instructions v. Student questionnaire and test supervisor's instructions
4	Marshall Islands	Marshallese	i. Y4 numeracy and test supervisor's instructions ii. Y4 literacy and test supervisor's instructions iii. Y6 numeracy and test supervisor's instructions iv. Y6 literacy and test supervisor's instructions v. Student questionnaire and test supervisor's instructions
5	Samoa	Gagana Samoan	i. Y4 numeracy and test supervisor's instructions ii. Y4 literacy and test supervisor's instructions iii. Y6 numeracy and test supervisor's instructions iv. Y6 literacy and test supervisor's instructions v. Student questionnaire and test supervisor's instructions
6	Tokelau	Tokelauan	i. Y4 numeracy and test supervisor's instructions ii. Y6 numeracy and test supervisor's instructions
7	Tonga	Tongan	i. Y4 numeracy and test supervisor's instructions ii. Y4 literacy and test supervisor's instructions iii. Y6 numeracy and test supervisor's instructions iv. Student questionnaire and test supervisor's instructions
8	Vanuatu	French	i. Y4 numeracy and test supervisor's instructions ii. Y4 literacy and test supervisor's instructions iii. Y6 numeracy and test supervisor's instructions iv. Y6 literacy and test supervisor's instructions v. Student questionnaire and test supervisor's instructions vi. Head teacher and teacher questionnaire
9	Tuvalu	Tuvaluan	i. Y4 numeracy and test supervisor's instructions

2.5 Administration

The field trial for PILNA 2018 was carried out in 2017 and aligned to the approximate timeline for the 2018 main study. The following tools were trialed in 2017 and administered for the PILNA 2018 data collection:

- literacy and numeracy assessments in Year 4 and Year 6 (cognitive instruments);
- student questionnaire (contextual instrument);
- teacher questionnaire (contextual instrument);
- head teacher/principal questionnaire (contextual instrument).

The PILNA main study was administered over two days in each participating country in October 2018. For administrations that occurred outside the month of October, the data collection days were agreed upon by the participating country in consultation with EQAP. The cognitive instruments were administered in 10 languages and contextual instruments were administered in eight languages (see Table 2.3).

Each student test booklet was assigned a specific identification number that was printed on the test booklet cover. Student information was included in pre-registration forms submitted to EQAP by each country. Student identification numbers were included in tracking forms.

Instruments and administration materials were sent to country education offices in August/September 2018 for dispatch by national coordinators to the participating schools. These materials included the cognitive and contextual instruments, and implementation manuals for the national coordinators, school coordinators and test supervisors. Soft copies of the implementation manuals were sent prior to the materials dispatch. Administration instruction videos for school coordinators and test supervisors supplemented the manuals.

The administration training was conducted by the national coordinators for the school coordinators in school clusters. The school coordinators subsequently trained the test supervisors at each of their schools. School coordinators who were not able to attend the training by the national coordinator were provided with test administration videos for training in their schools.

2.6 Coding and Scoring

The data collected were coded and validated in-country under strict security protocols. EQAP officers were in-country to train coders and to supervise the coding and data entry. PILNA national coordinators identified a numeracy coding panel leader and a literacy coding panel leader, and appointed the members of the panels. The national coordinators also identified data entry officers. Panel members were selected, based on their experience with assessment scoring, as well as their content knowledge in literacy or numeracy.

Data entry officers entered students' response codes online through Survey Solutions software or on a pre-prepared Excel spreadsheet (if internet was not available). Questionnaire responses were also entered through Survey Solutions software.

Coding and scoring were the two methods used to assess students' test responses. Student responses were first coded, meaning they were assigned to pre-defined response categories. The process of scoring occurs when a code is assigned a quantitative value (a score).

2018 CODING SCHEME

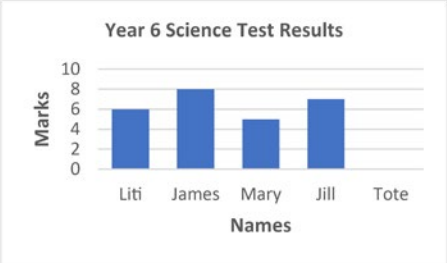
The advantages of a coding scheme are that additional information can be captured about student responses and it provides information on why some incorrect choices (or distractors) are more often selected by students than others. Figure 2.1 is an example of a coding scheme such as the one used in the PILNA programme.

For each item on the assessment, the "descriptor" identifies the particular concept or skill that is being assessed using that item. The "sample response" and "code" columns specify the code that is assigned to a particular response. The sample responses and codes are developed through an iterative process – first the item developers identify what they anticipate student responses will be, then content experts evaluate the codes to identify common misconceptions that provide insight into student thinking. Finally, the field trial results are used to validate and refine the coding scheme.

In the example provided, for item 1, the descriptor is that students are expected to round a given number to the nearest ten or hundred. The three answers students are most likely to provide to the question *Round 288 to the nearest hundred* are 300, 290 and 200 and are assigned a code of 1, 2 and 3 respectively, while all other responses will be assigned code 0. An invalid response will be assigned 8. This is when the response of the student does not meet the requirements for answering the question, such as selecting more than one choice in a multiple choice question. A non-response or a blank will be assigned a code of 9.

It is important to note that the coders are asked to observe and record what the students have given as responses. They are not asked to mark the question as correct or incorrect. That process, called scoring, occurs after values are assigned to particular codes to give full, partial or no credit for specific responses.

FIGURE 2.1 Sample Coding Scheme

ITEM #	STRAND	DESCRIPTORS and SAMPLE QUESTIONS	SAMPLE RESPONSES	CODES
1	NUMBERS	Rounding numbers to the nearest tens or hundreds *Round 288 to the nearest hundred*	300	1
			290	2
			200	3
			All other responses	0
			Invalid response	8
			No response or Blank	9
2	OPERATIONS	Solve word problems *In one year, a year 5 student collected 572 shells. She gave 58 shells to her friend. How many shells does she have left?*	514	1
			572-58	2
			630	3
			All other responses	0
			Invalid response	8
			No response or Blank	9
3	DATA	Identifies and compares everyday information represented in simple graphs *The graph below shows the Science test results for four students.* *Tote's mark is 6. Draw the bar on the graph to show Tote's mark.*  	Bar in correct position and height at 6	1
			Indicating a mark at correct position 6	2
			Drawing straight line to correct position 6	3
			Draw 6 bars or lines, but not exactly matching to gradations	4
			All other responses	0
			Invalid response	8
			No response or Blank	9

2.7 Data Capture

PILNA used two systems to organise and capture data. The first system – Pacific School Information Management System (PacSIMS) – was used to register students and assign students unique PILNA student identification numbers. PacSIMS was also used to generate class list reports, personalised labels for test booklets and school packing information for distribution to countries.

The second system – Survey Solutions – was used to capture the data. This was done by designing the data capture forms using Survey Solutions, and then creating an application installed on tablets.

For security purposes both systems had built-in authentication, meaning that users were allowed access to the system using their username and password. The systems were also role-based, which allowed users access to the different modules based on the type of role they were assigned. For countries that had internet connectivity issues, an Excel template was used to capture the data.

To ensure the integrity of the data, the systems had built-in validation rules. When the data were entered, the users with supervisory roles were able to check the information before submitting the entry.

DATA ANALYSIS

The 2018 PILNA data analysis for Year 4 and Year 6 was separately calibrated to estimate the item parameters using ACER ConQuest software. Rasch modelling was used to scale the data for numeracy and literacy. Student ability was estimated using plausible values (PVs), and PVs were generated for each domain, as well as for each strand. The strands identified for each domain are listed below.

NUMERACY

- Numbers
- Operations
- Measurement and geometry
- Data and chance

LITERACY

- Reading
- Writing

A detailed discussion of the PILNA 2018 analysis is presented in the PILNA 2018 Technical Report.

2.8 The Item-Person map

An item-person map provides a picture of an assessment by placing the difficulty of items on the same scale as the ability of students taking the assessment. Item-person maps visually show the relationship between *item difficulty* (indicated by numeric symbols on the right side of the map, distributing items from the most difficult at the top to the least difficult at the bottom) and *person ability* (indicated by X symbols of the left side of the map, showing distribution of measured ability of students from highest ability at the top and lowest ability at the bottom), with respect to the uniform scale. The maps also show how well the literacy and numeracy assessments are targeting the tested students in each cycle.

For example, Figure 2.2 shows the distribution of Year 4 numeracy items on the right side of the map alongside the ability distribution of Year 4 students on the left. The Year 4 numeracy items are positioned according to their difficulty from the bottom to the top, with 'Item 31' the most difficult item and the easiest item at the bottom is 'Item 17'. The Year 4 students with higher abilities are positioned at the top of the map and those students with lowest ability are positioned on the bottom of the map. On this map, one 'X' represents about 45 students such there a few students below the least difficult item 17. The majority of the students are distributed around the middle of the map with some students have higher abilities at the top range of the map.

The same relationships are shown for Figures 2.2, 2.3, 2.4, and 2.5 *(see next page).*

2.9 Regional Uniform Metric

To enable a consistent approach to reporting across all PILNA countries, student outcomes were reported on a single uniform metric applied across the region. The reporting metric was constructed for PILNA 2015 to achieve two main goals: first, to provide descriptions of what students can do at various points along the metric; and second, to show results in a way that can be interpreted consistently across all participating populations. This means that results can readily be compared across different parts of each country's population (for example, across students from urban and non-urban areas, or between girls and boys). National results can also be compared with the average achievement across the region.

The proficiency levels were developed during the analysis and reporting phase of PILNA 2015 to provide a consistent comparator for PILNA results across multiple cycles. A panel of experts developed and described proficiency levels using the process summarised below.

1. A 'generalised item thresholds' table was prepared, containing all items from both 2012 and 2015 cycles. This is essentially a listing of each available score point across all items, ordered by the difficulty of obtaining each score point.
2. Descriptors for each score point were attached to the ordered list. These descriptors encapsulated the key cognitive demand or the particular skill involved in obtaining each score point.
3. These descriptors were then used to develop the summary proficiency level descriptions. The 2015 items were prioritised in deciding the level cut-offs and in developing the summary level descriptions.

The set of new proficiency scale levels was developed, based on the item-to-skill mapping and placing the items on a Guttmann structure (i.e. ordering the items based on difficulty and establishing level cut-offs based on the skill and content grouping of the items). Although this process results in levels that are not strictly of equal width in terms of item difficulty, the panel endeavored to make the levels as uniform as possible. The summary descriptors for each proficiency level are described in Table 2.4 and Table 2.5 for numeracy and literacy respectively.

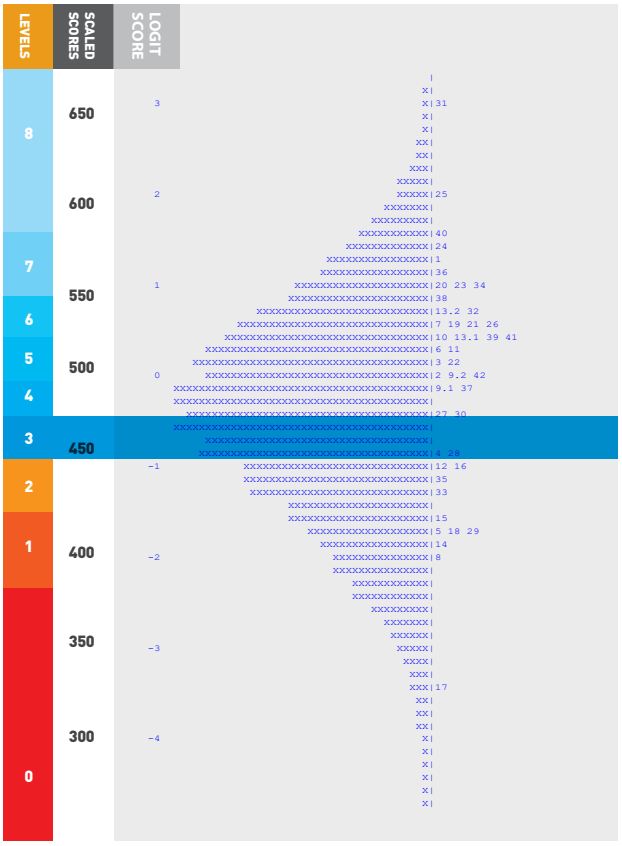
The ability estimates from the Item Response Theory[9] analysis are originally reported in units that are called logits, with a mean[10] of 0 and standard deviation[11] of 1. To avoid the confusion that might arise from reporting negative scores, the scaled scores that will be used for public reporting have to fit in a range that does not include negative numbers. The ability estimates in logits were converted into a PILNA scaled score, with a mean of 500 and standard deviation of 50, using the conversion formula below, making it wide enough for current and foreseeable future needs.

PILNA Scaled Score = [(score in logits) x 50] + 500

The equivalence between scores in logits, the transformed PILNA scaled scores, and corresponding proficiency levels are shown visually in Tables 2.4 and 2.5 (see pages 16 and 17).

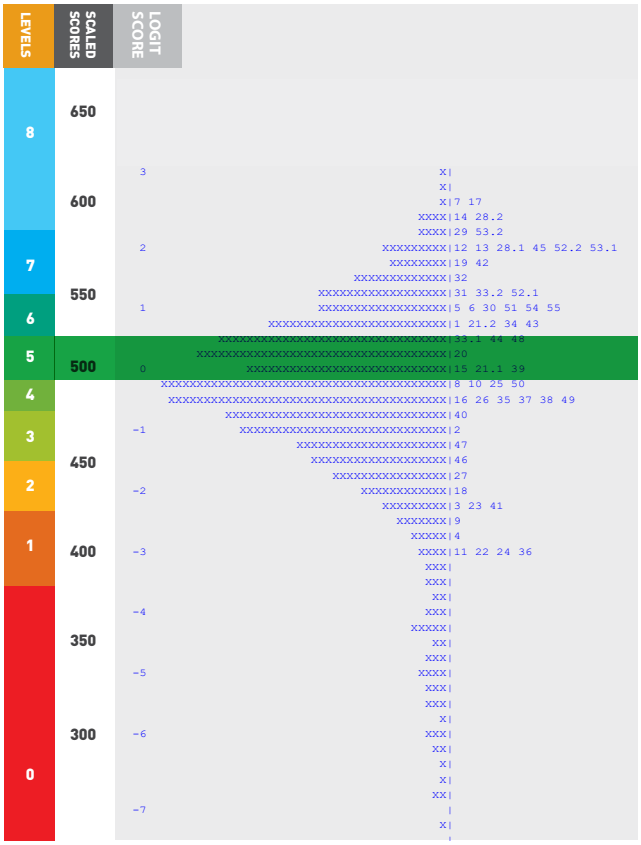
9. The Item Response Theory is an approach for the design, analysis and scoring of cognitive instruments.
10. The arithemetic mean, also commonly referred to as the average. The mean is the sum of all scores in a sample divided by the number of scores in that sample.
11. The standard deviation is the standardised measure of spread in a distribution (the distribution of scores in this context). It is defined as the square root of the average squared deviations from the mean.

FIGURE 2.2 Year 4 Numeracy Item-Person Map



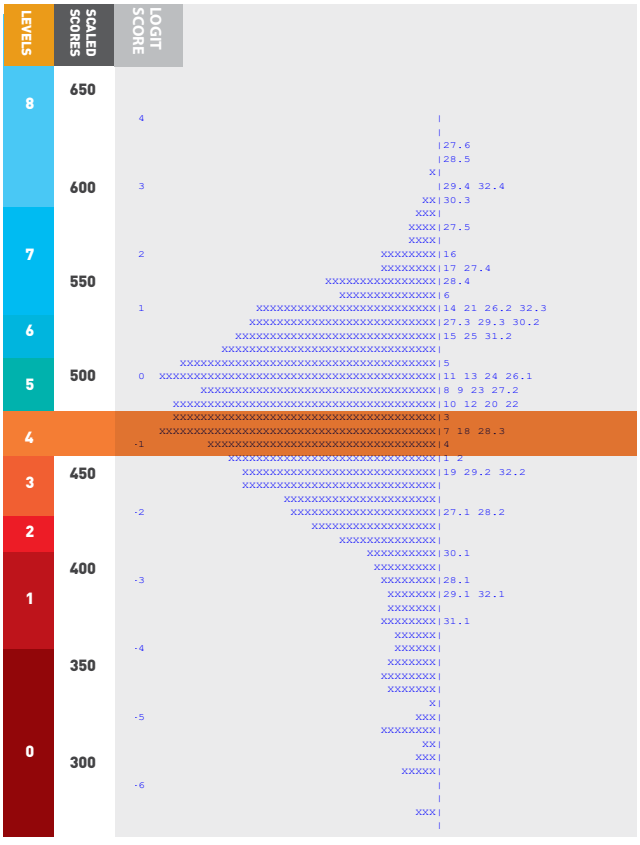
Each 'X' represents 45.4 cases. The labels for thresholds show the levels of item, and category, respectively

FIGURE 2.3 Year 6 Numeracy Item-Person Map



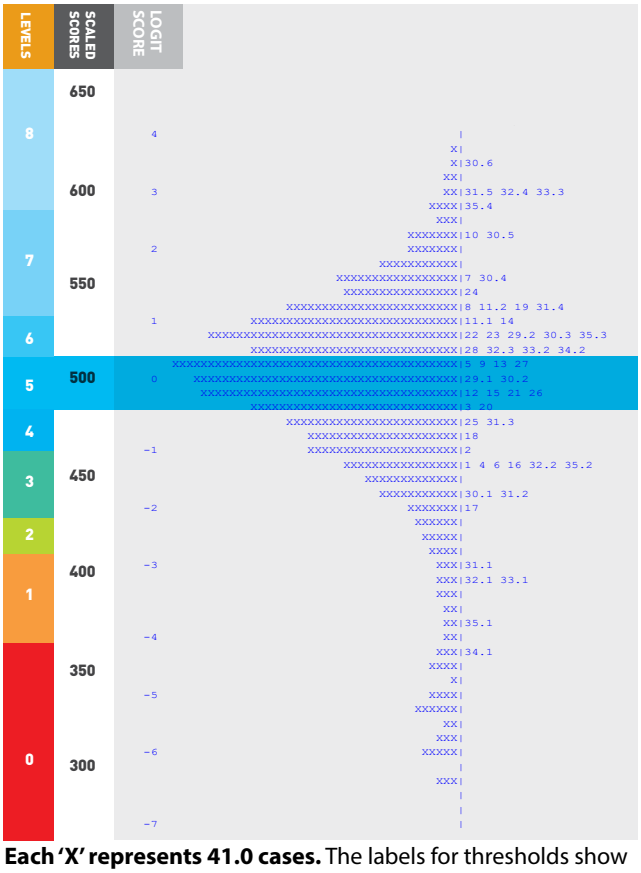
Each 'X' represents 43.7 cases. The labels for thresholds show the levels of item, and category, respectively

FIGURE 2.4 Year 4 Literacy Item-Person Map



Each 'X' represents 29.4 cases. The labels for thresholds show the levels of item, and category, respectively

FIGURE 2.5 Year 6 Literacy Item-Person Map



Each 'X' represents 41.0 cases. The labels for thresholds show the levels of item, and category, respectively

TABLE 2.4 Numeracy proficiency level descriptors

LEVELS and PILNA scale scores interval	NUMERACY DESCRIPTORS **Students at each of the Levels 1 to 8 are able to do the skills in each described level with proper guidance by the teacher and are likely to do the skills in the preceding lower levels independently.**
LEVEL 8 (575 or greater)	**8b:** Undertake the skills described for the levels below and as well can undertake metric length conversions and comparisons and calculate the probability of an event.
	8a: Round off numbers to the nearest tenth and hundredth and convert fractions to percentages and vice versa. Add and subtract fractions with denominators that are multiples. Subtract decimal numbers with different numbers of decimal places with regrouping (including with one number being a whole number). Solve complex word problems, involving mixed operations, fractions and rounding off decimals. Show time on a clock and solve problems involving time duration and length, perimeter and area of rectangles. Understand rotations on 2D shapes.
LEVEL 7 **(550 to < 575)**	Round off numbers to the nearest tens and hundreds and converting simple fractions to a percentage. Divide a two-digit number by a one-digit number with a remainder and understand the order of operation by simplifying expressions involving the four operations. Solve word problems involving multiple operations and money. Tell the time from an analogue clock in minutes.
LEVEL 6 **(525 to < 550)**	Apply understanding of numbers and place value to create whole numbers up to 999 meeting specified criteria, and identify fractions and percentages represented in words, numbers or models.. Subtract up to three-digit numbers from up to four-digit numbers with regrouping, and also subtract decimal numbers with different numbers of decimal places and with regrouping. Multiply a three-digit number by a two-digit number with regrouping. Complete an increasing number pattern that involves decimal numbers with two decimal places, and also complete a decreasing whole number pattern. Solve word problems including with multiple operations, fractions, money, and calculating total costs and change. Tell the time to the quarter hour and half hour from an analogue clock. Identify 2D from 3D shapes. Understand the use of common language of chance in relation to an everyday event. Identify and compare information represented in a simple graph (pie chart).
LEVEL 5 *Expected minimum level for Year 6 (500 to < 525)	Write a four-digit number involving zeros in numerals and identify place values of a two-digit number. Represent numbers up to 999 using place value material. Add and subtract fractions with the same denominators and add two decimal numbers with different numbers of decimal places and with regrouping. Multiply a three-digit with a two-digit number without regrouping and understand and simplify brackets to determine the order of operation. Measure the length of an object (in cm) and read measurement scales with appropriate unit (Temperature and Weight), and read the time shown on an analogue clock. Identify and compare information represented in a table. Draw lines of symmetry and identify the consequences of rotations on 2D shapes.
LEVEL 4 (475 to < 500)	Read numbers on a place value number system, compare four-digit whole numbers and compare decimal numbers. Identify and extend number patterns including skip counting by 2s, 5s,10s. Identify the numerator and denominator of a fraction. Add sets of whole numbers with regrouping, subtract a two-digit number from a three-digit number with regrouping, and multiply a two- or a three-digit number by a one-digit number with regrouping, and divide a two-digit by a one-digit number without remainder. Solve simple word problems using addition, subtraction and multiplication and calculating the total cost of a set of items. Use common language of chance in relation to identifying the outcome of a simple everyday event.
LEVEL 3 *Expected minimum level for Year 4 (450 to < 475)	Write a four-digit number not involving zero in words and numerals. Write a three-digit number involving zero in numerals and write a four-digit number involving zero in words. Add pairs of numbers with regrouping up to a total of 9999, and add two decimal numbers with the same number of decimal places and with regrouping. Multiply up to a two-digit number by a one-digit number (horizontal & vertical) with no regrouping. Complete increasing number patterns involving decimal numbers to one decimal place and recognise money according to its value. Solve simple word problems involving subtraction and simple multiplication. Use a ruler to draw and read a given length, tell simple time from an analogue clock, and identify correct volume of a given rectangular prism. Complete a whole number bar graph, using given data and graph.
LEVEL 2 (425 to < 450)	Write a three-digit number not involving zero in words and in numerals, and write a three-digit number involving zero in words only. Subtract pairs of numbers up to 999, without regrouping and solve simple word problems involving addition and subtraction (without regrouping). Identify hands of a clock and know the relation of days and weeks. Draw a triangle.
LEVEL 1 (375 to < 425)	Write a two-digit number not involving zero in words and in numerals, and also complete increasing number patterns in a simple relation. Add pairs of whole numbers up to 999 without regrouping. Interpret data represented in simple whole number bar graph or pictograph. Read value from a ruler and identify days in the week.
LEVEL 0 (Less than 375)	Students at this level are not able to do any of the skills above and/or there is insufficient evidence to indicate their ability.

TABLE 2.5 Literacy proficiency level descriptors

LEVELS and PILNA scale scores interval	LITERACY DESCRIPTORS **Students at each of the levels 1 to 8 are able to do the skills in each described level and are likely to demonstrate the skills in the preceding lower levels independently.**
LEVEL 8 (587.5 or greater)	Make inferences that require some reasoning of ideas across a text. Identify the purpose of a textual feature, such as numbering. Write an original or imaginative text with well-developed ideas that contribute to the overall theme. Coherently structure and logically sequence a text, such as a story that begins, develops and concludes. Demonstrate control over key language features, including some sophisticated vocabulary and punctuation that enhances meaning.
LEVEL 7 (537.5 to < 587.5)	Identify an idea developed across several sentences, and make subtle distinctions between related ideas. Interpret ideas in less familiar texts types, such as the reason for an instruction or an action in a poem. Apply an idea to a different context, using evidence from the text. Derive the author's intent when clues are prominent. Write a text with a range of features of the genre, such as a story with main events and an attempt at character, and with some coherence in structure, such as the sequencing of events. Use a variety of vocabulary and punctuation, such as commas and capital letters.
LEVEL 6 (512.5 to < 537.5)	Locate information that is surrounded by related ideas. Make a range of simple inferences from less familiar text types. Provide evidence from the text to support an interpretation. Provide a simple reason to support a personal judgment. Write a text with some features of the genre, such as a story with a setting or plot, where ideas are related. Spell basic words and use a small variety of sentence structures.
LEVEL 5 **(487.5 to < 512.5)** *Expected minimal level for Year 6	**Locate a paraphrase of an idea or detail in a less familiar text, such as a procedure. Connect ideas across several adjacent sentences to make an interpretation, such as the reason for an event. Generalise about a key feature, such as a character trait, from prominent clues across a text. Critically evaluate the logical purpose of a simple, straight-forward text. Write a text with minimal awareness of genre, such as a story with some details that is largely descriptive.**
LEVEL 4 **(462.5 to < 487.5)** *Expected minimal level for Year 4	**Locate explicitly stated information in a less prominent position from a range of simple, familiar texts where the key word or phrase is repeated. Make inferences from prominent clues, and simple distinctions between related ideas. Interpret the main idea of a simple paragraph. Write a text of some length where ideas may relate but not develop.**
LEVEL 3 (437.5 to < 462.5)	Locate an explicit detail, such as a main action or event, from a less prominent position in a small range of simple, highly familiar texts. Make simple inferences, such as about a character's feelings or behaviour, using prominent clues. Write a brief text with some genre elements, such as a story with a beginning that does not develop.
LEVEL 2 (412.5 to < 437.5)	Identify and match identical or synonymous words to locate explicitly stated information, such as a setting, in a small range of simple, highly familiar texts. Write a brief text that shows some control over simple sentence structures and uses a small range of simple vocabulary.
LEVEL 1 (362.5 to < 412.5)	There is no information about students' reading ability at this level. Write a very brief text where ideas are present but not clearly related or developed.
LEVEL 0 (Less than 362.5)	There is no information about students' reading ability at this level. Write some basic words or very simple sentences with limited vocabulary, some correct spelling and simple punctuation, such as a full stop.

2.10 Development of the Expected Levels and Benchmarks in Literacy and Numeracy

The purpose of the *expected level* in literacy and numeracy is to provide a reference point for the countries to indicate the minimum standard of achievement for students who have gone through four and six years of schooling. It also provides countries with information about how their students have performed in relation to the expected level.

The reference points were derived from the set of learning outcomes indicated on the eight-level proficiency scale (Tables 2.4 and 2.5), which was developed using the psychometric analysis of the 2012 and 2015 tests. This scale shows what students are able to do to qualify for each performance level. These learning outcomes are based on the regional benchmark indicators. Subject experts in English and mathematics at EQAP, who were involved in developing the learning descriptors and item construction, were tasked to set the reference points for literacy and numeracy for Years 4 and 6.

The process of setting the expected levels entailed discussing the learning outcomes on the proficiency scale, focusing on the specific skills and knowledge that are represented at each level of the scale. The expected levels were then finalised, based on how the learning outcomes mapped the regional benchmark indicators in literacy and numeracy.

The expected Level 4 and Level 5 were finalised as the benchmarks for Years 4 and 6 respectively for literacy. The same process was used for numeracy, where Level 3 and Level 5 were finalised as the benchmarks for Years 4 and 6, respectively.

2.11 Limitations and Challenges

As noted in the introductory section of this report, PILNA 2012 was designed initially as a one-time snapshot of literacy and numeracy levels in the region with the goal of gaining insight into student learning outcomes in literacy and numeracy in Year 4 and Year 6. In 2014, however, the Forum Education Ministers' Meeting elected to implement a second cycle of PILNA in 2015. PILNA 2015 was implemented with a view to both update the snapshot of literacy and numeracy levels in the region, as well as to strengthen elements of the administration for future cycles.

A partnership between EQAP and the Australian Council for Educational Research (ACER) was established in 2015 to support particular areas of technical expertise, including psychometric support, sampling support, questionnaire support, and support for trend measures and reporting. This partnership has evolved to a long-term partnership that continues to support and strengthen the PILNA programme.

Further analysis could usefully be conducted to identify relevant contributing factors, and until that is done, care should be taken in the way the results are interpreted.

The splitting of Level 8 of the numeracy scale into 8a and 8b provides for a better description of what students know and can do at each of those levels. At the same time, care should be taken in interpreting how the combined Level 8 results from 2012 and 2015 compare with 2018 as the category was expanded through the incorporation of additional items in measurement, geometry, data and probability that were not part of the previous instruments.

The questionnaire component of PILNA was fully implemented for the first time in 2018. Contextual data is referenced significantly in the reports but only to provide descriptive context and indications of association with student learning outcomes. When interpreting the results, care should be taken not to ascribe a causal relationship between contextual factors and student literacy and numeracy performance.

The categorisation of locality (urban, rural, remote or very remote) is not included in the regional and small island states reports because of the differing definitions of locality in each of the PILNA countries. For example, one country identifies all its schools as rural. However, locality is included as a subgroup in the individual country reports. Similarly, categorisation of school authority (government, non-government) is not included in the regional and small island states reports for the same reason. School authority, where applicable, is included as a subgroup in the individual country reports.

3. Performance of Year 4 &Year 6 students in numeracy

THIS chapter presents the achievement of the Year 4 and Year 6 students in the PILNA numeracy assessment. It describes the performance of the Year 4 students first, followed by the performance of the Year 6 students. For each of the year levels, the 2018 overall achievement results are presented, together with the disaggregation of the results by gender as well as by the four strands: numbers, operations, measurement and geometry, and data and chance. Also addressed for each year level are the regional trends in performance over the three PILNA cycles: 2012, 2015 and 2018.

Following a successful pilot in 2015 and field trials in 2017, a coding approach was fully implemented in 2018 to capture more information about the range of student responses. The coding process enables capture of additional information about student performance on an item, rather than just scoring responses as 'correct' or 'incorrect'.

The codes used can vary slightly from item to item, both in number and in meaning, but the process remains essentially the same. For each item there will be one or more responses that show that the intended learning outcome has probably been achieved. There is also a possibility that students will leave a question entirely blank (code 9 in all cases) or simply give a response that is incorrect but not likely to provide any further information to teachers if reported. Specific codes are used across all items for invalid responses (selecting two or more choices for a multiple-choice response, for example) and for technical issues voiding the response (a page missing or unreadable in the test booklet, for example). Additionally, many items have codes that are used to capture incorrect responses that demonstrate common misconceptions that students have or responses that show partial but not full understanding of the outcome being assessed.

Throughout the chapter there are coding stories, which include examples of coding that highlight specific findings from the PILNA 2018 numeracy assessment. Each coding example includes the data for student performance at Year 4 or Year 6 for selected items, including information about the frequency of predicted different, incorrect responses by students. These data illuminate different levels of understanding or ability in relation to the concepts and skills assessed. These coding stories on student responses can be shared with classroom teachers who can use the data, particularly where common misconceptions have been identified, for planning instruction and possible interventions.

3. 1 General Information on Student Numbers

In total, 19,247 Year 4 students and 19,171 Year 6 students' results were fed into the analysis for the numeracy assessment. Table 3.1 shows the student numbers disaggregated by gender for each year level. In general, about 2% more boys than girls participated in Year 4 and 2% more girls than boys participated in Year 6.

TABLE 3.1 Students results analysed for numeracy by year level and gender, PILNA 2018

YEAR	Year 4		Year 6	
Gender	Girls	Boys	Girls	Boys
	9472	9776	9787	9384

3.2 Overall Performance in Numeracy in Year 4

This section discusses the overall numeracy performance in Year 4. It looks at the distribution of students across proficiency levels and at the mean scores for the overall domain, as well as the strands within the domain. The data show slight differences within the proficiency levels. They indicate that, over time, more students are performing at higher levels on the numeracy scale. The data for the mean numeracy scores show that, while the mean numeracy score improved from 2012 to 2015, the Year 4 mean score remained stable from 2015 to 2018.

PROFICIENCY LEVELS 2018

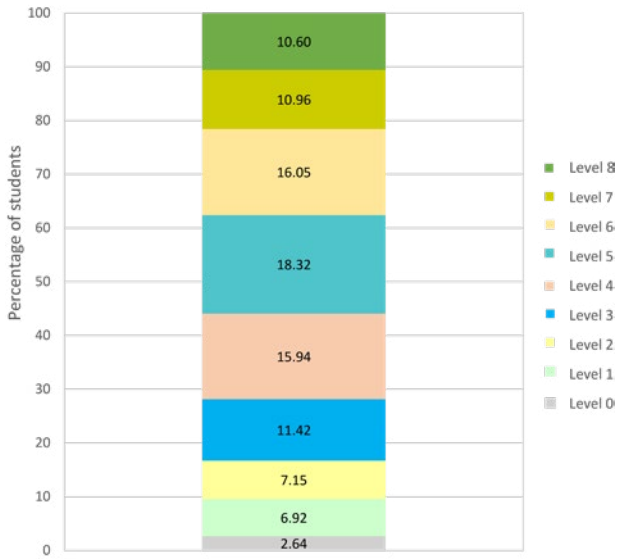
The regional numeracy performance by Year 4 students is reported against the numeracy proficiency level descriptors referred to in Table 2.4 of Chapter 2. Distribution of Year 4 students for each proficiency level, as shown in Table 3.2 and illustrated in Figure 3.1, varies from the lowest level at 0 to the highest in level 8. The minimum level of proficiency expected from Year 4 students is level 3 on the scale, with the expectation that students who are performing at level 3 are also able to successfully engage with PILNA items related to skills and knowledge from both levels 1 and 2.

TABLE 3.2 Distribution of Year 4 students by proficiency levels, PILNA 2018

PROFICIENCY LEVEL	PERCENTAGE
	YEAR 4
8	10.60 (0.67)
7	10.96 (0.49)
6	16.05 (0.45)
5	18.32 (0.39)
4	15.94 (0.43)
3	**11.42 (0.37)**
2	7.15 (0.33)
1	6.92 (0.38)
0	2.64 (0.32)

■ Expected minimum proficiency level for Year 4.
Numbers in brackets are standard errors.

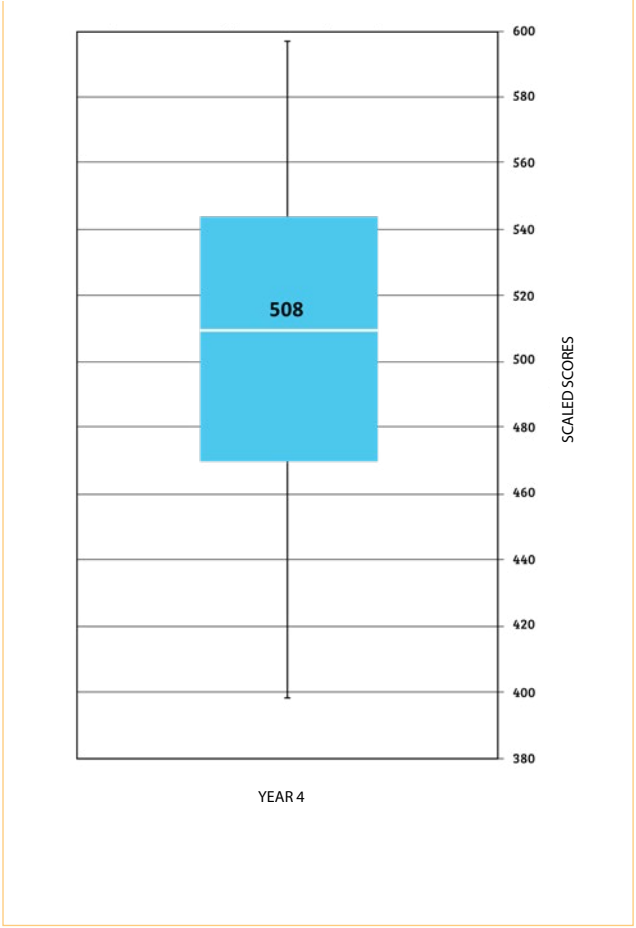
FIGURE 3.1 Regional numeracy proficiency levels for Year 4, PILNA 2018.



DOMAIN AND STRAND PERFORMANCE 2018

The box plot in Figure 3.2 provides a graphical representation of the distribution of numeracy scores for Year 4 in 2018. The two parts of the box above and below the median are relatively symmetrical, showing that the distribution of half of the students falls equally on either side. The bottom whisker of the box plot is longer than the top whisker, indicating a wider spread of performance at the lower proficiency levels for Year 4 numeracy than at the upper levels.

FIGURE 3.2 Distribution of numeracy scores for Year 4, PILNA 2018.



The stacked graph (Figure 3.1) provides a visual representation of the distribution of Year 4 students achieving each of the levels for the 2018 PILNA.

Analysis of the results of PILNA 2018, shows that approximately 83% of Year 4 students were performing at or above the expected minimum proficiency level (the regional minimum benchmark indicator highlighted in Table 3.2). Only about 17% of Year 4 students performed below the expected minimum proficiency level for year 4, that is, at the lower proficiency levels (Level 0 to Level 2). Just over 11% of Year 4 students were at the minimum expected level, 62% of students in Year 4 clustered at levels 3 to 6 and the remaining 22% of Year 4 students performed at the higher proficiency levels (levels 7 and 8).

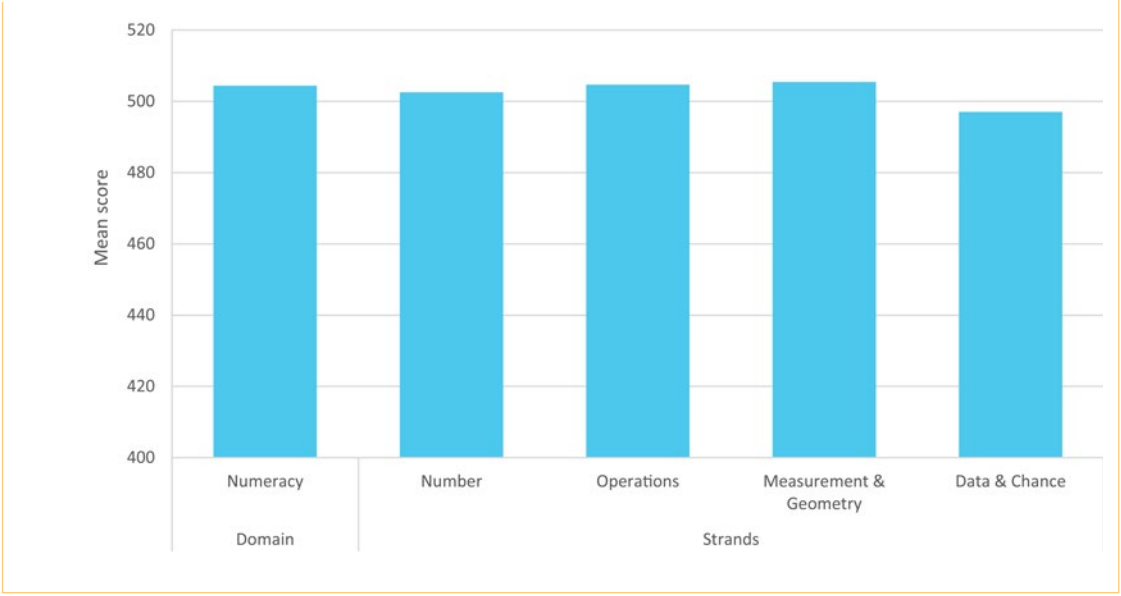
Looking more deeply into the numeracy results, we can examine the performance of students in each of the four strands within numeracy: numbers, operations, measurement and geometry, and data and chance. A comparison of the mean performance by strand, along with the mean performance overall, is presented in Table 3.3 and Figure 3.3.

TABLE 3.3 Mean performance of Year 4 students in numeracy by domain and strands, PILNA 2018

YEAR	DESCRIPTIVE STATISTICS	DOMAIN	STRANDS			
		NUMERACY	NUMBER	OPERATIONS	MEASUREMENT & GEOMETRY	DATA & CHANCE
4	Mean	504.40 (1.56)	502.54 (1.65)	504.66 (2.09)	505.45 (1.13)	497.05 (2.38)
	SD	60.72 (1.23)	66.24 (1.99)	79.85 (1.81)	49.16 (1.94)	88.02 (1.69)

Numbers in brackets are standard errors. SD - Standard Deviation

FIGURE 3.3 Mean scores of Year 4 students by domain and strands , PILNA 2018.



Overall, the means for all the strands were similar to the domain mean value, showing little variation in performance across the four strands. In 2018, the highest mean performance of Year 4 students was in measurement and geometry and the lowest mean performance was in data and chance, although it should be noted that there were only a small number of items (4 items) measuring data and chance at Year 4.

There was a significant positive correlation (0.610) between reading and numeracy word problems in Year 4 level. A fairly moderate correlation indicating that 37% of the variation in the numeracy word problem can be attributed to reading. It is important for teachers to explicitly address the issue of reading and associated mathematical language in their mathematics classrooms. When they teach maths, teachers need to also teach the language of maths and numeracy, as they go hand in hand.**

***Correlation is significant at the 0.01 level (2-tailed).*

I-Kiribati students reading during a short recess.
Credit: DANICA WAITI/RRRT-Pacific Community

PERFORMANCE BY GENDER 2018

Girls demonstrated higher levels of numeracy achievement than boys, on average, across the region in 2018. This is evident in their higher mean scores, as well as in the way students are distributed across the proficiency levels. These data are represented in Table 3.4 and Table 3.5 and Figure 3.4 and Figure 3.5.

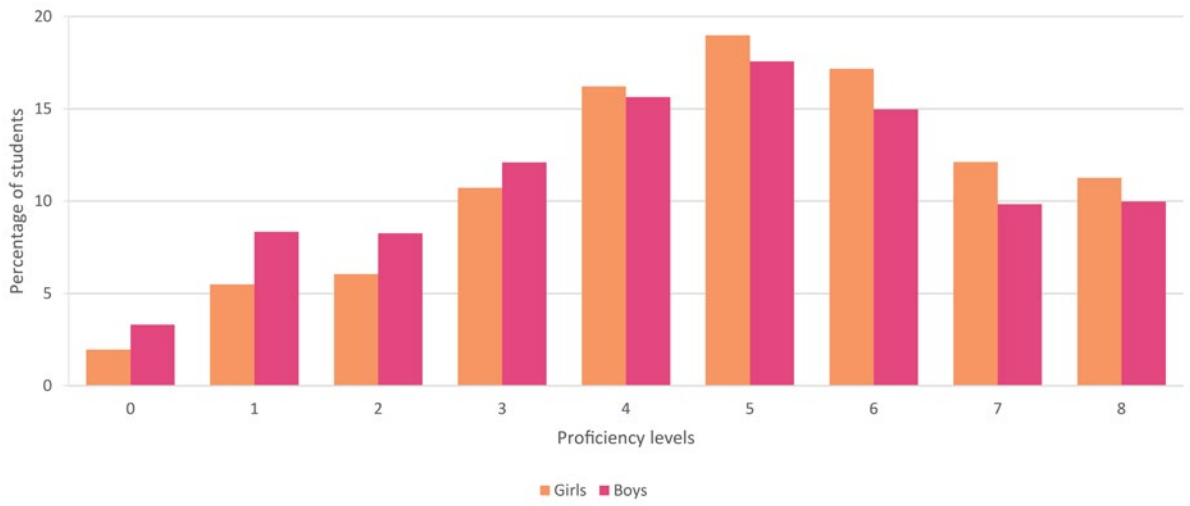
These distributions by gender and proficiency level are also shown in Figure 3.4.

TABLE 3.4 Distribution of Year 4 students' proficiency levels by gender, PILNA 2018

PROFICIENCY LEVEL	Year 4 (%)	
	Girls	Boys
8	11.26 (0.78)	9.97 (0.74)
7	12.13 (0.59)	9.83 (0.59)
6	17.17 (0.60)	14.97 (0.56)
5	18.98 (0.57)	17.57 (0.55)
4	16.23 (0.70)	15.64 (0.60)
3	**10.72 (0.47)**	**12.10 (0.50)**
2	6.05 (0.38)	8.26 (0.48)
1	5.50 (0.46)	8.34 (0.49)
0	1.96 (0.29)	3.31 (0.49)

■ Expected minimum proficiency level for Year 4.
Numbers in brackets are standard errors.

FIGURE 3.4 Regional Year 4 numeracy proficiency levels by gender, PILNA 2018



More girls than boys performed at or above the expected minimum proficiency level in numeracy at Year 4, and, at the upper end of the scale, just over 23% of girls performed in the higher proficiency levels (levels 7 and 8) compared to just under 20% of boys. Moreover, only 13% of girls performed in the lower proficiency (levels 0 to 2) compared to about 20% of boys. The proportion of girls performing at or above the expected minimum proficiency level (the regional minimum benchmark indicator highlighted in Table 3.4) was 86% compared to approximately 80% of boys.

Table 3.5 and Figure 3.5 indicate that girls outperformed boys in the overall numeracy domain as well as in each strand in Year 4.

> **The highest mean performance of girls by strand was in operations while for boys it was in measurement and geometry.**

Coding Story 1

STRAND: Operations

LEARNING OUTCOME: Subtracting a two-digit number from a three-digit number with regrouping (vertical subtraction). Students need to understand place value in order to regroup, as well as the operation of subtraction in order to successfully respond to this item.

SAMPLE ITEM* & RESPONSE

SUBTRACT: 541

− 13

CORRECT RESPONSE: **528**

POSSIBLE MISCONCEPTIONS:

532 - Subtracting the smaller digit from the bigger digit and not understanding regrouping in subtraction

554 - Using an incorrect operation – added

MINIMUM EXPECTED PROFICIENCY LEVEL

The question item is asked of both Year 4 and Year 6 students. The question item is on level 4 of the numeracy proficiency descriptors, which is above the minimum level of proficiency expected from Year 4 (level 3). For Year 6, the minimum level of proficiency expected is level 5. This means we would expect only higher performing Year 4 students to successfully answer this question, whilst the majority of Year 6 students should be able to successfully answer this type of question.

ITEM ANALYSIS FOR YEAR 4

Code	Notes/Interpretation of the codes	Score	% of total
0	Incorrect response	0	33.29
1	Expected response	1	31.52
2	Some evidence of correct subtraction	0	10.19
3	Subtracts smaller from bigger number	0	12.09
4	Incorrect operation	0	6.16
5	Incorrect alignment	0	0.83
9	No response/blank	0	5.81

NOTES & INTERPRETATIONS

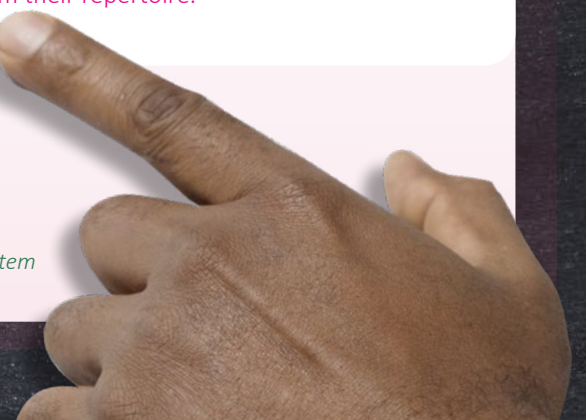
- The correct response is code 1, and close to 32% of Year 4 students got the expected (correct) response.
- 12% of the students simply took the smallest number from the bigger number and did not regroup (code 3).
- 10% of the students (code 2) attempted the question and showed evidence of some correct subtraction.
- Small percentages of students attempted the question using an incorrect operation (code 4) or incorrect alignment (code 5), while another 33% gave a different, incorrect response.
- In Year 6, close to 61% of students got the expected (correct) response, an expected improvement for Year 6 students.

SUGGESTIONS FOR INTERVENTION

1. Emphasise the importance of understanding subtraction, including its symbol, and of place value, and that the order in subtraction is important. Point out that, whilst the commutative law applies to addition, it does NOT apply to subtraction.

2. Teach correct methods of subtraction with regrouping, especially decomposition, but also other methods, such as equal addition or Austrian subtraction.

3. The idea is to give students as many options as possible to choose from when attempting a question of this type. Students can then use the method they know best from their repertoire.



Note that this is not the exact item used in the assessment. For security reasons, the actual item cannot be made public.

Coding Story 2

STRAND: Operations.

LEARNING OUTCOME: Solving word problems involving subtraction up to four-digit numbers.

Students need to be able to read the question and identify the key word(s) that will give them a clue as to what operation to use, and then apply the operation correctly.

SAMPLE ITEM* & RESPONSE

QUESTION: A school library had 742 books. The teacher in charge of the library gave 28 books to another school close by. How many books does the school library have now?

CORRECT RESPONSE: **714**

MINIMUM EXPECTED PROFICIENCY LEVEL

The question item is asked of Year 6 students and the question item is on level 5 of the numeracy proficiency descriptor, which is the minimum level of proficiency expected for Year 6 students. This means we would expect a good number of Year 6 students to successfully answer this question.

POSSIBLE MISCONCEPTIONS:

770 - Subtracting the smaller digit from the bigger digit and not understanding regrouping in subtraction

554 - Incorrect operation - added, and not being able to associate the word 'gave' with subtraction

ITEM ANALYSIS FOR YEAR 6

Code	Notes/Interpretation of the codes	Score	BOYS: % of total	GIRLS: % of total
0	Incorrect response	0	43.7	37.1
1	Expected response	1	36.5	45.1
2	Correct number sentence	0	1.7	1.3
3	Incorrect operation	0	12.9	13.9
9	No response/blank	0	5.3	2.5

NOTES & INTERPRETATIONS

- The correct response is code 1.
- 45% of girls provided the correct response, compared to close to 37% of boys.
- 14% of girls and 13% of boys were given a code 3, which is for using an incorrect operation.
- Slightly more boys (5%) than girls (close to 3%) left the question blank (code 9).
- Girls are still performing better than boys with regard to engaging with word problems as evident in this item.

SUGGESTIONS FOR INTERVENTION

1. Teachers can work with students to expand their numeracy vocabulary as it relates to operations. One way to do this when teaching how to interpret and solve word problems involving operations is to discuss and build up sets of vocabulary cards for key words and their associated operations.

2. Providing questions using varied vocabulary helps students recognise that there are many words that can indicate what operation might be appropriate.

3. Ask students to work in pairs and use the vocabulary cards to construct their own word problems – create a word problem for each of the four operations.

4. Working with students to understand (reading comprehension) word problems is another technique that can support students in applying their literacy skills in a numeracy context.

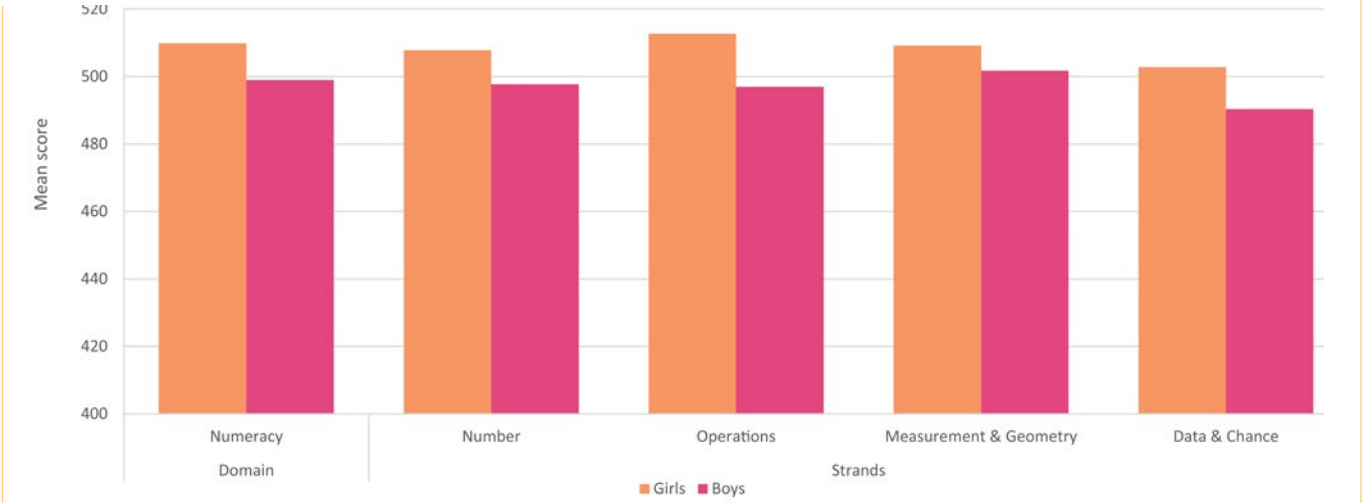
** Note that this is not the exact item used in the assessment. The actual item cannot be made public because of security reasons.*

TABLE 3.5 Mean performance of Year 4 students in domain and strands by gender, PILNA 2018

YEAR	GENDER	DESCRIPTIVE STATISTICS	DOMAIN	STRANDS			
			NUMERACY	NUMBER	OPERATIONS	MEASUREMENT & GEOMETRY	DATA & CHANCE
4	Girls	Mean	509.87 (1.53)	507.74 (1.60)	512.72 (2.07)	509.13 (1.12)	502.81 (2.35)
		SD	57.47 (0.98)	61.84 (1.21)	75.88 (1.44)	46.21 (1.04)	84.09 (1.41)
	Boys	Mean	499.00 (1.85)	497.71 (1.98)	496.93 (2.39)	501.74 (1.42)	490.35 (2.79)
		SD	63.31 (1.72)	69.79 (3.17)	82.81 (2.52)	51.48 (3.16)	90.22 (2.31)

Numbers in brackets are standard errors. SD - Standard Deviation

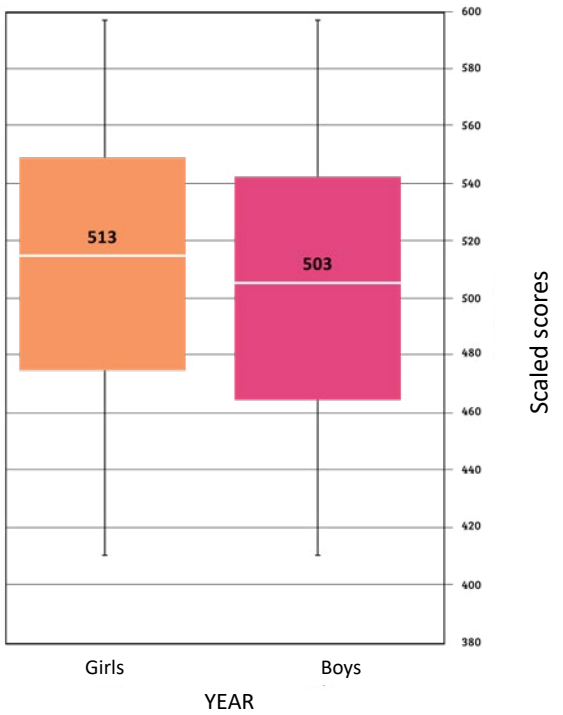
FIGURE 3.5 Mean scores of Year 4 students in domain and strands by gender, PILNA 2018



The highest mean performance of girls by strand was in operations while for boys it was in measurement and geometry and the largest difference between boys and girls was in the operations strand. The lowest mean performance by both girls and boys was in data and chance and the difference between boys' and girls' performance in data and chance was almost as large as in the operations strand.

The box plot in Figure 3.6 shows the distribution of scores in numeracy for Year 4 grouped by gender. The distribution of the interquartile range around the median is relatively symmetrical, although the overall range is slightly wider for boys than for girls, i.e. the distribution of scores is more widely dispersed among boys than among girls. The spread at the lower end was larger for boys.

FIGURE 3.6 Distribution of numeracy scores by gender for Year 4, PILNA 2018



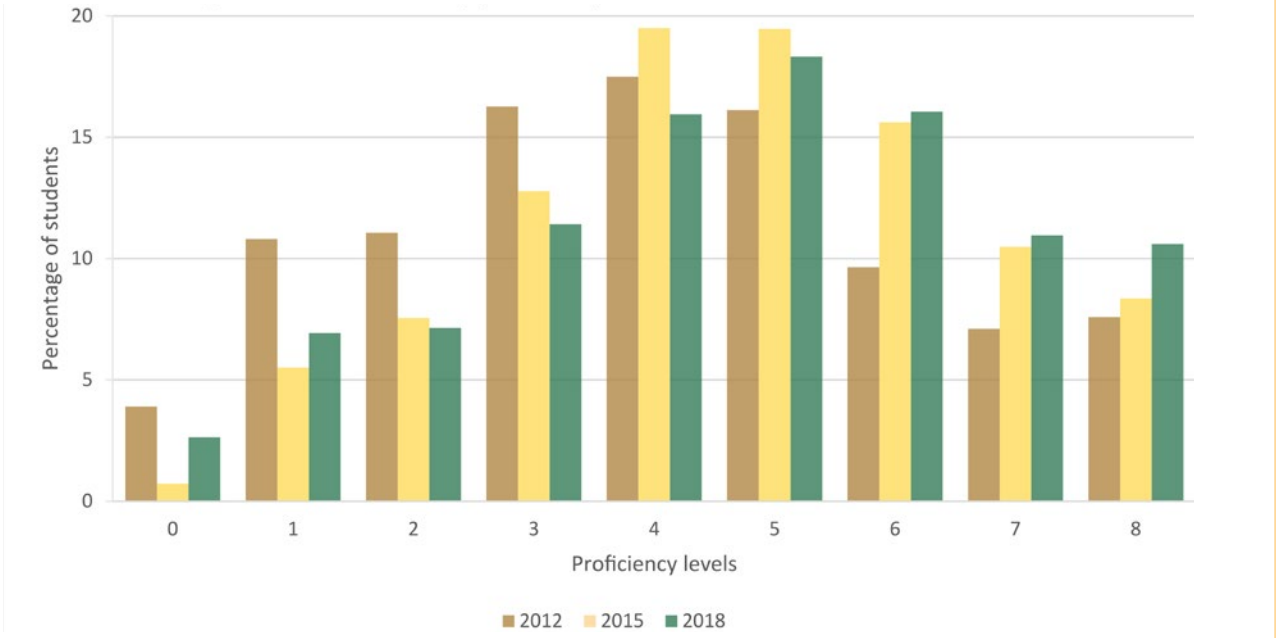
TREND PERFORMANCE – 2012, 2015 AND 2018

Looking back over time, comparisons can be made across the three PILNA cycles to provide information on trends in student achievement in 2012, 2015 and 2018.

PROFICIENCY LEVELS IN 2012, 2015 AND 2018

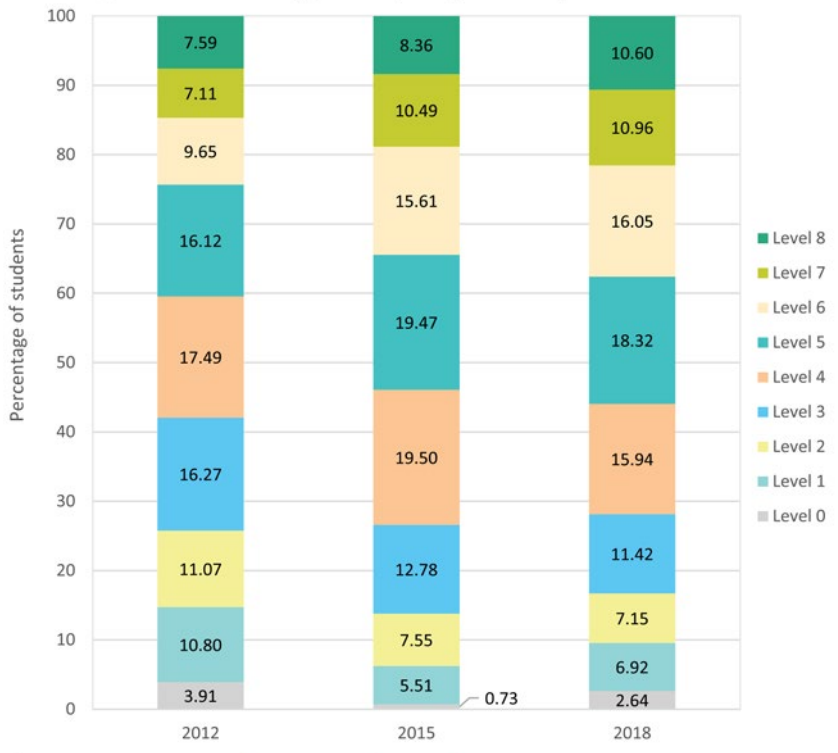
The histogram (Figure 3.7) displays the distribution of proficiency level achievement at Year 4 in 2012, 2015 and 2018. The brown bars on the left of each grouping show higher percentages of students at lower levels (levels 0 to 3) in 2012; whilst in 2015 and 2018 (red and green bars) it shows higher percentage of students at the higher levels (levels 5 to 8). This overall trend is indicative of an increase in the level of student performance in Year 4 numeracy over the period 2012 to 2018.

FIGURE 3.7 Distribution of Year 4 numeracy proficiency levels in the region, PILNA 2012, 2015 and 2018



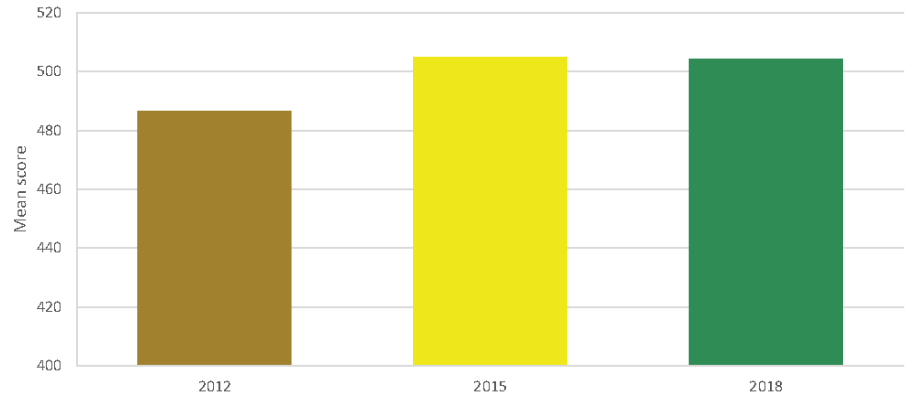
The stacked graph (Figure 3.8) also shows the distribution of percentages of students achieving each proficiency level. Focusing on the placement and size of each of the colour bands, one can see that more students are achieving at the highest levels (6, 7 and 8) moving from 2012 on the left to 2018 on the right.

FIGURE 3.8 Distribution of Year 4 numeracy proficiency levels in the region, PILNA 2012, 2015 and 2018



There are differences across the proficiency levels but overall there is an indication that students' achievement in 2018 has improved from 2015, with more students achieving at the higher levels. The graphs show that in 2015 and 2018, there are fewer students represented on the lower proficiency levels (levels 0 to 2) and more students represented on the higher proficiency levels (levels 7 and 8) compared to 2012. For example, approximately 38% of students performed at levels 6, 7 and 8 in 2018, compared with 34.5% in 2015 and just over 24% in 2012.

FIGURE 3.9 Distribution of Year 4 numeracy mean scores, PILNA 2012, 2015 and 2018.



DOMAIN PERFORMANCE 2012, 2015 AND 2018

Table 3.6 and Figure 3.9 show the domain mean performance of Year 4 students in numeracy across the three cycles. The means show an improvement from 2012 to 2015, with no significant difference from 2015 to 2018, although there are slight differences in the distribution of students as shown by the differences in the standard deviations.

TABLE 3.6 Mean performance of Year 4 students in numeracy, PILNA 2012, 2015 and 2018

YEAR	DESCRIPTIVE STATISTICS	STRANDS		
		2012	2015	2018
4	Mean	486.43	505.01	504.40 (1.56)
	SD	61.82	51.35	60.72 (1.23)

Numbers in brackets are standard errors.
SD - Standard Deviation

FIGURE 3.10 Distribution of Year 4 numeracy scores across PILNA cycles, PILNA 2012, 2015, and 2018

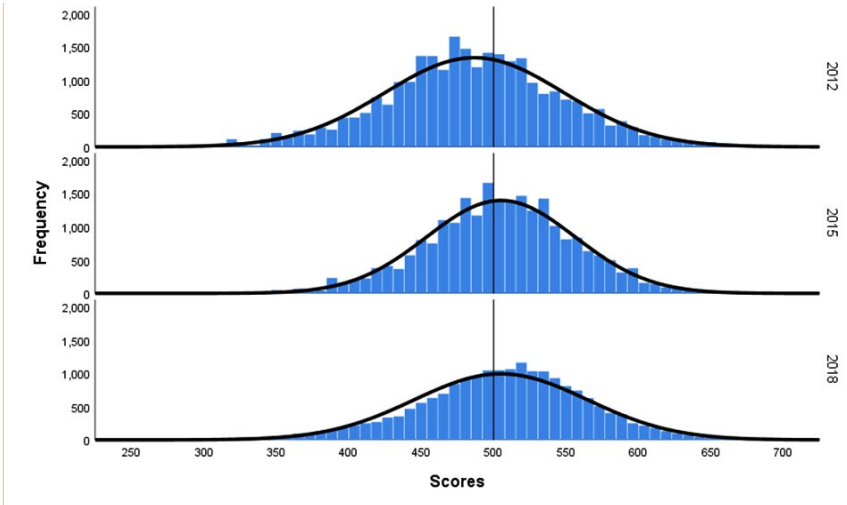


Figure 3.10 is a visual representation showing the distribution of the scaled Year 4 numeracy scores for each of the PILNA cycles (2012, 2015 and 2018). The distributions are centred at 500 with a standard deviation of 50. It is expected that the scaled scores are to be normally distributed. Ideally, over time, the peak of the normal curve should be moving to the right showing an improvement from cycle to cycle. The distributions of student scores are relatively similar across the cycles, although in 2012, as observed, the largest portion of the scores fall below 500. It is encouraging to note that the peaks of the curves for 2015 and 2018 are to the right of 500, and that the number of students on the lower left end of the tail is reduced from 2012 through to 2018.

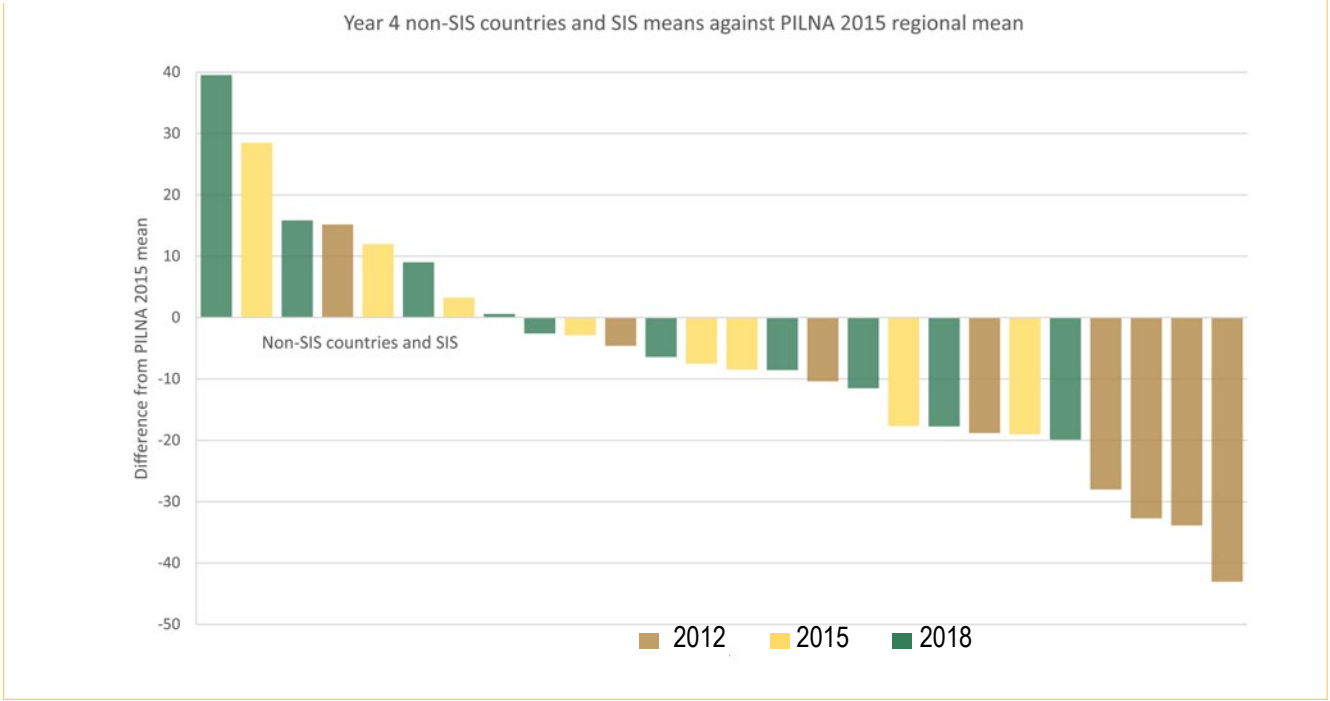
REGIONAL AND COUNTRIES PERFORMANCE 2012, 2015 AND 2018

An analysis of the mean performance in numeracy achievements in the PILNA countries over the three cycles is important to show the spread and shift of country-level performance over time. For the purposes of analysis, mid-sized and larger countries are represented individually, while the six small countries, collectively known as the small island states (SIS)[12], are represented as an aggregate group.

In Figure 3.11, the difference between the national mean and the 2015 baseline regional mean is shown. In order to determine whether there have been improvements, the 2015 regional mean score (2015 regional mean score for Year 4 numeracy was 505.01 points) was subtracted from the mean scores of each of the non-SIS countries and the mean scores of the combined SIS to determine the mean difference. The magnitude of the difference is indicated by the height of the bars. The bars above the line represent countries with means higher than the 2015 regional mean, whereas the bars below the line are countries with means lower than the 2015 mean.

The colours of the bars represent the three PILNA cycles. There are many more brown (2012) bars than red (2015) or green (2018) below the baseline. Over time the colours show the countries and SIS gradually shifting from being below the standard mean to above the mean. Additionally it is interesting to note the magnitude of the spread which is shown by the height of the bar.

FIGURE 3.11 Distribution of country and SIS means against PILNA 2015 regional mean



As shown in Figure 3.11, in 2012 one country (non-SIS or SIS) was above the 2015 baseline mean, in 2015 three countries (non-SIS or SIS) had means above the baseline mean and in 2018 four countries (non-SIS or SIS) had means above the 2015 baseline mean. It is encouraging to note that the negative differences decreased in magnitude over the three PILNA cycles, which is shown by the magnitude of the bars getting shorter below the standard mean over the years.

12. For 2012, there were seven non-SIS countries and six combined for SIS; for 2015 there were also seven non-SIS countries but only five combined for SIS; and for 2018 there were nine countries and six combined for SIS.

3.3 Overall Performance in Numeracy in Year 6

The analysis of PILNA data discussed in this section on the overall numeracy performance in Year 6 looks at the distribution of students across proficiency levels and at the mean scores for the overall domain, as well as the strands within the domain. The Year 6 data show that, across the region, there has been a marked improvement in numeracy performance across the three PILNA cycles.

PROFICIENCY LEVELS 2018

The regional numeracy performance by Year 6 students is reported against the numeracy proficiency level descriptors referred to in Table 2.4 of Chapter 2. One of the enhancements to the PILNA 2018 analysis was the splitting of Level 8 on the numeracy scale into two parts: 8a and 8b, as shown in Table 3.7. The split of Level 8 allows more detail to be provided in describing what students know and are able to do at the highest levels of the scale, with students reaching Level 8b having more advanced skills and knowledge than their peers reaching Level 8a.

The comparative distribution of Year 6 students for each proficiency level, as given in Table 3.7 and illustrated in Figure 3.12, varies from the lowest level at 0 to the highest in Level 8b. The minimum level of proficiency expected from Year 6 students is Level 5 on the scale, with the expectation that students who are performing at Level 5 are also able to successfully engage with PILNA items related to skills and knowledge from levels 1 through 4.

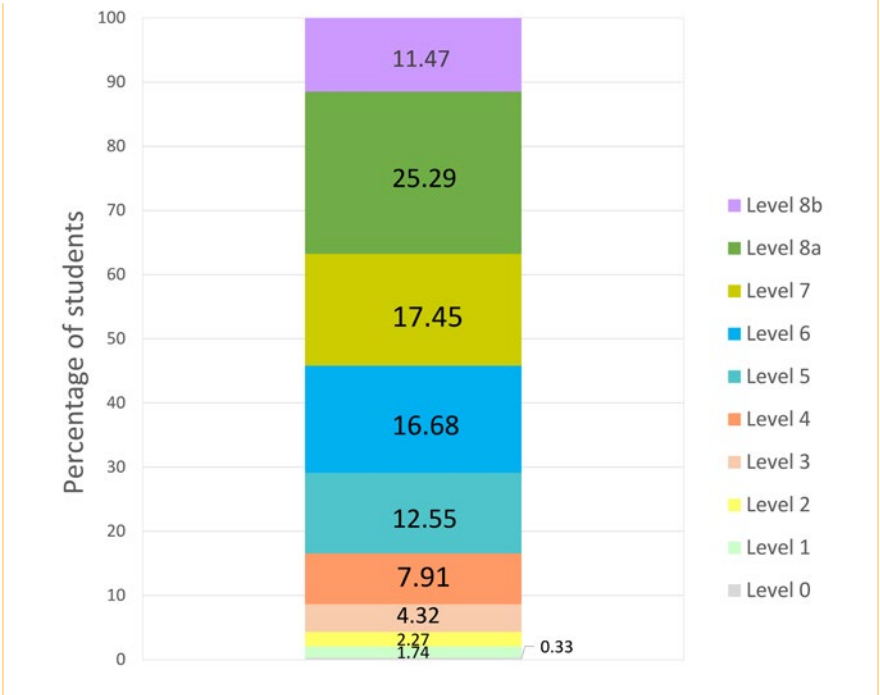
TABLE 3.7 Distribution of Year 6 students by proficiency levels, PILNA 2018

PROFICIENCY LEVEL	PERCENTAGE
	YEAR 6
8b	11.47 (0.77)
8a	25.29 (0.86)
7	17.45 (0.65)
6	16.68 (0.64)
5	12.55 (0.53)
4	7.91 (0.46)
3	4.32 (0.32)
2	2.27 (0.24)
1	1.74 (0.22)
0	0.33 (0.10)

Expected minimum proficiency level for Year 6.
Numbers in brackets are standard errors.

The stacked graph (Figure 3.12) provides a visual representation of the distribution of Year 6 students achieving each of the levels for the PILNA 2018.

FIGURE 3.12 Regional numeracy proficiency levels for Year 6, PILNA 2018



> About 83% of Year 6 students were performing at or above the expected minimum proficiency level

Analysis of the results of the PILNA 2018, shows that approximately 83% of Year 6 students were performing at or above the expected minimum proficiency level (the regional minimum benchmark indicator highlighted in Table 3.7). Only about 17% of Year 6 students performed below the expected minimum proficiency level for Year 6,

that is, at the lower proficiency levels (level 0 to level 4). Just over 12% of Year 6 students were at the minimum expected level, 59% clustered at levels 6 to 8a, and the remaining 11% performed at the highest proficiency level (8b). The stacked graph shows that there are few students represented on the lower proficiency levels (levels 0 to 2) and a significant number of students represented on the higher proficiency levels (levels 7, 8a and 8b).

DOMAIN AND STRAND PERFORMANCE 2018

The box plot in Figure 3.13 provides a graphical representation of the distribution of numeracy scores for Year 6 in 2018. The two parts of the box above and below the median are relatively symmetrical, showing that the distribution of half of the students falls equally on either side. It can also be seen that the whiskers are of the same length, indicating an even spread of performance in the proficiency for Year 6 numeracy.

Looking more deeply into the numeracy results, we can examine the performance of students in each of four strands within numeracy: numbers, operations, measurement and geometry, and data and chance. A comparison of the mean performance by strand, along with the mean performance overall, is presented in Table 3.8 and Figure 3.14.

Overall, the means for all the strands were similar to the domain mean value, showing little variation in performance across the four strands. In 2018, the highest mean performance of Year 6 students was in operations and the lowest mean performance was in data and chance.

FIGURE 3.13 Distribution of numeracy scores for Year 6, PILNA 2018

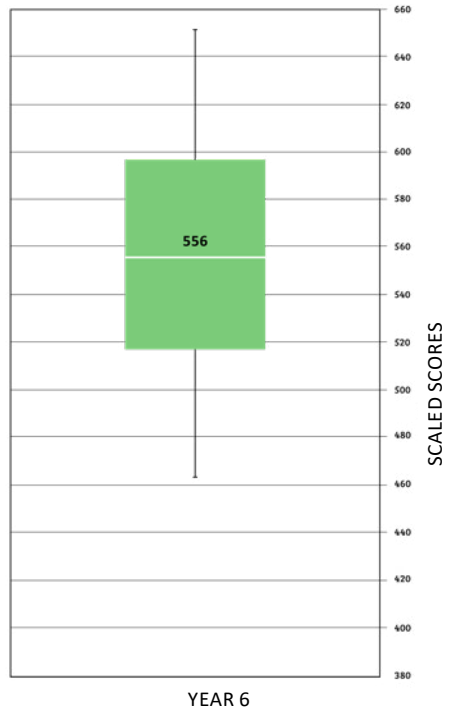
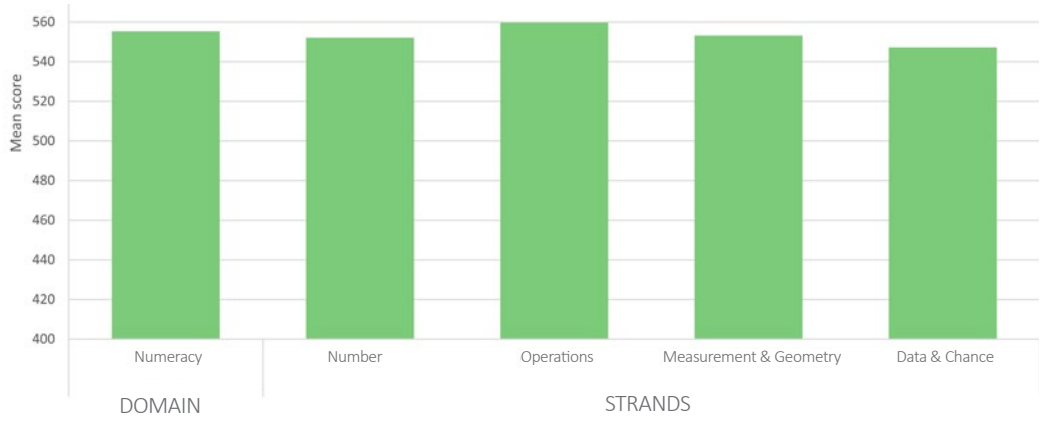


TABLE 3.8 Mean performance of Year 6 students by domain and strands, PILNA 2018

YEAR	DESCRIPTIVE STATISTICS	DOMAIN	STRANDS			
		NUMERACY	NUMBER	OPERATIONS	MEASUREMENT & GEOMETRY	DATA & CHANCE
6	Mean	555.24 (1.63)	552.05 (1.52)	559.65 (1.65)	553.18 (1.61)	547.13 (1.97)
	SD	59.75 (1.05)	61.04 (1.06)	68.18 (1.18)	56.72 (0.91)	72.35 (1.01)

Numbers in brackets are standard errors. SD - Standard Deviation

FIGURE 3.14 Means scores of Year 6 students by domain and strands, PILNA 2018



PERFORMANCE BY GENDER 2018

Year 6 girls demonstrated higher levels of numeracy achievement than Year 6 boys, on average, across the region in 2018. This is evident in the performance distribution across the proficiency levels and the higher mean scores for girls in each of the strands, as well as overall. These data are represented in Table 3.9 and Table 3.10 and in Figure 3.15 and Figure 3.16.

TABLE 3.9 Distribution of Year 6 students by proficiency levels and by gender, PILNA 2018

PROFICIENCY LEVEL	YEAR 6 (%)	
	Girls	Boys
8b	12.60 (0.80)	10.39 (0.87)
8a	27.21 (1.04)	23.33 (0.84)
7	18.12 (0.81)	16.87 (0.77)
6	16.73 (0.77)	16.66 (0.69)
5	**12.03 (0.64)**	**13.10 (0.80)**
4	6.91 (0.54)	8.86 (0.74)
3	3.35 (0.42)	5.26 (0.38)
2	1.62 (0.23)	2.91 (0.48)`
1	1.24 (0.27)	2.18 (0.33)
0	0.18 (0.09)	0.43 (0.14)

Expected minimum proficiency level for Year 6.
Numbers in brackets are standard errors. SD - Standard Deviation

FIGURE 3.15 Regional Year 6 numeracy proficiency levels by gender, PILNA 2018

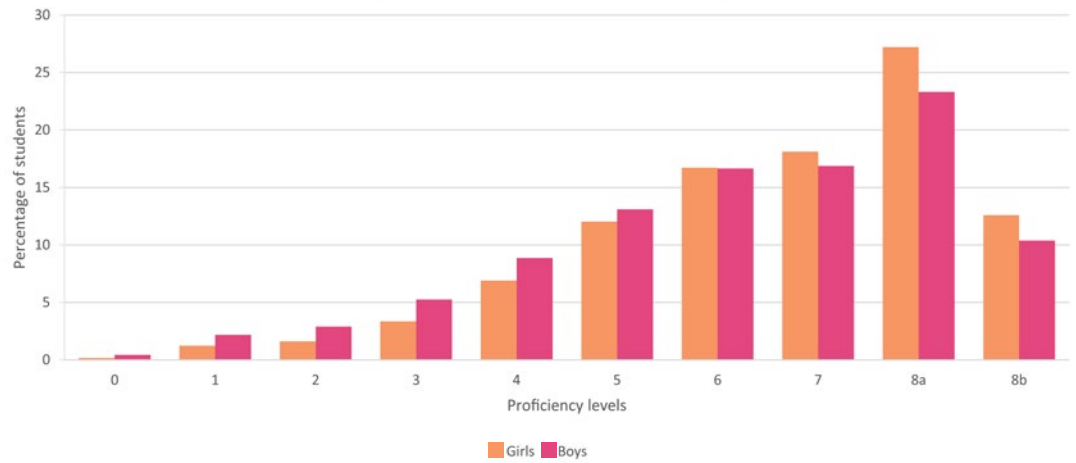


FIGURE 3.16 Mean scores of Year 6 students in domain and strands by gender, PILNA 2018

The proportion of girls performing at or above the expected minimum proficiency levels (the regional minimum benchmark indicator highlighted in Table 3.9) was approximately 87%, compared to approximately 80% of boys. About 58% of girls performed in the higher proficiency (levels 7, 8a and 8b), compared to about 51% of boys. At the other end of the scale, only 3% of girls performed in the lowest proficiency (levels 0 to 2), compared to about 6% of boys.

Table 3.10 and Figure 3.16 indicate that girls outperformed boys in the overall numeracy domain as well as in each strand in Year 6.

The highest mean performance by both girls and boys was in the operations strand. The lowest mean performance by both girls and boys was in the data and chance strand. As was the case in the Year 4 results, at Year 6 the biggest differences in performance by gender were also in data and chance and operations.

TABLE 3.10 Mean performance of Year 6 students in domain and strands by gender, PILNA 2018

YEAR	GENDER	DESCRIPTIVE STATISTICS	DOMAIN	STRANDS			
			NUMERACY	NUMBER	OPERATIONS	MEASUREMENT & GEOMETRY	DATA & CHANCE
6	Girls	Mean	560.87 (1.78)	556.28 (1.65)	566.93 (1.75)	556.30 (1.68)	554.29 (2.15)
		SD	57.37 (1.08)	59.19 (1.06)	64.58 (1.25)	54.76 (1.02)	70.23 (1.18)
	Boys	Mean	549.86 (1.74)	548.20 (1.68)	552.62 (1.87)	550.44 (1.79)	540.48 (2.11)
		SD	61.30 (1.25)	62.30 (1.28)	70.19 (1.58)	57.87 (1.15)	72.48 (1.21)

Numbers in brackets are standard errors. SD - Standard Deviation

The box plot in Figure 3.17 shows the distribution of scores in numeracy for Year 6 grouped by gender. The distribution of the interquartile range around the median is relatively symmetrical for both boys and girls. However, the overall range is slightly wider for boys than for girls, i.e. the distribution of scores is more widely dispersed among boys than girls, especially at the lower end.

TREND PERFORMANCE - 2012, 2015 AND 2018

Looking back over time, comparisons can be made across the three PILNA cycles to provide information on trends in student achievement in 2012, 2015 and 2018.

PROFICIENCY LEVELS IN 2012, 2015 AND 2018

The corresponding histogram (Figure 3.18) displays the distribution of proficiency level achievement at Year 6 in 2012, 2015 and 2018.

FIGURE 3.17 Distribution of numeracy scores for Year 6 by gender, PILNA 2018

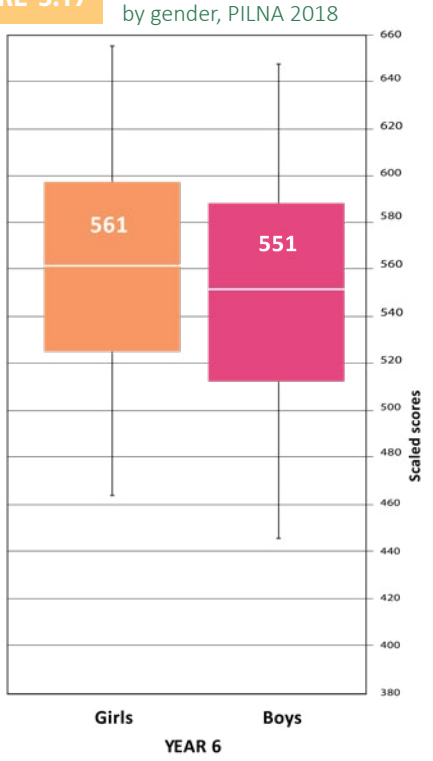
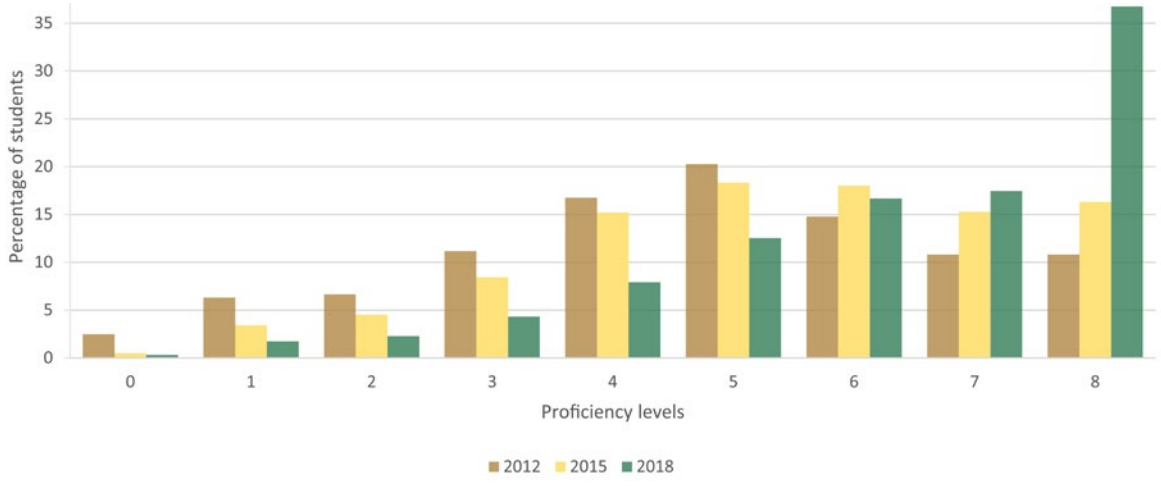


FIGURE 3.18 Distribution of Year 6 numeracy proficiency levels in the region, PILNA 2012, 2015 and 2018



There has been a marked improvement in numeracy achievement in terms of the distribution of students on the proficiency scale, with more students concentrated at the upper levels (levels 7 and 8 (8a and 8b) in 2018 than in the previous two PILNA cycles.

The stacked graph (Figure 3.19) is another visual representation of the distribution of percentages representing students achieving at each proficiency level.

There are differences across the proficiency levels but overall there is an indication that students' achievement in 2018 has improved from 2015, with many more students achieving at the higher levels.

The graph shows that in 2018, there are fewer students represented on the lower proficiency levels (levels 0 to 2) and significantly more students represented on the higher proficiency levels (levels 7 and 8 (8a and 8b)), compared to 2012 and 2015.

Some of the differences, particularly at the upper end of the scale, could be accounted for by the refinement of analysis in 2018; the two year levels were split for analysis rather than treating the entire set of data as one unit, as was done in 2012 and 2015. This could also be due to the fact that additional mathematics content was added to the 2018 Year 6 blueprint and benchmarks in numeracy. This enabled a wider and broader range of questions, covering different skill areas, than in 2012 and 2015. This extension may have allowed more students to demonstrate their skills and abilities to a higher level than in previous cycles.

DOMAIN PERFORMANCE 2012, 2015 AND 2018

Table 3.11 and Figure 3.20 show the domain performance of Year 6 students in numeracy across the three cycles.

The table and figure show improvements in the mean performance of Year 6 students in numeracy across each of the three cycles of PILNA.

FIGURE 3.19 Distribution of Year 6 numeracy proficiency levels in the region, PILNA 2012, 2015 and 2018

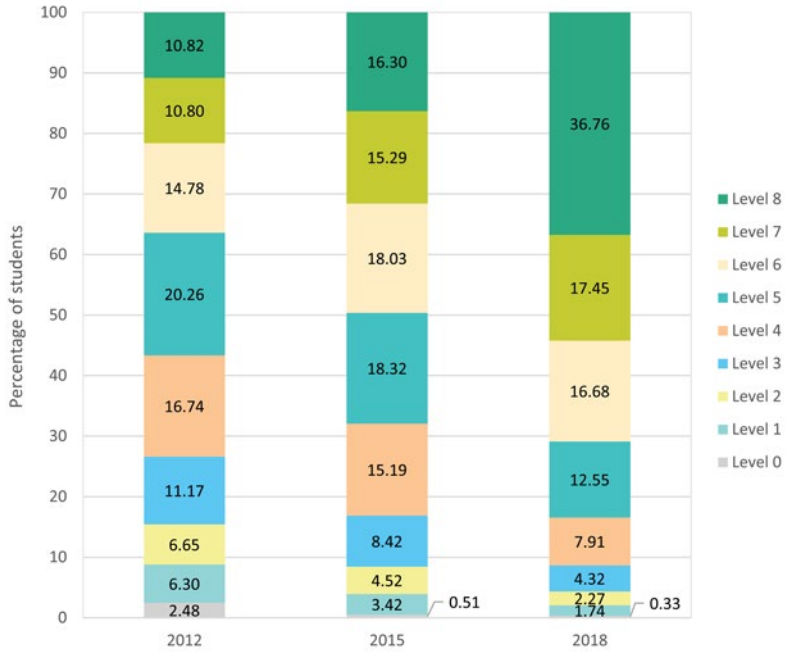


TABLE 3.11 Mean performance of Year 6 students in numeracy, PILNA 2012, 2015 and 2018

YEAR	DESCRIPTIVE STATISTICS	NUMERACY		
		2012	2015	2018
6	Mean	506.01	523.47	555.24 (1.63)
	SD	58.95	53.22	59.75 (1.05)

Numbers in brackets are standard errors. SD - Standard Deviation

FIGURE 3.20 Distribution of Year 6 numeracy mean scores, PILNA 2012, 2015 and 2018

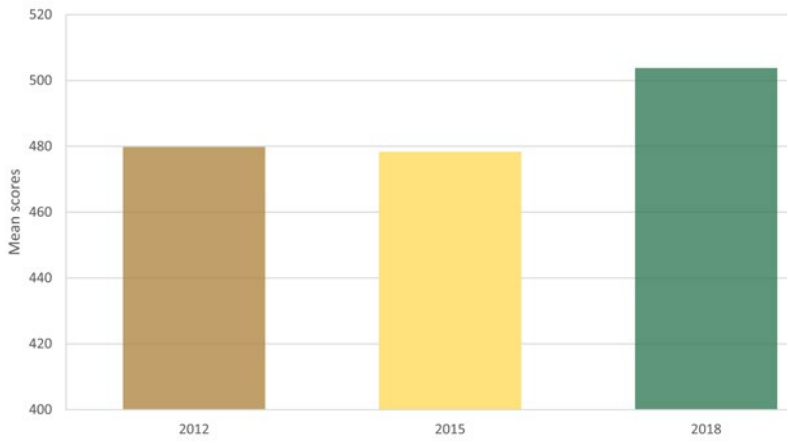
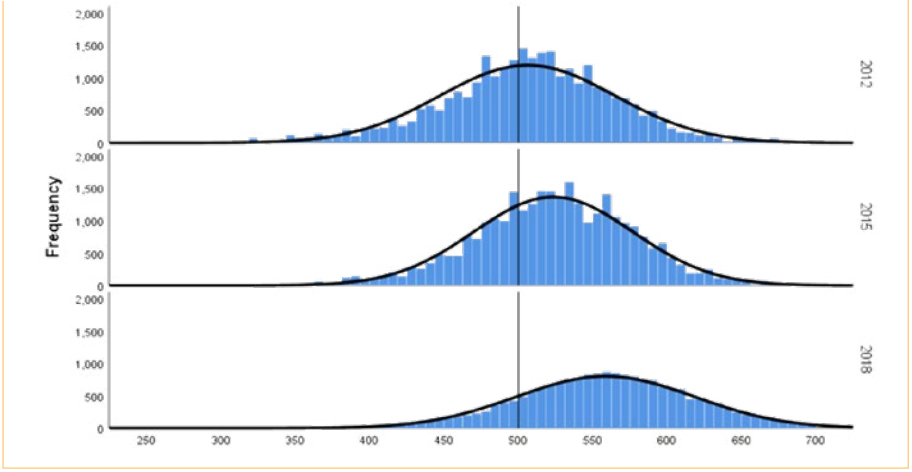


Figure 3.21 shows the distribution of student scaled scores in Year 6 numeracy for each of the PILNA cycles (2012, 2015 & 2018). The distributions are centred at 500 with a standard deviation of 50. It is expected that the scaled scores are to be normally distributed. Ideally, over time, the peak of the normal curve should be moving to the right, showing an improvement from cycle to cycle.

As can be observed, the distributions of the scores are relatively normal across the cycles, although in 2018, a large portion of scores fall above 500. Furthermore, the 2018 distribution has a positive shift of more than half a standard deviation from 2015.

FIGURE 3.21 Distribution of Year 6 numeracy scores, PILNA 2012, 2015 and 2018.



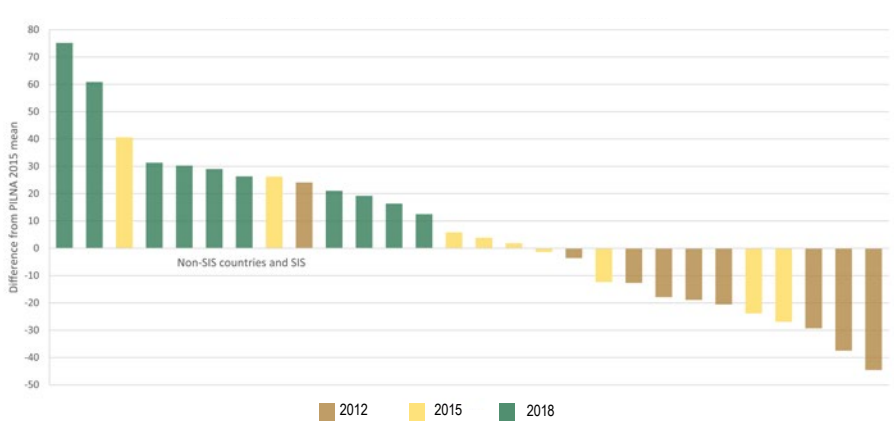
REGIONAL AND COUNTRIES PERFORMANCE 2012, 2015 AND 2018

An analysis of the mean performance in numeracy achievement in the PILNA countries over the three cycles is important to show the spread and shift of the SIS and non-SIS countries from being below the standard mean to above the mean. For the purposes of analysis, mid-sized and larger countries are represented individually, while the six small countries, collectively known as the small island states, are represented as an aggregate group. In order to determine whether there have been improvements, the 2015 regional mean score (2015 regional mean score for Year 6 numeracy was 523.47 points) was subtracted from the mean scores of each of the non-SIS countries and the mean scores of the combined SIS to determine the mean difference.

The magnitude of the difference is indicated by the height of the bars. The bars above the baseline represent countries with means higher than the 2015 regional mean, whereas the bars below the line are countries with means lower than the 2015 regional mean (Figure 3.22).

This analysis shows that there is a clear, overall improvement in the mean performance of the countries in 2018 based on the 2015 mean, with all the countries (SIS and non-SIS) that participated in the PILNA 2018 having their mean performance above the 2015 regional mean.

FIGURE 3.22 Distribution of country and SIS means against PILNA 2015 regional means



3.8 Conclusions

The results of PILNA 2018 show that overall achievement in numeracy has improved across the region. Larger proportions of students at both Year 4 and Year 6 are reaching the higher proficiency levels. Larger proportions of students at both year levels are at or above the expected proficiency levels. Analysis of the results of the PILNA 2018 shows that approximately 83% of Year 4 students were performing at or above the expected minimum proficiency level and 83% of Year 6 students were performing at or above the expected minimum proficiency level for year 6.

Following the revision of the regional numeracy benchmarks in 2016, the 2018 PILNA main study included an extension in the assessment content; geometry was added in Year 4 and geometry and chance in Year 6, amongst other minor changes and additions across the strands for both year levels. With the additional content, there were more and different skills to be assessed, which may have affected the overall student performance in 2018. One of the enhancements to the 2018 PILNA analysis was the splitting of level 8 on the numeracy scale into two parts: 8a and 8b. This allowed more detail to be provided in describing what students know and are able to do at those higher levels.

Improvement in numeracy performance was observed between 2012, 2015 and 2018 and across both Year 4 and Year 6. The most significant improvement was shown in numeracy performance in Year 6 from 2015 to 2018, where the growth in the mean score was in excess of 30 scale points, equivalent to about one full proficiency level. Students were assessed for numeracy skills in the strands of numbers, operations, measurement and geometry, and data and chance. In 2018, Year 4 students had the highest relative performance in measurement and geometry, while Year 6 students had the highest relative performance in operations.

At the regional level, girls outperformed boys in numeracy in both Year 4 and Year 6. The difference in performance between boys and girls was small, but statistically significant. Girls also performed better than boys at both year levels in all the strands. There is a slight difference in the distribution of boys and girls across the proficiency levels, where girls represent a slightly higher proportion of students in the upper proficiency levels than boys in both Year 4 and Year 6.

It was also noted that there was a positive correlation between performance on the numeracy word problems and performance in reading in the literacy assessment. It is a reasonable correlation, indicating around 37% variation, but there is some evidence that, apart from other factors, children who struggle with reading find the word problems in numeracy challenging.

There was a significant positive correlation (0.543) between reading and numeracy word problems at the Year 6 level. A fairly moderate correlation indicates that 29% of the variation in the numeracy word problem performance can be attributed to reading. It is important for teachers to explicitly address the issue of reading and associated mathematical language in their mathematics classrooms. When they teach maths, teachers need to also teach the language of maths and numeracy, as they go hand in hand.**

*** Correlation is significant at the 0.01 level (2-tailed).*

A student in Tanna, Vanuatu, uses a classroom resource during a lesson.

Coding Story 3

STRAND: Measurement and geometry.

LEARNING OUTCOME: Describe the consequences of half and quarter turns on 2D shapes.

Students need to be able to identify the new orientation of a 2D shape after a full, half or quarter turn.

SAMPLE ITEM* & RESPONSE

QUESTION: Letter B was turned. B ⟶ ꟴ

How was the letter turned? Circle the correct answer.

A. Full turn clockwise.

B. Half turn clockwise.

C. Quarter turn clockwise.

D. Three quarter turn clockwise.

CORRECT RESPONSE: **'B'**

MINIMUM EXPECTED PROFICIENCY LEVEL

The question item is asked of Year 6 students and the question item is on level 8 of the numeracy proficiency descriptor, which is the maximum level of proficiency expected for Year 6 students. This means we would expect only high performing Year 6 students to successfully answer this question.

POSSIBLE MISCONCEPTIONS:

Misunderstanding of the language and meaning of rotations: clockwise and of quarter, half and full turns.

ITEM ANALYSIS FOR YEAR 6

Code	Notes/Interpretation of the codes	Score	BOYS: % of total	GIRLS: % of total
0		0	2.1	1.3
1	A	0	34.1	36.3
2	B	1	33.1	33.3
3	C	0	14.5	13.3
4	D	0	11.1	12.7
9	No response/blank	0	4.8	3.0

NOTES & INTERPRETATIONS

- The correct response is code 2
- Around 33% of both boys and girls provided the correct response.
- Slightly more girls (36%) than boys (34%) selected full turn clockwise, showing a misunderstanding of full and half turns/rotations.
- On average, approximately 13% of both boys and girls selected each of the other two options related to quarter turns.
- More boys (5%) than girls (3%) did not give any response or left it blank.

SUGGESTIONS FOR INTERVENTION

1. Demonstrate and discuss things that rotate in real life (e.g. dancers, windmills, car and bike wheels, volume controls, steering wheels) and get students to rotate physically.

2. Students need to know that turns can be in two directions: clockwise and anticlockwise, and that clockwise is the direction of the forward movement of the hands of a clock.

3. Connect key angles and key turns: 90˚ is a quarter turn, 180˚ degrees a half turn, 270˚ a three-quarter turn and 360˚ a full turn.

4. Give students cut-out shapes so that they can physically rotate the shapes to gain understanding, before introducing complex ones such as letters of the alphabet as in this case.

** Note that this is not the exact item used in the assessment. For security reasons, the actual item cannot be made public.*

4. Performance of Year 4 &Year 6 students in literacy

THIS chapter presents the achievement of the Year 4 and Year 6 students in the PILNA literacy assessment. It describes the performance of the Year 4 students first, followed by the performance of the Year 6 students. For each of the year levels, the 2018 overall achievement results are presented, together with the disaggregation of the results into the two strands of literacy – reading and writing, as well as disaggregation by gender. Also addressed for each of the year levels is the regional trend performance over the three cycles: 2012, 2015 and 2018.

Following a successful pilot in 2015 and field trials in 2017, a coding approach was fully implemented in 2018 to capture more information about the range of student responses. The coding process enables capture of additional information about student performance on an item, rather than just scoring responses as "correct" or "incorrect". Each PILNA literacy item is linked to a specific learning outcome that is assessed by the item.

The codes used vary slightly from item to item, both in number and in meaning, but the process remains essentially the same. For each item there will be one or more responses that show that the intended learning outcome has probaly been achieved. There is also a possibility that the student will leave a question entirely blank (Code 9 in all cases) or simply give a response that is incorrect but not likely to provide any further information to teachers if reported. There are specific codes used across all items for invalid responses (selecting two or more choices for a multiple-choice response, for example) and for technical issues voiding the response (a page missing or unreadable in the test booklet, for example). Additionally, many items have codes that are used to capture incorrect responses that demonstrate common misconceptions or responses that show partial but not full understanding of the outcome being assessed.

Throughout the chapter there are coding stories, which include examples of coding that highlight specific findings from the 2018 PILNA literacy assessment. Each coding example includes the data for student performance at Year 4 and Year 6 for selected items and provides information about certain incorrect responses that are frequently given. This can indicate different levels of understanding or ability in relation to the concepts and skills assessed. Coding stories on student responses can be shared with classroom teachers who can use the data, particularly when common misconceptions have been identified, for planning instruction and possible interventions.

4.1 General Information on Student Numbers

In total, 19,041 Year 4 students and 19,084 Year 6 students had their results analysed for the literacy assessment. Table 4.1 shows the student numbers disaggregated by gender for each of the year levels. Approximately 2% more boys than girls participated in Year 4, and 2% more girls than boys participated in Year 6.

TABLE 4.1 Students results analysed for literacy by year level and gender, PILNA 2018

YEAR 4		YEAR 6	
GIRLS	BOYS	GIRLS	BOYS
9414	9627	9681	9403

4.2 Overall Performance in Literacy in Year 4

This section discusses the overall literacy performance in Year 4. It looks at the distribution of students across proficiency levels and at the mean scores for the overall domain, as well as the strands in the domain. The analysis of the data shows that, across the region, there has been some improvement in the distribution of students across the proficiency levels in the 2018 PILNA, compared to the 2012 and 2015 PILNA cycles.

PROFICIENCY LEVELS 2018

The regional literacy performance of Year 4 students is reported against the literacy proficiency level descriptors referred to in Table 2.5 of Chapter 2. The distribution of Year 4 students for each proficiency level, as given in Table 4.2 and illustrated in Figure 4.1, varies from the lowest at Level 0 to the highest at Level 8. The minimum level of proficiency expected from Year 4 students is Level 4 on the scale, with the expectation that students who are performing at Level 4 are also able to successfully engage with PILNA items related to skills and knowledge from levels 1, 2 and 3.

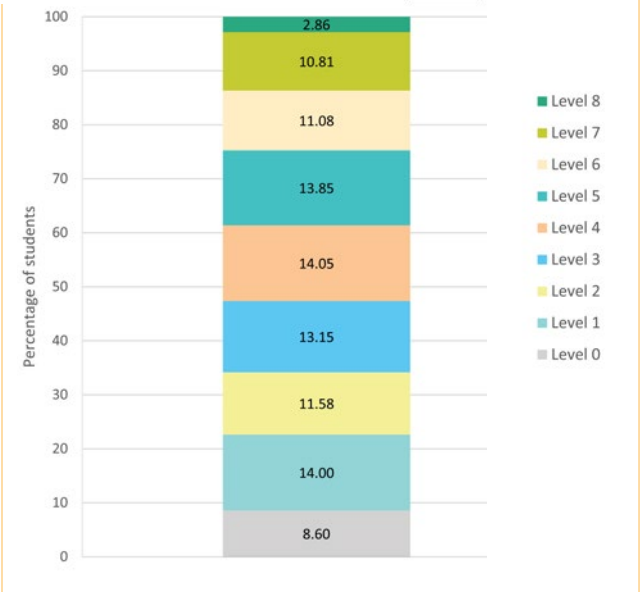
TABLE 4.2 Distribution of Year 4 students by proficiency levels, PILNA 2018

PROFICIENCY LEVEL	PERCENTAGE
	YEAR 4
8	2.86 (0.39)
7	10.81 (0.61)
6	11.08 (0.44)
5	13.85 (0.46)
4	**14.05 (0.53)**
3	13.15 (0.50)
2	11.58 (0.39)
1	14.00 (0.56)
0	8.60 (0.46)

■ Expected minimum proficiency level for Year 4.
Numbers in brackets are standard errors.

The stacked graph (Figure 4.1) is a visual representation of the data in Table 4.2, showing the distribution of percentages of Year 4 students by proficiency levels in PILNA 2018. Level 0 represents those students whose efforts were not able to be assessed using the PILNA instrument – either insufficient evidence was provided by the instruments or the students were not able to engage with the items on the assessment to demonstrate their understanding of concepts being addressed.

FIGURE 4.1 Regional literacy proficiency levels for Year 4, PILNA 2018

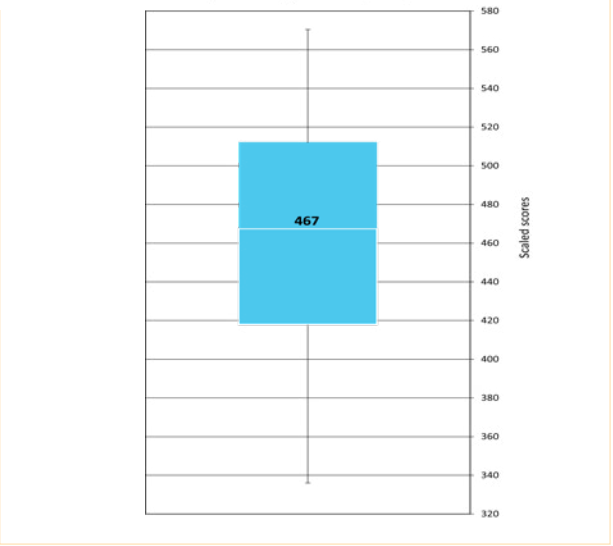


Analysis of the PILNA 2018 results shows that approximately 53% of Year 4 students were performing at or above the expected minimum proficiency level (the regional minimum benchmark indicator highlighted in Table 4.2). Of the 47% of students performing below the minimum proficiency level for Year 4, almost 40% were distributed relatively evenly across levels 1, 2 and 3. Close to 9% of students' performances were not measurable using the PILNA instruments, indicating their proficiency level was probably lower than Level 1 on the scale. At the top end of the scale, almost 14% of Year 4 students performed in the two highest proficiency levels (levels 7 and 8).

DOMAIN AND STRAND PERFORMANCE 2018

The box plot (Figure 4.2) is a graphical representation of the distribution of scores in literacy for Year 4 in 2018. The two parts of the box above and below the median show that the distribution of half of the students is more spread out below the median. The bottom whisker of the box plot is longer than the top whisker, indicating a wider spread of performance at the lower proficiency levels for Year 4 literacy than at the upper levels.

FIGURE 4.2 Distribution of literacy scores for Year 4, PILNA 2018



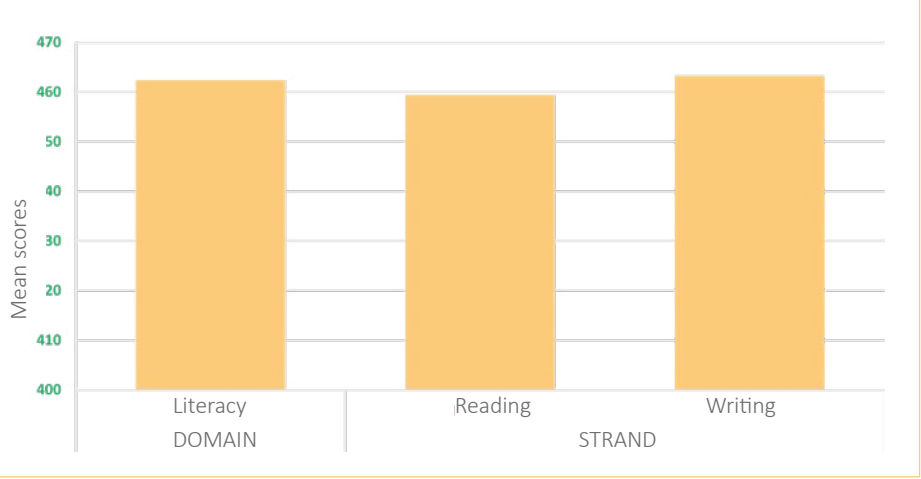
Looking more deepely into the literacy results, we examine the performance of students in each of the two strands: reading and writing. A comparison of the mean performance by strand is presented in Table 4.3 and Figure 4.3. Overall, Year 4 students had a higher mean performance in writing than in reading. This is probably in part due to the nature of the instruments, as the rubric-based writing instrument is more suited to measuring even the lowest levels of writing proficiency, while reading assessment items must be constructed specifically to assess achievement at the lowest levels.

TABLE 4.3 Mean performance of Year 4 students by domain and strands, PILNA 20018

YEAR	DESCRIPTIVE STATISTICS	DOMAIN	STRANDS	
		LITERACY	READING	WRITING
4	Mean	462.40 (1.93)	459.48 (2.00)	463.31 (2.46)
	SD	72.22 (1.18)	75.28 (1.31)	95.05 (1.45)

Numbers in brackets are standard errors. SD - Standard Deviation

FIGURE 4.3 Mean scores of Year 4 students by overall domain and strands, PILNA 2018



PERFORMANCE BY GENDER 2018

Girls demonstrated higher levels of literacy achievement than boys, on average, across the region in 2018. This is evident in their higher mean scores, as well as in the way students are distributed across the proficiency levels. These data are represented in Table 4.4, Table 4.5, Figure 4.4, Figure 4.5 and Figure 4.6.

More girls than boys performed at or above the expected minimum proficiency level in literacy at Year 4. Table 4.4 shows relatively similar numbers of boys and girls performing at the minimum expected proficiency level (Level 4), but considerably more girls than boys performing at each of the levels above that minimum threshold. In total, approximately 60% of Year 4 girls are meeting or exceeding minimum literacy proficiency expectations, while only 46% of Year 4 boys are meeting or exceeding that level. In addition, only 28% of girls performed at the lowest proficiency levels (Level 0–2) compared to 41% of boys and, at the upper end of the scale, almost 18% of girls performed at the highest proficiency levels (levels 7 and 8) compared to just under 10% of boys.

TABLE 4.4 Distribution of Year 4 students by proficiency levels and gender, PILNA 2018

PROFICIENCY LEVEL	YEAR 4 (%)	
	GIRLS	BOYS
8	4.10 (0.57)	1.69 (0.30)
7	13.59 (0.80)	8.11 (0.59)
6	13.15 (0.57)	9.00 (0.52)
5	14.76 (0.54)	12.95 (0.62)
4	**14.29 (0.58)**	**13.86 (0.72)**
3	12.43 (0.63)	13.90 (0.76)
2	10.36 (0.47)	12.76 (0.54)
1	11.35 (0.69)	16.57 (0.69)
0	5.96 (0.50)	11.17 (0.62)

■ Expected minimum proficiency level for Year 4.
Numbers in brackets are standard errors.

Figure 4.4 provides a visual representation of the distribution of boys and girls across the proficiency levels. The proportion of boys at levels 0 to 3 is considerably higher than the proportion of girls at those levels, while the proportion of boys at the highest levels is lower than that of girls.

Figure 4.5 and Table 4.5 indicate that girls outperformed boys in the overall literacy domain, as well as in both strands, reading and writing, in Year 4.

The difference in mean performance by gender is significant. In the writing strand, Year 4 girls received scaled scores on average 29 points higher than that of boys and, in the reading strand, Year 4 girls received scaled scores on average 24 points higher than that of boys.

The box plot in Figure 4.6 shows the distribution of scores in literacy for Year 4 grouped by gender. The distribution of the interquartile range around the median is relatively symmetrical, with the range of scores in the upper half approximately the same as the range of scores in the lower half. Taking the whiskers at either end of the plot into account, the overall range is slightly wider for boys than for girls, i.e. the distribution of scores is more widely dispersed among boys than girls. The spread at the lower end was larger for boys.

The differences in the spread of scores are seen in the values of the standard deviation of scores reported in Table 4.5.

TREND PERFORMANCE - 2012, 2015 AND 2018

Looking back over time, comparisons can be made across the three PILNA cycles to provide information on trends in student achievement in 2012, 2015 and 2018.

FIGURE 4.4 Regional Year 4 literacy proficiency levels by gender, PILNA 2018

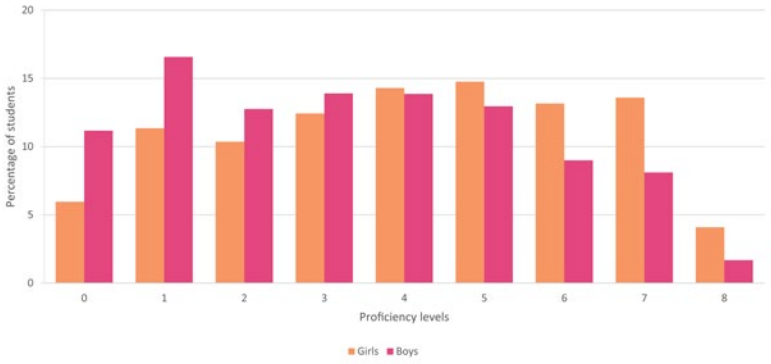


FIGURE 4.5 Mean scores of Year 4 students in domain and strands by gender, PILNA 2018

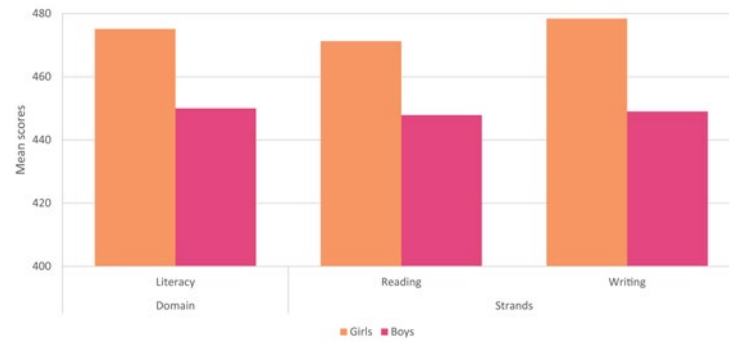


TABLE 4.5 Mean performance of Year 4 students in domain and strands by gender, PILNA 2018

YEAR	GENDER	DESCRIPTIVE STATISTICS	DOMAIN	STRANDS	
			NUMERACY	READING	WRITING
4	Girls	Mean	475.12 (2.11)	471.25 (2.24)	478.40 (2.76)
		SD	70.18 (1.38)	73.72 (1.62)	92.67 (1.75)
	Boys	Mean	450.01 (1.93)	447.87 (2.03)	449.01 (2.47)
		SD	72.07 (1.30)	75.15 (1.36)	94.77 (1.60)

Numbers in brackets are standard errors. SD - Standard Deviation.

FIGURE 4.6 Distribution of literacy scores for Year 4 levels by gender, PILNA 2018

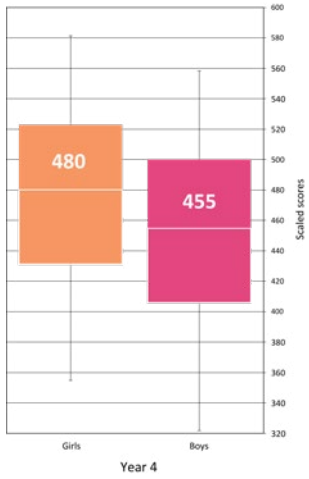


FIGURE 4.7 Distribution of Year 4 literacy proficiency levels in the region, PILNA 20 12, 2015 and 2018.

PROFICIENCY LEVELS IN 2012, 2015 AND 2018

The histogram in Figure 4.7 displays the distribution of proficiency level achievement at Year 4 in 2012, 2015 and 2018. The brown bars to the left of each grouping show higher percentages of students at lower levels in 2012. There is a general shift towards the right in each of the subsequent cycles (2015 and 2018). This overall trend is indicative of an increase in the level of student performance in Year 4 literacy over the period 2012 to 2018.

The stacked graph (Figure 4.8) also shows the distribution of percentages of students achieving each proficiency level. Focusing on the placement and size of each of the colour bands, one can see that more students are achieving at the highest levels (6, 7 and 8), moving from 2012 on the left to 2018 on the right.

There are differences across the proficiency levels but overall there is an indication that student achievement in 2018 improved from 2015, with more students achieving at the higher levels (levels 7 and 8). The graph also shows that in 2015 and 2018 there were fewer students represented on the lower proficiency level (levels 0 to 2) than in 2012.

Figure 4.8 Distribution of Year 4 literacy proficiency levels in the region, PILNA 2012, 2015 and 2018

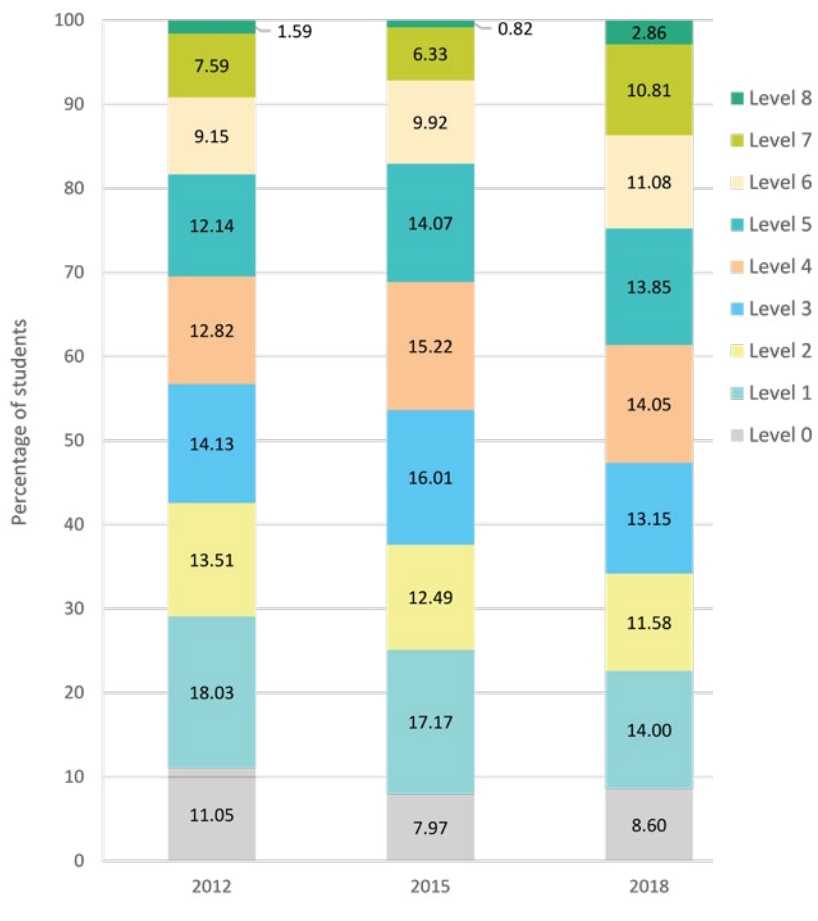


TABLE 4.6 Mean performance of Year 4 students in literacy, PILNA 2012, 2015 and 2018

YEAR	DESCRIPTIVE STATISTICS	DOMAIN		
		2012	2015	2018
4	Mean	448.85	453.43	462.40 (1.93)
	SD	68.87	61.33	72.22 (1.18)

Numbers in brackets are standard errors. SD- Standard Deviation

For example, in 2018 about 25% of students performed at levels 6, 7 and 8, compared with just over 18% in 2012.

Similarly, the proportion of students in the lowest proficiency levels (levels 0 to 2) in Year 4 has decreased since 2012. In 2012, 43% of Year 4 students were in the three lowest proficiency levels, compared to 38% in 2015 and 34% in 2018.

DOMAIN PERFORMANCE 2012, 2015 AND 2018

Table 4.6 and Figure 4.9 show that, generally, the mean performance of Year 4 students in literacy is consistent across the three cycles of PILNA. The means are relatively similar, showing a small increase across each of the three cycles. There is, however, a notable difference in the distribution of students, as shown by the differences in the standard deviations in 2018 compared to 2015.

Figure 4.10 is a visual representation of the distribution of scaled scores in Year 4 literacy for each of the PILNA cycles (2012, 2015 and 2018). The distributions are centred at 500 with a standard deviation of 50. It is expected that the scaled scores will be normally distributed. Ideally, over time, the peak of the normal curve should be moving to the right, showing an improvement from cycle to cycle.

The distributions of student scores appear normal and relatively similar across the PILNA cycles. Although the three cycles show that the majority of the scores are less than 500, the trend indicates a positive shift of score distribution where in 2018 it shows half a standard deviation more than the 2015 distribution.

FIGURE 4.9 Distribution of Year 4 mean scores in literacy, PILNA 2012, 2015, and 2018

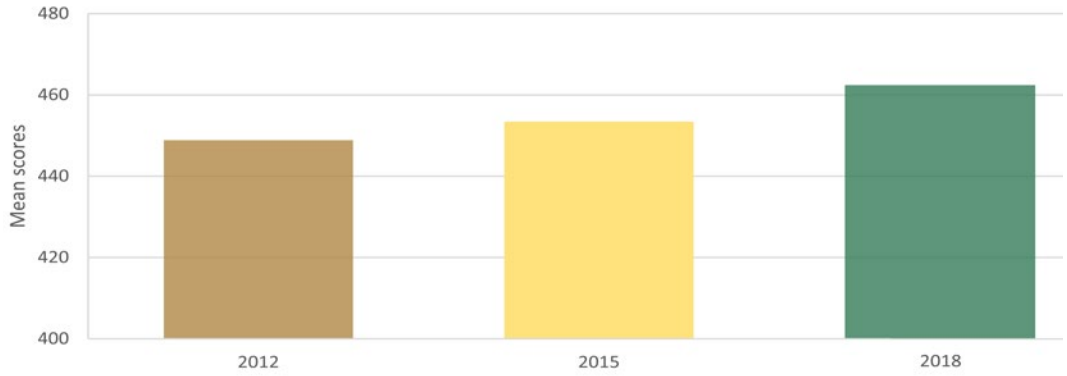
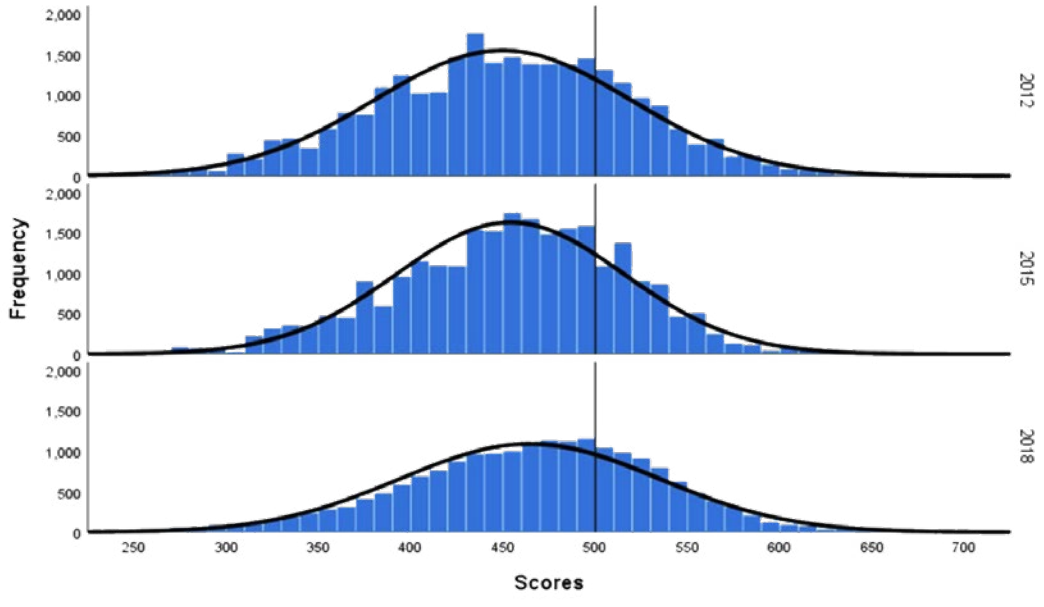


FIGURE 4.10 Distribution of Year 4 literacy scores in the region, PILNA 2012, 2015 and 2018



REGIONAL AND COUNTRIES PERFORMANCE 2012, 2015, AND 2018

An analysis of the mean performance in literacy achievement in the PILNA countries over the three cycles is important, as it shows the spread and shift of country-level performance over time. For the purposes of analysis, mid-sized and larger countries are represented individually, while the six small countries, collectively known as the small island states (SIS), are represented as an aggregate group. In Figure 4.11, the difference between the national mean and the 2015 baseline regional mean is shown. In order to determine whether there have been improvements, the 2015 regional mean score for Year 4 literacy (453.43 points) was subtracted from the mean scores of each of the non-SIS countries and the mean scores of the combined SIS to determine the mean difference. The magnitude of the difference is indicated by the height of the bars. The bars above the horizontal axis 0 represent countries with means higher than the 2015 regional mean, whereas the bars below the axis are countries with means lower than the 2015 mean.

The colours of the bars represent the three PILNA cycles. Over time, the colours show the non-SIS countries and the combined SIS gradually shifting from being below the standard mean to above the mean. Additionally, it is interesting to note the magnitude of the spread, which is shown by the height of the bar.

FIGURE 4.11 Regional Year 4 numeracy proficiency levels by gender, PILNA 2018

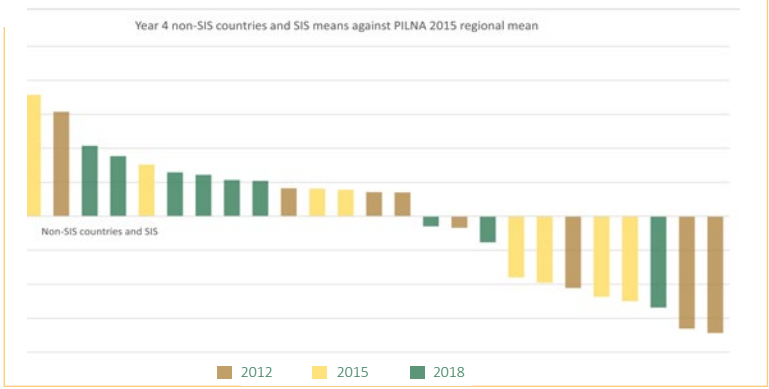
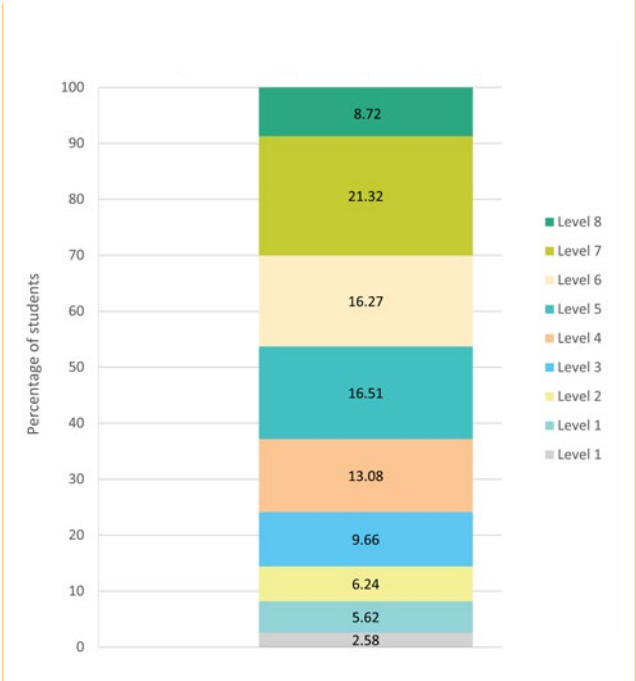


TABLE 4.7 Distribution of Year 6 students by proficiency levels, PILNA 2018

PROFICIENCY LEVEL	YEAR 6 (%) GIRLS
8	8.72 (0.93)
7	21.32 (0.64)
6	16.27 (0.51)
5	**16.51 (0.56)**
4	13.08 (0.53)
3	9.66 (0.40)
2	6.24 (0.34)
1	5.62 (0.30)
0	2.58 (0.25)

■ Expected minimum proficiency level for Year 6
Numbers in brackets are standard errors

FIGURE 4.12 Regional literacy proficiency levels for Year 6, PILNA 2018



4.3 Overall Performance in Literacy in Year 6

This section discusses the overall performance in literacy of Year 6 PILNA students. It analyses the distribution of students across proficiency levels, as well as the mean scores for the overall domain and the two strands within the domain. The Year 6 data shows that, across the region, there has been some improvement in the distribution of students across the proficiency levels and an overall improvement in literacy performance since 2015.

PROFICIENCY LEVELS 2018

The regional literacy performance of Year 6 students is reported against the literacy proficiency level descriptors referred to in Table 2.5 of Chapter 2. Distribution of Year 6 students for each proficiency level, as shown in Table 4.7 and illustrated in Figure 4.12, varies from the lowest (Level 0) to the highest (Level 8). The minimum level of proficiency expected from Year 6 students is Level 5 on the scale, with the expectation that students who are performing at Level 5 are also able to engage successfully with PILNA items related to skills and knowledge from levels 1 through 4.

The stacked graph (Figure 4.12) provides a visual representation of the distribution of Year 6 students achieving at each of the proficiency levels for the PILNA2018. Level zero represents those students whose efforts were not able to be assessed using the PILNA instrument – either insufficient evidence was provided by the instruments or the students were not able to engage with the items on the assessment to demonstrate their understanding of the concepts being addressed.

Analysis of the results of the PILNA 2018 shows that approximately 63% of Year 6 students were performing at or above the expected minimum proficiency level (the regional minimum benchmark indicator highlighted in Table 4.7). Approximately 37% of Year 6 students performed below the expected minimum proficiency level for Year 6, that is, at the lower proficiency levels (Level 0 to Level 4). Over 16% of Year 6 students were at the minimum expected level (Level 5) and almost 38% of students in Year 6 clustered at levels 6 and 7. The stacked graph shows that there is still a significant percentage of students in Year 6 (14%) represented on the lower proficiency levels (levels 0 to 2) while over 30% of students are showing achievement in the highest levels of the scale (levels 7 and 8).

DOMAIN AND STRAND PERFORMANCE 2018

The box plot in Figure 4.13 provides a graphical representation of the distribution of literacy scores for Year 6 in 2018. The two parts of the box above and below the median are relatively symmetrical, showing that the distribution of half of the students falls equally on either side. The whisker at the bottom of the figure shows a broader distribution of students at the low end than the top quartile, which are less distributed at the top of the figure.

Looking more deeply into the literacy results, we can examine the performance of students in both of the literacy strands: reading and writing. A comparison of the mean performance by strand, along with the mean performance overall, is presented in Table 4.8 and Figure 4.14. A comparison of the mean performance by strand, along with the mean performance overall, is presented in Table 4.8 and Figure 4.14. Overall, Year 6 students had a higher mean performance in writing than in reading. This is probably in part due to the nature of the instru-ments, as the rubric-based writing instrument is more suited to measuring even the lowest levels of writing proficiency, while reading assessment items must be constructed specifically to assess at the very lowest levels.

FIGURE 4.13 Distribution of literacy scores for Year 6, PILNA 2018

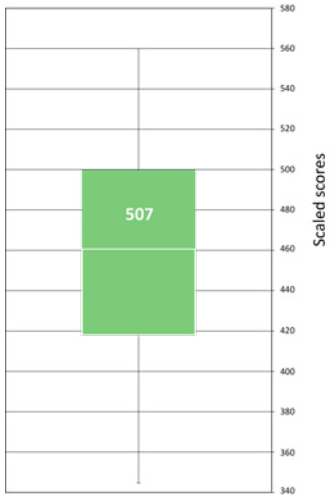
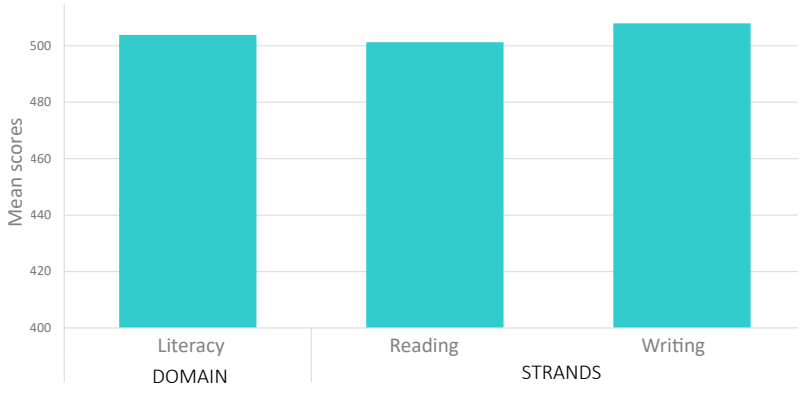


TABLE 4.8 Mean performance of Year 6 students in literacy by overall domain and strands, PILNA 2018

YEAR	DESCRIPTIVE STATISTICS	DOMAIN	STRANDS	
		LITERACY	READING	WRITING
6	Mean	503.79 (2.00)	501.21 (2.14)	507.92 (2.42)
	SD	66.21 (1.14)	70.27 (1.31)	87.80 (1.27)

Numbers in brackets are standard errors. SD - Standard Deviation

FIGURE 4.14 Mean scores of Year 6 students by domain and strands, PILNA 2018



CODING STORY 4

The regional benchmark indicators for reading at Year 4 and Year 6 include understanding and engaging with a variety of texts with some complexity of ideas and a less predictable structure; and using comprehension strategies to interpret and evaluate a variety of texts of increasing complexity in content and structure.

The coding stories in reading are taken from a newspaper article titled *Bravery Award for Young Crime Fighter*, which was included in the 2015 PILNA and at both Year 4 and Year 6 in 2018 PILNA as a link or common item. A news article is a continuous text, made up of sentences and paragraphs. The unit has four items; three of which are constructed response items and a selection response, all of which are of varying levels of difficulty.

READ THE NEWS ARTICLE BELOW AND THEN ANSWER THE QUESTIONS.

NEWS ARTICLE: BRAVERY AWARD FOR YOUNG CRIME FIGHTER

Class Six student, Andrew Moli helped the police to catch a robber last week. A man was robbed while waiting at a bus stop near the school gate. Andrew saw the robber and chased after him. Soon afterwards, the police caught the robber. The Minister for Education awarded Andrew with a *Certificate of Bravery.* He thanked Andrew and told him, 'You have shown a good example to all students. It's a job well done!'

Adapted from The Times, Wednesday, June 8, 2015

STRAND: READING (Link item, moderate difficulty, constructed response item)

LEARNING OUTCOME: Identifying Information: Identify the title in a short, simple and familiar text. Students need to understand what constitutes a title. A title precisely identifies the subject or content of a text; it is short, distinguishable and recognisable; it is often written in sentence case, where the initial letter is usually capitalised; it is generally singular in form and is usually written above the actual text.

ITEM & RESPONSE

What is the title of the news article?

CORRECT RESPONSE:

Code 1: ***Provides the title***

Note: spelling mistakes are acceptable.

- Bravery Award for Young Crime Fighter
- Bravery award for … (ellipsis implies re-maining part of title)

Code 2: ***Refers to 'News Article'***

(incorrect title)

- news article

MINIMUM EXPECTED PROFICIENCY LEVEL

The question item is on Level 3 of the literacy proficiency descriptor, which is below both the minimum levels of proficiency expected from Year 4 (Level 4) and Year 6 (Level 5). This means we would expect the majority of Year 4 and Year 6 students to answer this type of question successfully.

POSSIBLE MISCONCEPTIONS:

Code 2 was included for 2018 PILNA to provide data relating to a possible misconception, that is, that the title was the 'News Article' which appears at the top of the page on the test booklet, but is not the title of the news article.

ITEM ANALYSIS FOR YEAR 4

Code	Score	% of total
0	0	29.98
1	1	57.4
2	0	1.94
9	0	8.13

ITEM ANALYSIS FOR YEAR 6

Code	Score	% of total
0	0	15.62
1	1	79.42
2	0	-
9	0	1.33

NOTES & INTERPRETATIONS

- The correct response is Code 1 and over 57% of Year 4 students and approximately 79% of Year 6 students provided the correct response.
- Although this task is simple, almost 30% of students at Year 4 and 16% at Year 6 did not provide the expected response.
- Code 2 indicates that students are looking only at placement for a title, not its function in identifying the subject in a text. The data show that only a small proportion of students demonstrated this misconception.
- Students who provided the expected response have demonstrated that they can accurately identify the title of a simple text.

TEACHING SUGGESTIONS

Students could benefit from teaching intervention regarding what constitutes a 'title' in simple information texts.

For example:

1. Assist students in their understanding of titles and their purpose by asking them to identify the title from a text before reading the whole text, and then predict what they might be reading about. After reading, go back to the title and explore with students their predictions, as well as how the title specifically relates to the text.

2. Provide students with a titled text and ask them to identify specific parts of the text that relate back to the title.

3. Ask students to come up with an alternative title to a text and justify from the text why that title would be appropriate.

"... explore with students their predictions..."

PERFORMANCE BY GENDER 2018

Overall, Year 6 girls demonstrated higher levels of literacy than Year 6 boys across the region in the PILNA 2018. This is evident in their higher mean scores, as well as in the distribution of percentag-es across the proficiency levels, as can be seen in Table 4.9 and Table 4.10, and in Figure 4.15 and Figure 4.16.

Table 4.9 shows that slightly more girls than boys performed at the minimum expected proficiency level (Level 5) and considerably more girls than boys performed at each of the levels above that minimum threshold. In total, approximately 71% of Year 6 girls are meeting or exceeding minimum literacy proficiency expectations, while only 55% of Year 6 boys are meeting or exceeding that level. Similarly, only 9% of girls performed at the lowest proficiency levels (level 0 – level 2) compared to 20% of boys. At the upper end of the scale, almost 37% of girls performed at the highest proficiency levels (levels 7 and 8), compared to 23% of boys.

Figure 4.15 provides a visual representation of the distribution of boys and girls across the proficiency levels. The proportion of boys at levels 0 to 3 is considerably higher than the proportion of girls performing at those levels, while the proportion of boys at the highest levels is significantly lower than that of girls.

TABLE 4.9 Distribution of Year 6 students' proficiency levels by gender, PILNA 2018

PROFICIENCY LEVEL	YEAR 6 (%)	
	GIRLS	BOYS
8	11.17 (1.09)	6.25 (0.91)
7	25.29 (0.83)	17.19 (0.77)
6	17.49 (0.62)	14.97 (0.58)
5	**16.79 (0.73)**	**16.11 (0.66)**
4	11.99 (0.74)	14.19 (0.54)
3	8.21 (0.47)	11.22 (0.48)
2	4.41 (0.36)	8.18 (0.52)
1	3.43 (0.38)	7.90 (0.46)
0	1.23 (0.22)	3.98 (0.36)

■ Expected minimum proficiency level for Year 6.
Numbers in brackets are standard errors

FIGURE 4.15 Regional Year 6 literacy proficiency levels by gender, PILNA 2018

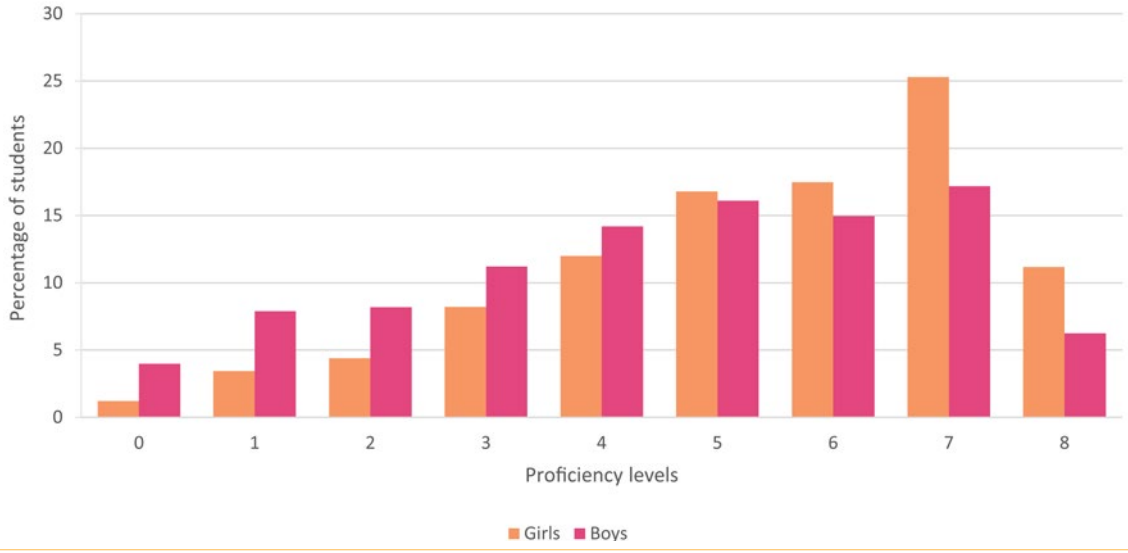


TABLE 4.10 Mean performance of Year 6 students in domain and strands by gender, PILNA 2018

YEAR	GENDER	DESCRIPTIVE STATISTICS	DOMAIN	STRANDS	
			NUMERACY	READING	WRITING
6	Girls	Mean	516.95 (2.23)	512.26 (2.38)	525.47 (2.86)
		SD	61.57 (1.28)	66.86 (1.38)	83.27 (1.60)
	Boys	Mean	490.13 (2.10)	489.46 (2.29)	490.35 (2.36)
		SD	68.19 (1.36)	71.84 (1.54)	88.69 (1.40)

Numbers in brackets are standard errors. SD - Standard Deviation

Table 4.10 and Figure 4.16 show that girls outperformed boys in the overall literacy domain, as well as in both strands, reading and writing, in Year 6.

The difference in mean performance by gender is significant. In the writing strand, Year 6 girls received scaled scores on average 35 points higher than those of boys and, in the reading strand, Year 6 girls received scaled scores on average 23 points higher than those of boys.

The box plot in Figure 4.17 shows the distribution of scores in literacy for Year 6 grouped by gender. The distribution of the interquartile range around the median is relatively symmetrical, with the range of scores in the upper half approximately the same as the range of scores in the lower half. Taking the whiskers at either end of the plot into account, the overall range is slightly wider for boys than for girls, that is, the distribution of scores is more widely dispersed among boys than girls. The spread at the lower end was larger for boys.

TREND PERFORMANCE - 2012, 2015 AND 2018

Looking back over time, comparisons can be made across the three PILNA cycles to provide information on trends in student achievement in 2012, 2015 and 2018.

PROFICIENCY LEVELS 2012, 2015 AND 2018

The histogram in Figure 4.18 shows the distribution of proficiency level achievement at Year 6 in 2012, 2015 and 2018. The brown bars to the left of each grouping show higher percentages of students at lower levels in 2012; with a general shift towards the right in each of the subsequent cycles (2015 and 2018). This overall trend is indicative of an increase in the level of student performance in Year 6 literacy over the period from 2012 to 2018.

FIGURE 4.16 Mean scores of Year 6 students in domain and strands by gender, PILNA 2018

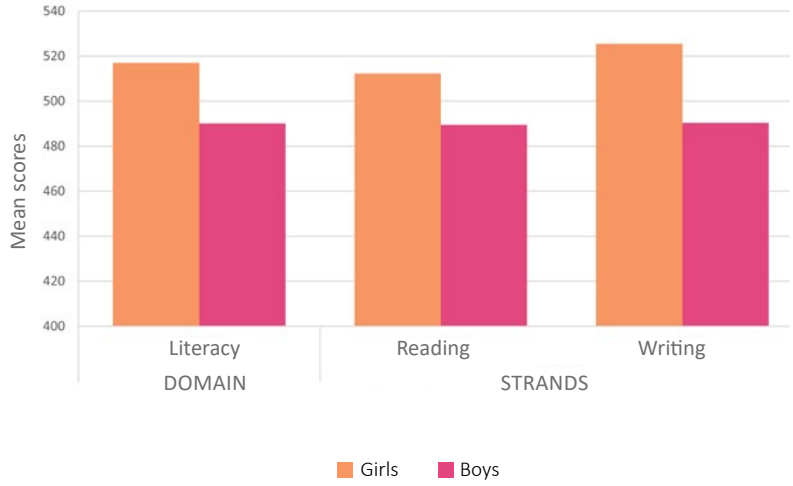


FIGURE 4.17 Distribution of literacy scores for Year 6 by gender, PILNA 2018

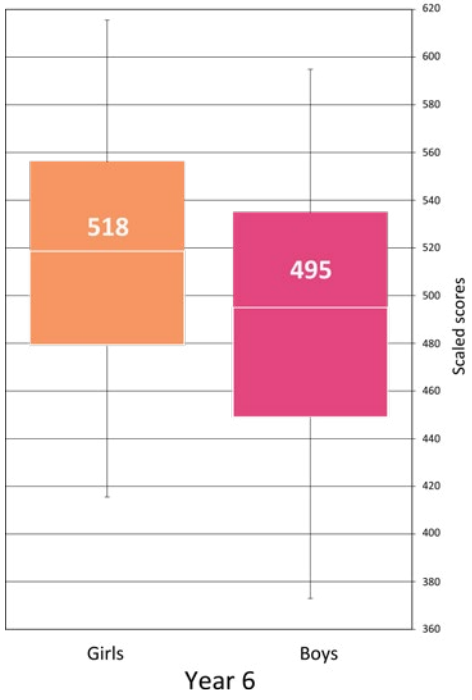
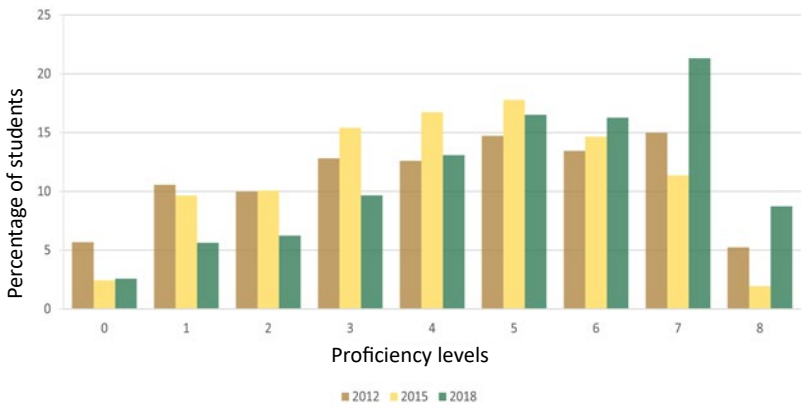


FIGURE 4.18 Regional literacy proficiency levels, Year 6 for PILNA 2012, 2015 and 2018



CODING STORY 5

STRAND: READING *(Selection response, an average moderate difficulty item)*

LEARNING OUTCOME: Identifying information: Locate information using a direct word match in short, simple, highly familiar texts where there is some competing information.

Refer to Coding Story 4 for the text, Bravery Award for Young Crime Fighter.

Students are to connect the word 'robbed' used in the item with the reference to 'robbed' in the text. Once students find the word 'robbed', which is in the second sentence, they then need to locate the adjacent information of where the robbery occurred and relate this information to the four options provided to identify the correct response.

ITEM & RESPONSE

Where was the man robbed? Circle the correct answer.

A. in a shop
B. in a bus
C. at a bus stop near the school gate
D. at a bus stop near Andrew's home

CORRECT RESPONSE: 'C' at the bus stop near the school gate

MINIMUM EXPECTED PROFICIENCY LEVEL

The item is on Level 2 of the literacy proficiency descriptor, which is below both the minimum levels of proficiency expected from Year 4 (Level 4) and Year 6 (Level 5). This means we would expect a good number of Year 4 students to successfully answer this question and the majority of Year 6 students should be able to successfully answer this type of question.

POSSIBLE MISCONCEPTIONS:

Either option B or D indicates a possible misreading of the text, as both refer to the 'bus', but in the wrong context.

ITEM ANALYSIS FOR YEAR 4

Code	Score	% of total
0	0	0.674
1	0	5.5
2	0	8.72
3	1	68.32
4	0	8.59
9	0	7.11

ITEM ANALYSIS FOR YEAR 6

Code	Score	% of total
0	0	2.94
1	0	1.96
2	0	5.35
3	1	85.4
4	0	4.69
9	0	8.3

NOTES & INTERPRETATIONS

- In a selection response or multiple-choice item such as the one in this example, options A, B, C and D correspond with the codes 1, 2, 3 and 4 in the analysis given above.
- The correct response is Code 3 and over 68% of Year 4 students and approximately 85% of Year 6 students, provided the correct response.
- About 7% of students at Year 4 and 8% at Year 6 did not select any of the options provided.
- Almost 9% of Year 4 students and around 5% of Year 6 students chose options B and D, both of which refer to a key aspect of the location, 'bus', but are incorrect.
- Students who provided the expected response have demonstrated that they understand an important detail of the setting in a news article.

TEACHING SUGGESTIONS

Students could benefit from teaching intervention regarding locating information using a direct word match in short, simple, highly familiar texts or class activities on how to respond to selection type items such as multiple choice. For example:

1. Create activities related to scanning a text for a key word and finding relevant information adjacent to this word.

2. Support students in their understanding of a text, taking them through the steps involved in clearly understanding a question, locating the relevant information, and writing the correct response.

3. Practice producing selection type/multiple choice items, asking students to come up with a question that includes a word match from the text and produce three or four plausible options – one that is a correct response and others that are plausible misreading. This takes some time but encourages students to explore the text more deeply and identify pertinent information, as well as information that distracts from the correct response.

CODING STORY 6

STRAND: READING *(constructed response item, difficult item)*

LEARNING OUTCOME: Identifying information: Locate information adjacent to matched words in short, simple, highly familiar texts where there is some competing information.

Refer to Coding Story 4 for the text, Bravery Award for Young Crime Fighter.

Students need to scan the text to locate the key words 'saw the robber' and then retrieve the adjacent information. There is competing information that may distract students from the correct response, including the use of the word 'robber' and the name 'Andrew' in a number of places in the text.

ITEM & RESPONSE

What did Andrew do when he saw the robber?

CORRECT RESPONSE:

Refers to chasing the robber in some form

- Ran after robber
- Chased after him
- Tried to catch him
- chased

MINIMUM EXPECTED PROFICIENCY LEVEL

The item is on Level 4 of the literacy proficiency descriptor, which is the minimum level of proficiency expected from Year 4 (Level 4) and below the minimum level of proficiency expected of Year 6 (Level 5). This means we would expect an average number of Year 4 students and a majority of Year 6 students to be able to answer this type of question successfully.

POSSIBLE MISCONCEPTIONS:

Many responses suggested that Andrew 'chased and caught' or simply 'caught' the robber. These students made the false assumption that the act of chasing the robber resulted in catching the robber. This is not what the text indicates.

ITEM ANALYSIS FOR YEAR 4

Code	Score	% of total
0	0	42.39
1	1	50.12
9	0	7.48

ITEM ANALYSIS FOR YEAR 6

Code	Score	% of total
0	0	25.73
1	1	71.12
9	0	3.16

NOTES & INTERPRETATIONS

- The correct response is Code 1 and over 50% of Year 4 students and approximately 71% of Year 6 students provided the correct response.
- Almost 40% of students at Year 4 and 26% at Year 6 provided a response that was not correct and were awarded a Code 0.
- Between 3% and 7% left the item unanswered, providing no evidence of their learning.
- Students who provided the correct response demonstrated that they were able to locate information relating to an action with the support of a direct word match when there is some competing information.

TEACHING SUGGESTIONS

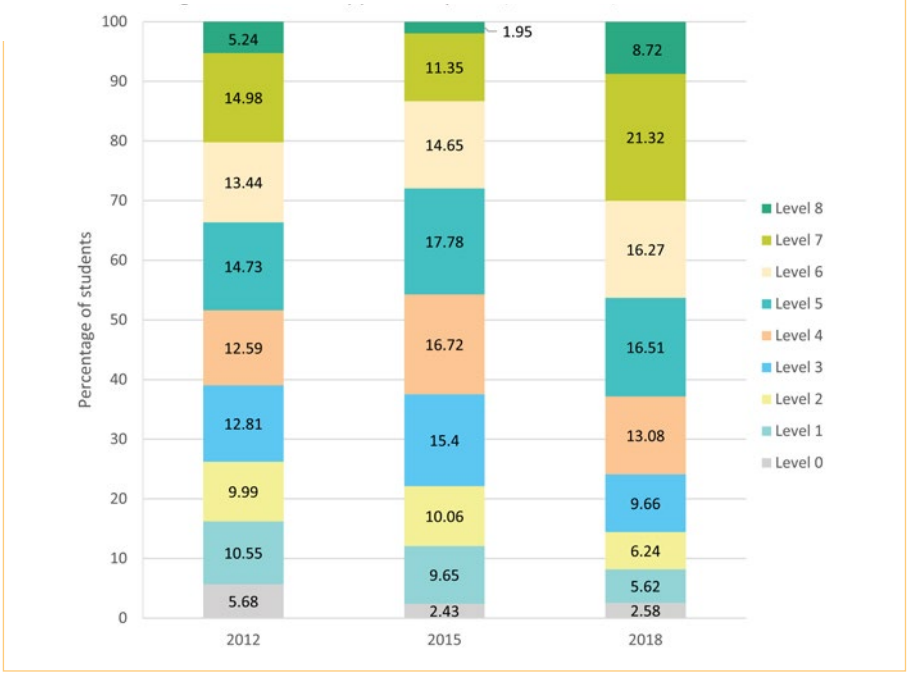
Students could benefit from teaching intervention that helps students to locate information in a text and construct their answers. For example:

1. Provide practice in writing answers by giving students a question, asking them to copy the correct information directly from the text, and then rephrase these words into their own words, keeping the same meaning. Students can check each other's rewordings to see that the meaning is maintained.

2. Provide more practice for students to write their own answers to questions. This is essential, as many students may have understanding but lack confidence in their writing. Emphasise that sometimes a single word (such as 'chased' in the item above) is enough to show understanding.

3. Select texts where a key word (such as 'robber' or 'Andrew' in the item above) is mentioned several times, provide students with a question containing this key word, and ask students to find which reference to this word in the text has the correct information.

FIGURE 4.19 Regional literacy proficiency levels for Year 6, PILNA 2012, 2015 and 2018



The stacked graph (Figure 4.19) shows the distribution of percentages of students achieving each proficiency level. Focusing on the placement and size of each of the colour bands, one can see that more students are achieving at the highest levels (6, 7 and 8) moving from 2012 on the left to 2018 on the right.

There are differences across the proficiency levels but, overall, there is an indication that student achievement in 2018 improved from that of 2015, with more students achieving at the higher levels. Furthermore, in 2015 and 2018, there are fewer students represented on the lower proficiency level (levels 0 to 2) and more students represented on the higher proficiency levels (levels 7 and 8), compared to 2012.

DOMAIN PERFORMANCE 2012, 2015 AND 2018

Table 4.11 and Figure 4.20 show that the mean performance of Year 6 students in literacy is generally improving over the three cycles of PILNA. The means are similar, but they show a small increase from the 2012 and 2015 cycles to the 2018 cycle. There are differences in the distribution of students, as shown by the differences in the standard deviations.

TABLE 4.11 Mean performance of Year 6 students in literacy, PILNA 2012, 2015 and 2018

YEAR	DESCRIPTIVE STATISTICS	DOMAIN		
		2012	2015	2018
6	Mean	479.81	478.34	503.79 (2.00)
	SD	70.20	55.50	66.21 (1.14)

Numbers in brackets are standard errors. SD- Standard Deviation.

FIGURE 4.20 Distribution of Year 6 literacy mean scores, PILNA 2012, 2015 and 2018

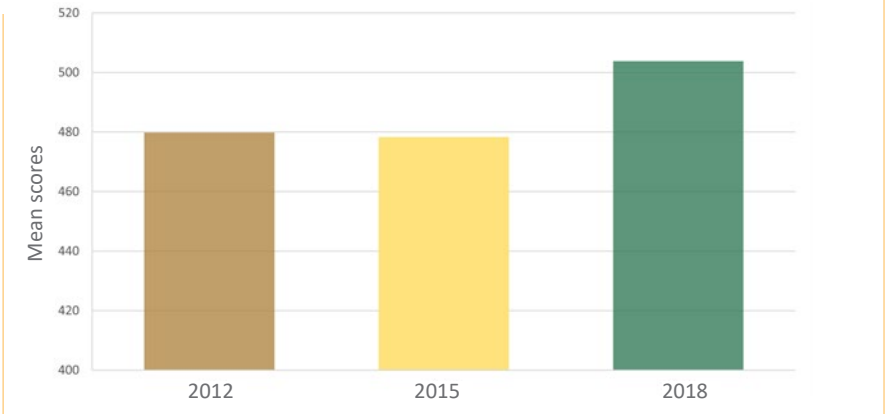


Figure 4.21 is a visual representation of the distribution of scaled scores in Year 6 literacy for each of the PILNA cycles (2012, 2015 and 2018). The distributions are centred at 500, with a standard deviation of 50. It is expected that the scaled scores will be normally distributed. Ideally, over time, the peak of the normal curve should be moving to the right, showing an improvement from cycle to cycle. The distributions of student literacy scores are relatively normal across the cycles. In 2018, the distribution is more spread out compared to the previous cycles and the 2018 distribution has a positive shift of half a standard deviation from 2015.

FIGURE 4.21 Distribution of Year 6 literacy scores for PILNA 2012, 2015 and 2018

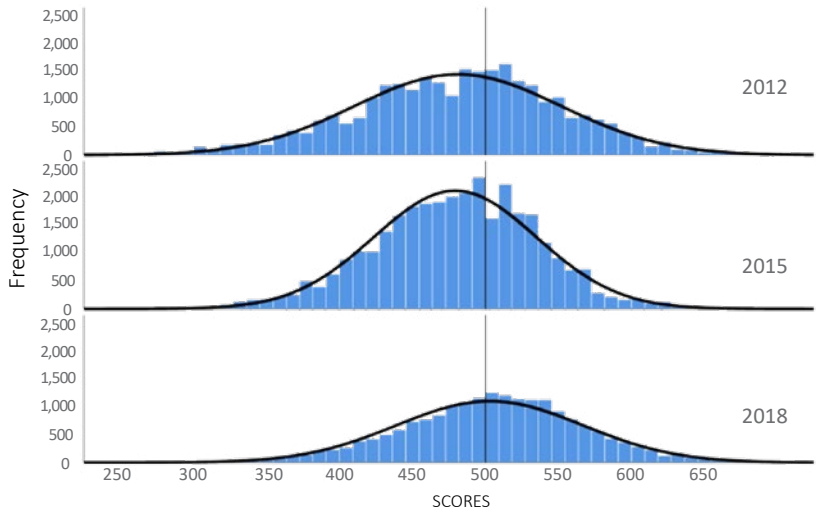
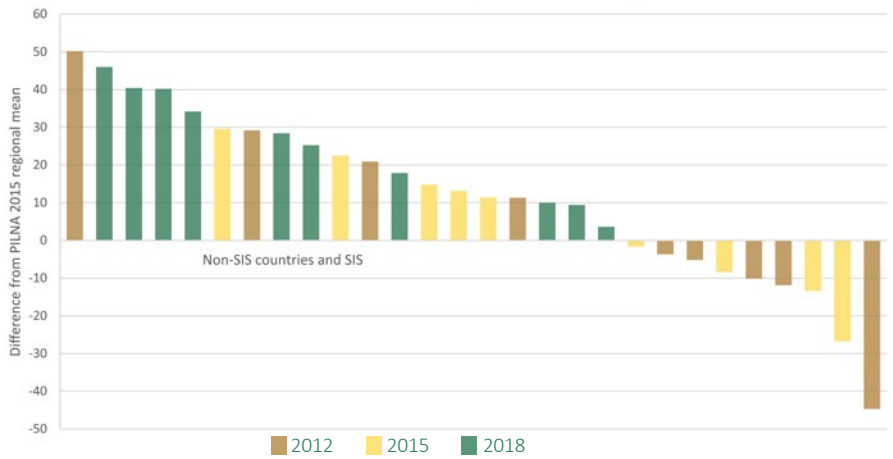


FIGURE 4.22 Distribution of mean difference in Year 6 literacy for non-SIS countries and SIS, PILNA 2018



REGIONAL AND COUNTRY PERFORMANCE 2012, 2015 AND 2018

An analysis of the mean performance in literacy achievement in the PILNA countries over the three cycles is important, as it shows the spread and shift of country-level performance over time. For the purposes of analysis, mid-sized and larger countries are represented individually, while the six small countries, collectively known as the small island states (SIS), are represented as an aggregate group. In Figure 4.22, the difference between the national mean and the 2015 baseline regional mean is shown. In order to determine whether there have been improvements, the 2015 regional mean score (2015 regional mean score for Year 6 literacy was 503.79 points) was subtracted from the mean scores of each of the non-SIS countries and the mean scores of the combined SIS, to determine the mean difference. The magnitude of the difference is indicated by the height of the bars. The bars above the line represent countries with means higher than the 2015 regional mean, whereas the bars below the line are countries with means lower than the 2015 mean.

The colours of the bars represent the three PILNA cycles. There are more brown (2012) bars below the baseline than above, and more brown bars than red (2015) below the line, while all the green (2018) bars are above the line. Over time, the colours show the non-SIS countries and SIS gradually shifting from being below the standard mean to above the mean. Additionally, it is interesting to note the magnitude of the spread, which is shown by the height of the bars.

Figure 4.22 shows that, in 2012, four countries or groupings were above the mean, five in 2015 but proportionally higher above the mean than in 2012, and in 2018 all the countries

(non-SIS or SIS) had means above the 2015 baseline mean. It is encouraging to note that the negative differences have decreased in magnitude over the three PILNA cycles, which is shown by the magnitude of the bars getting shorter below the standard mean over the years.

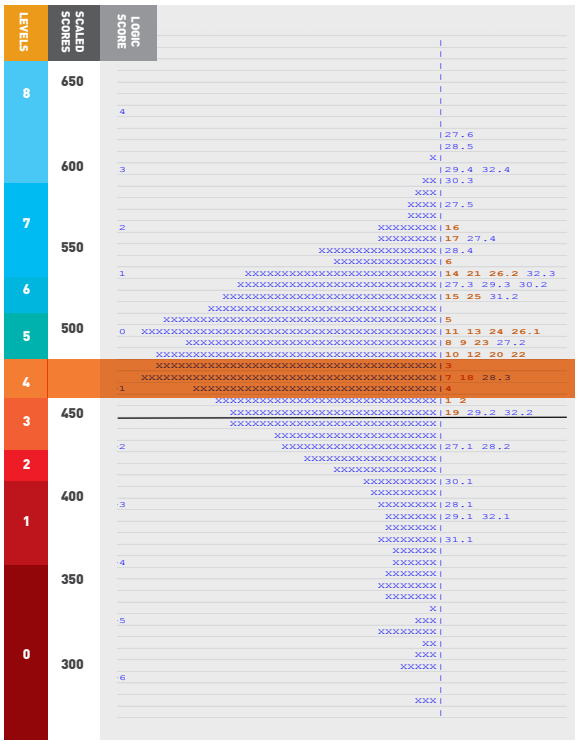
4.4 Reading – Additional Observation

When reading and writing scales are analysed separately instead of collectively as a single literacy scale, the data reveal that the reading test was extremely challenging for a significant number of students.

LITERACY ITEM-PERSON MAPS

The Year 4 item-person map for literacy in Figure 4.23 shows that the reading comprehension question set for Year 4 did not contain any items that directly matched the ability level of 30% of the lowest performing students. The reading items, represented by question numbers on the right-hand side of the vertical axis, are highlighted to show where reading begins and ends on the scale. The plot on the left-hand side of the axis shows the number of students whose ability is below the simplest reading item. Each x on the left side of the graph represents 29 cases, or Year 4 students, in the 2018 PILNA literacy data set.

FIGURE 4.23 Year 4 literacy item-person map, PILNA 2018



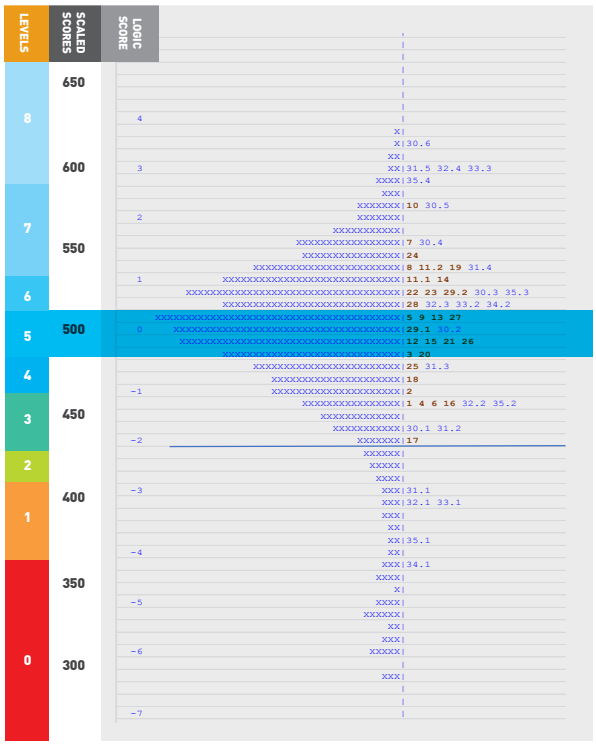
Each 'X' represents 29.4 cases. The labels for thresholds show the levels of item, and category, respectively

The Year 6 results in Figure 4.24 show some of the same issues in the information about the proficiency of the lowest performing students. Twenty-five per cent of Year 6 students were unable to engage with the simplest of reading items, in this case, Question 17. Each X in the figure represents 41 students who are unlikely to be able to engage successfully with even that lowest level of reading item.

The recognition of a need to capture information about the performance of students at the lowest ability levels came out of the 2015 data analysis. In an attempt to capture the ability of the less proficient readers, a highly simplified text of 51 words was included in the 2018 reading test. This text was on a familiar topic and had simple and compound sentences. Given the large number of students for whom this text was too challenging, there is a need for a selection of items in the literary instruments that assess the meaning of single words and sentences to ensure that the majority of lower-performing readers are able to engage with the assessment and provide evidence of their reading capabilities.

There were no reading items that were within the reach of the bottom 30 per cent of Year 4 students' ability distribution.

FIGURE 4.24 Year 6 literacy item-person map, PILNA 2018



Each 'X' represents 41.0 cases. The labels for thresholds show the levels of item, and category, respectively

An effort to measure and address the reading needs of lower-performing readers had a potential effect on numeracy results, as well literacy results. The PILNA 2018 data revealed that there was significant positive correlation between reading and numeracy word problems at Year 4 (0.610**) and Year 6 (0.543**). A moderate correlation indicates that 37% at Year 4 and 29% at Year 6 of the variation in the numeracy word problem performance can be attributed to reading.

There were no reading items that were within the reach of the bottom 25 per cent of Year 6 students' ability distribution.

4.8 Conclusions

The main findings discussed in this chapter reveal some improvement in the overall literacy achievement across the region. There is improvement in the mean performance in the domain and strands of literacy from 2012 to 2018 for both Year 4 and Year 6. While the improvements are evident for both boys and girls, boys still lag behind girls in both reading and writing proficiency. This is shown by a lower set of mean scores for boys than for girls across year levels and strands, as well as a higher concentration of boys distributed across the lower levels of the scale compared girls and a higher concentration of girls distributed across the middle and into the upper end of the scale.

Trend performance analysis over the three cycles of PILNA highlights a gradual improvement in the distribution of both Year 4 and Year 6 students across the proficiency levels. There are fewer students in the lowest proficiency levels and more students in the middle range (levels 3–6) of the proficiency scale in Years 4 and 6 as time passes. At the same time, there has been an increase in the number of students achieving at the highest proficiency levels. In addition, these trends are borne out across the countries within the region, including the SIS grouping, with more countries and groupings having mean scores above the baseline mean in 2018 than in either of the previous cycles.

It is important for teachers of Year 4 students to devote attention to struggling readers and those who have yet to master basic comprehension skills.

Coding examples provide additional information that is useful for classroom teachers in working towards further improving literacy achievements in Pacific schools.

A Word Wall is a fun way for students to learn new words and their spelling.

CODING STORY 7

STRAND: READING *(Difficult item, constructed response)*

LEARNING OUTCOME: Interpretation: Infer the reason for the title in short, simple and familiar texts.

Refer toCoding Story 4 for the text, Bravery Award for Young Crime Fighter.

A minimal correct response for this item required students to identify the two significant components that this title emphasises, i.e. that Andrew was both young and fought a crime. The more proficient response indicated that 'young crime fighter' emphasised Andrew's bravery, thereby showing an awareness that the title was celebratory.

ITEM & RESPONSE

Why did the newspaper call Andrew a 'young crime fighter'?

CORRECT RESPONSE:

Refers to any plausible reason relating to Andrew being brave, inspiring etc., or to him being BOTH young and catching a robber

- He was brave enough to chase after the robber
- He was only in Class 6, a young boy, but did the right thing, fighting against crime, beginning to help in the fight against crime
- He was a good example to young people
- He did a good job
- Because he was young and helped catch a robber
- Young and chased a robber
- Brave
- Awarded a Certificate of Bravery

MINIMUM EXPECTED PROFICIENCY LEVEL

The question item is on Level 7 of the literacy proficiency descriptor, which is above both the minimum levels of proficiency expected from Year 4 (Level 4) and Year 6 (Level 5). This means that we would expect higher performing students to answer this type of question successfully.

POSSIBLE MISCONCEPTIONS:

A proportion of Code 0 responses stated what Andrew did, e.g. 'caught a robber', but did not show understanding of the reason for the title.

ITEM ANALYSIS FOR YEAR 4

Code	Score	% of total
0	0	66.24
1	1	24.4
9	0	9.36

ITEM ANALYSIS FOR YEAR 6

Code	Score	% of total
0	0	56.14
1	1	38.27
9	0	5.59

NOTES & INTERPRETATIONS

- The correct response is Code 1 and a little over 24% of Year 4 students and around 38% of students in Year 6 provided the correct response.
- Over 64% of students at Year 4 and over 56% at Year 6 provided a response that was not correct and were awarded a Code 0.
- Students who provided the expected response have demonstrated that they can interpret the reason for a title, based on the information in the text.

TEACHING SUGGESTIONS

Students need to engage in higher order thinking skills, in particular to practise making inferences, a skill often considered as 'reading between the lines' of the text. Higher order thinking skills include inferring, reasoning, generalising, summarising, making comparisons, sequencing and predicting. For example:

1. Discuss interpretations of information in texts as a class or in small group activities. This can include giving an interpretation of a text to groups and asking them to find information in the text to support this interpretation. Groups can also be provided with a range of interpretations relating to a text, and be asked to identify which interpretations are accurate and which are not, providing evidence from the text to support their findings.

2. Support students' understanding of underlying meaning by creating an activity that requires them to look at the intention behind a particular phrase or title. This could include providing a selection of short texts on a single topic, each of which suggests a different authorial intention or tone, e.g. fear, celebration, anger, humour. Students are then given a list of titles that represent those intentions or tones and have to match them to the appropriate text. Depending on their proficiency level, students could further be asked to produce their own short text and a title that represents the intention or tone of that text.

3. Regularly discuss ideas in texts with students, in particular ideas that are not directly stated and require students to infer or interpret. Ask open ended questions (using beginnings such as 'what', 'why' and 'how') and encourage students to explain their thoughts.

CODING STORY 8

STRAND: WRITING

The regional benchmark indicators for Writing at Years 4 and 6 include presenting ideas and information using mostly simple sentences and paragraphs to create a range of texts, and using a variety of writing conventions to present ideas and information on a wide range of topics and text types. For the PILNA writing assessment at Year 4 and 6, students were required to write a story based on either of the two prompts provided. The prompts were provided to encourage ideas and engagement in the process. The criterion for the narrative task encompasses the two main features of writing – content and language elements – as can be seen in the writing rubric. Six different writing skills are assessed in PILNA: quality of ideas, structure and organisation, grammar and syntax, vocabulary, spelling and punctuation. The coding story in writing specifically looks at students' performance in ***quality of ideas*** and ***grammar*** and ***syntax.***

QUALITY OF IDEAS

This criterion measures the quality of the students' ideas and how well those ideas have been developed to produce an entertaining story. The codes range from code 1, indicating a very brief attempt at a story idea with no real substance, to code 8, where the writing shows interesting/original ideas, details that enhance the story, and characters that are distinctive/well developed. Code 0 is assigned when there is insufficient evidence to assess.

Descriptors	**CODES** *(percentage of Year 4 and 6 students)*	
	Year 4	**Year 6**
8 = Chooses ideas, details, events to enhance the story. Deals with a theme consistently. Prompt is well incorporated. Characters are distinguished explicitly through description, or implicitly through actions and speech. Story contains original thought and/or an individual voice.	1.1% (Girls-1.3%, Boys-0.8%)	3.0% (Girls-4.3%, Boys-1.8%)
7 = Shows an understanding of the narrative genre. Ideas contribute to the storyline, but may fall away or lack resolution. Incorporates prompt, but perhaps not in a substantial way. A sense of character emerges through description, actions and/or speech. Story shows imagination or consideration of an audience by attempting a story 'type', such as a mystery or suspense.	3.9% (Girls-5.2%, Boys -2.7%)	6.8% (Girls-8.9%, Boys - 4.9%)
6 = Has main events, characters and a setting. Clear attempt to incorporate the prompt, although may not be sustained. Characters are introduced but not well defined. May show an emerging sense of audience by attempting to use content to achieve a purpose, such as suspense.	7.6% (Girls -9.4%, Boys-6.0%)	13.1% (Girls-15.8%, Boys-10.7%)
5 = Has a simple storyline that relates, even if minimally, to the prompt. May be descriptive rather than a coherent narrative. Events may be detailed. Characters lack substance.	13.1% (Girls-14.7%, Boys-11.6%)	17.7% (Girls-19.1%, Boys-16.5%)
4 = Shows a basic understanding of the task related to the prompt. May include a setting, a plot that does not develop, and/or attempt an ending. May have some indication of character that is not developed.	19.5% (Girls-20.1%, Boys-19.2%)	21.8% (Girls-21.4%, Boys-22.0%)
3 = Shows an awareness of the task but there is no clear storyline that relates to the prompt. No real sense of character. May be brief or long and rambling.	23.4% (Girls-23.3%, Boys-23.5%)	18.6% (Girls-16.8%, Boys-20.2%)

CODING STORY 8

Descriptors	CODES *(percentage of Year 4 and 6 students)*	
	Year 4	Year 6
2 = Brief writing (no more than two sentences) that does not develop.	9.1% (Girls-8.0%, Boys-10.4%)	5.6% (Girls-4.0%, Boys-7.1%)
1 = Writing consists of only one or two lines that attempt a story or description, and communicates nothing of substance to the reader.	7.6% (Girls-6.2%, Boys-9.0%)	3.7% (Girls-2.4%, Boys-5.0%)
0 = Insufficient to assess, i.e. only a few or random words or words copied from the prompt.	13.5% (Girls-10.8%, Boys-16.0%)	9.3% (Girls-7.0%, Boys-11.3%)

NOTES & INTERPRETATIONS

- The largest proportion of students received code 3, with only a slightly smaller percentage receiving Code 4.
- With code 3, 26% of Year 4 and 22% of Year 6 students showed an awareness of writing a story, but did not produce a clear storyline with relevant narrative features, such as a sense of character or plot.
- At code 4, around 21% of both Year 4 and Year 6 students showed a basic ability in story writing, with some of the narrative features, such as plot and character, emerging but still highly undeveloped.
- There is still a reasonable proportion of students with code 5 (Year 4 – 12%; Year 6 – 17%) demonstrating the ability to produce a simple storyline relating to a central idea that is likely to be descriptive rather than well developed.
- Almost 15% of students at Year 4 and over 9% at Year 6 received a Code 0 and therefore did not provide sufficient evidence to assess, writing only a few words or random words or words copied from the prompt.
- Girls outperformed boys, with higher percentages receiving Code 5 to 8 in both Year 4 and Year 6.

TEACHING SUGGESTIONS

Students are likely to benefit from a teaching intervention that focuses on increasing their ability to develop and communicate good quality ideas. For example:

1. Practice story-writing by putting students in small groups and giving each group the starting line of a story that sets out a key aspect of that story, such as an event. Each student in the group adds to the plot of the story, i.e. a short summary of what happens next. The last student in the group has to try and finish the story. The group then adds details in order to make the ideas more interesting. They may decide to change the events in order to improve the story. Give support to less proficient writers or ask more proficient writers in the group to offer assistance.
Ask groups to swap their stories and discuss the merits of the other groups' ideas.

2. Practice developing ideas by putting students in small groups and giving each group an image that shows an event, such as a birthday party or a bicycle accident. Ask students in the groups to describe the image, and then develop ideas based on the image to turn the image into a story. This can be achieved by encouraging students in the groups to ask what, where, who, how and why questions. Depending on their proficiency levels, students can either make note of the key events to tell their story to the class, or write down the story in its entirety.

3. Practice story sequencing and development by preparing flash cards of the plot details of several different stories. Give these cards out to small groups or individual students and ask them to sequence the story from beginning to end. Students hold the cards up in the order of their choice and ask the rest of the class to read the story. The class should be encouraged to ask questions or suggest a change.

CODING STORY 8

GRAMMAR and SYNTAX

This criterion measures students' ability to produce a range of sentence structures with accuracy. The codes range from 1, which is assigned for the use of simple sentences with errors that impede meaning, to code 4, which indicates accuracy in the use of a range of sentence structures. Code 0 is assigned when there is insufficient evidence to assess. This criterion is not designed to diagnose particular errors in grammar and syntax, but to indicate the level of grammar and syntax proficiency demonstrated by the students.

DESCRIPTORS	CODES (% of Year 4 and 6 students)	
	Year 4	Year 6
4 = Sentences are generally accurate and varied in form.	3.9% (Girls-5.1%, Boys-2.7%)	8.0% (Girls-10.4%, Boys-5.6%)
3 = Variety in sentence structure but with some errors.	24.4% (Girls-29.1%, Boys-19.7%)	35.7% (Girls-41.3%, Boys-30.3%)
2 = Simple or repetitive sentence structures with some intrusive grammar errors; or a variety of sentences with significant errors.	37.7% (Girls-37.9%, Boys-37.8%)	37.8% (Girls-35.6%, Boys-40.0%)
1 = Simple or repetitive sentence structure; frequent grammatical errors with impeded meaning.	24.9% (Girls-21.2%, Boys-28.4%)	14.3% (Girls-10.4%, Boys-17.9%)
0 = Insufficient evidence to assess, i.e. a few or random words, or words copied from the prompt.	8.1% (Girls-5.8%, Boys-10.4%)	3.8% (Girls-1.9%, Boys-5.6%)

NOTES & INTERPRETATIONS

- The largest proportion of students achieved a code 2, 40% of Year 4 students and 38% of students in Year 6, indicating that they are able to produce simple sentences that are clear in meaning but with some errors, and may have produced a variety of sentence structures with significant errors.
- The proportion decreases towards codes 8 or 0.
- At both Years 4 and 6, a higher proportion of girls than boys received codes 3 and 4.

TEACHING SUGGESTIONS

Students are likely to benefit from teaching intervention that focuses on their ability to increase their range of sentence structures and reduce the number of simple errors.

1. At lower proficiency levels, students could be encouraged to produce simple sentences from an image, such as a boy looking sad or a girl riding a bike. Students write their description of the image as a sentence. Encourage students to add details about the image. Students can then share their sentence or sentences with a fellow student who checks for errors.

2. To improve on self-editing, students can be provided with a text appropriate to their level of proficiency and asked to identify and correct any grammatical errors. These findings can then be discussed as a class.

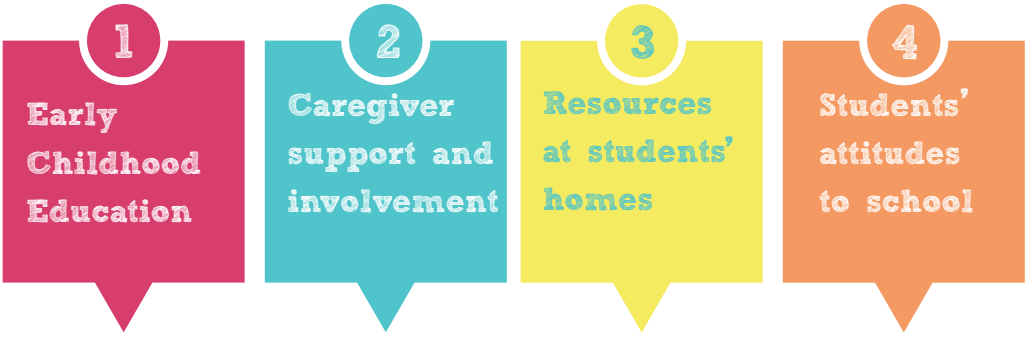
3. At higher proficiency levels, students could be given a scenario that they have to describe in writing. Students then swap their writing with a fellow student and identify any errors. Types of common errors, such as tenses and pronoun references, can be discussed as a class. Students could then be asked to change the tense of their writing, e.g. from past to present.

"teaching intervention that focuses on their ability to increase their range of sentence structures ..."

5. Getting to know our students

5.1 Introduction

TO understand our students, we must attempt to understand their backgrounds: the contexts from which they enter our schools and classrooms on a daily basis. Student learning, and hence student achievement in formal assessments, is affected by conditions and circumstances, some of which are outside the control of the formal education system. It is essential to consider the wider context of student learning, as this provides greater insight into the degree of social inequality in the academic achievement of students. This chapter presents four areas that were explored to enrich our understanding of Pacific students.



Based on well-established international evidence and theory, and through a consultation process with participating countries, EQAP identified the above four areas and developed questionnaire items to generate findings.

The first area, early childhood education, is gaining increased attention and funding in the Pacific region and internationally, with considerable evidence indicating that high-quality early learning opportunities can lead to better educational outcomes later in life.

The second area is valuable to explore in its own right, as well as in relation to student achievement, as parents (or caregivers) are key stakeholders in education.

Thirdly, it was important for PILNA to create a relevant measure of the availability of resources in students' homes. Internationally, findings from large-scale assessments consistently indicate a positive relationship between students' social background characteristics and their academic achievement, across countries, domains and year levels.[13]

The fourth area discussed in this chapter concerns the attitudes of students to literacy and numeracy, and to school in general. Also presented here is the relationship between student attitudes to these specific domains and their related achievement scores. It is recognised that fostering positive student attitudes is an important educational goal in itself, aside from improving student achievement.

Lastly, it must be made explicit that, as a cross-sectional design, PILNA does not allow causal or long-term outcomes to be interpreted from the data. This is particularly important when considering some of the areas presented in this chapter, as correlations do not necessarily capture the true extent or importance of supportive caregivers and an enabling home environment on the performance of students.

5.2 Early childhood education

Early childhood education (ECE) is one aspect of early learning opportunities that forms a crucial part of a child's development. PILNA collected information from school leaders on the provision of ECE to the school population. In addition, students participating in PILNA were asked if they

13. Watermann Rainer, Kai Maaz, Sonja Bayer and Nina Roczen. 2016. Social Background. pp117–145 In Kruger S., Klieme, E., Jude, N., Kaplan, D. (eds), Assessing contexts of learning: An international perspective. Switzerland: Springer.

had attended an early childhood education programme (such as pre-school or kindergarten) before attending Year 1. These two sources provided rich information on the accessibility of ECE programmes in the region, attendance at ECE programmes and the relationship between attending an ECE programme and performance in the literacy and numeracy assessments. It is recognised that information on the programme quality, and frequency or length of time students attended an early childhood education programme is outside the scope of the data collected.

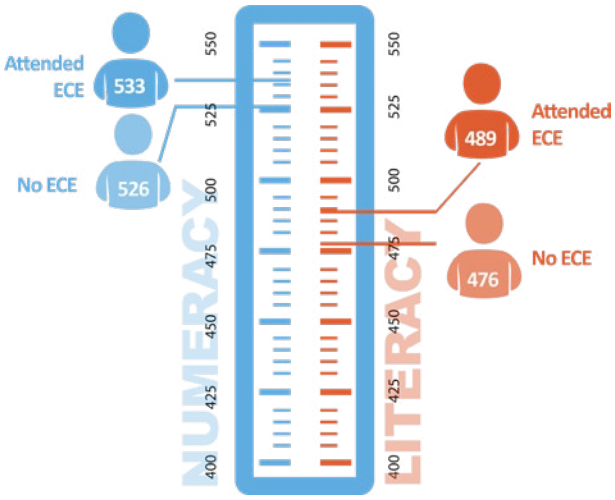
Detailed information on the percentage of students who attended pre-school overall, by year and gender, as well as the correlation between attending an early childhood education programme and the student's achievement in literacy and numeracy, is found in Table B.1 in Appendix B.

79%
of students in the region attended an early childhood education programme

In the region, 79% of students reported attending an early childhood education programme. There were small differences between attendance rates when compared by gender, with 80% of the girls indicating they attended an early childhood education programme, compared to 77% of the boys. At the country level, the percentage of students who attended an early childhood education programme ranged from 63% to 89%. The percentages did not seem to vary between Year 4 and Year 6. A similar trend of higher attendance rates at an early childhood education programme for girls was noted at the country level.

n the region, there was significant association between attendance at an early childhood education programme and achievement in literacy and numeracy. Students who attended an early childhood programme achieved an average numeracy score that was seven points higher than the score of those who did not attend a programme. Similarly for literacy, those who attended an early childhood programme achieved a 13 point higher average score. The extent of the association varied across countries in the region.

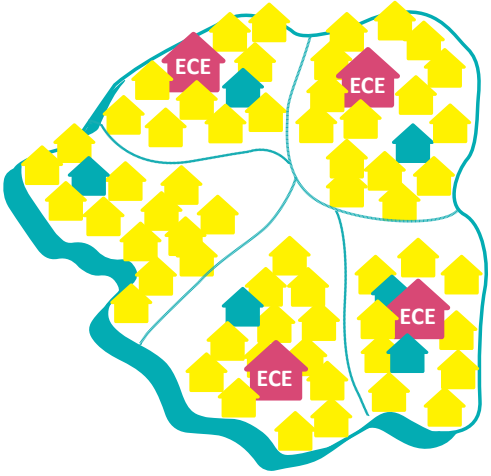
MEAN ACHIEVEMENT SCORE
of students with or without attending an early childhood education programme



The information on the provision of early childhood education in the same village or community as schools participating in PILNA was collected from head teachers and principals. They were asked about the provision of an early childhood education centre at their school and the type of early childhood centre in the village or community (community-based, home-based or government). The detailed results are in Table C.1, in Appendix C.

At the country level, the percentage of students who attended schools that also had an early childhood education centre ranged from 43% to 96%. In the region, 64% to 89% of students attended a school that had an early childhood education centre (of any type) in the same community or village.

4 out of 5
students in the region attended a school that had an ECE centre in the same community or village.

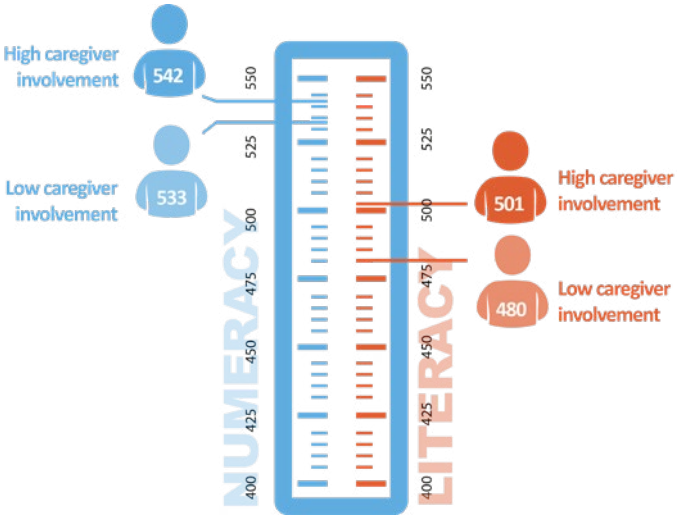


5.3 Caregiver Involvement and Support

Parental or caregiver involvement and support is an important facet of the home learning environment that has become increasingly relevant in educational policy.[14] As family structures differ from household to household, the inclusive term "caregivers" is used throughout this report to represent adults in the home who have primary responsibility for the child. These may be parents, grandparents or other extended family members. The PILNA questionnaire collected information from teachers and students about caregiver involvement. Involvement and support of caregivers as reported in this section is in relation to the home environment, and not involvement with the school directly. Teachers were asked about the degree of support from caregivers for student's reading requirements. Based on the responses of teachers, only 39% of students had caregivers who were supporting the child's reading requirements.

Students were asked to indicate how frequently someone they lived with checked or helped them with their homework, asked about their schoolwork and asked what they read. Students reported that their caregivers showed limited interest or engagement with their schoolwork. Over 50% of students reported that caregivers "never", or "sometimes", checked or helped with their homework. More than 60% of students indicated that their caregivers only "sometimes" or "never" asked about what they read. The detailed results are in Table D.1, in Appendix D. This is an area of concern for the region.

MEAN ACHIEVEMENT SCORE of students by the level of caregiver involvement



Across the region, the involvement of caregivers made a noticeable difference in the scores of students. Students who had caregivers with a high level of involvement had an average literacy score that was 21 points higher than those whose caregivers were not very involved. Similarly, for numeracy, students who had caregivers with a higher level of involvement achieved an average score that was nine points higher than those whose caregivers were not very involved.

Notably, students whose caregivers were more involved with their school work were more likely to have higher levels of achievement on both literacy and numeracy scales. As can be seen in Table 5.1, this correlation between caregiver involvement and achievement exists at both Year 4 and Year 6 levels.

TABLE 5.1 Association between caregiver involvement in school work and student achievement

Correlation with numeracy achievement				Correlation with literacy achievement			
Year 4		Year 6		Year 4		Year 6	
0.17	(0.03)	**0.12**	(0.03)	**0.18**	(0.02)	**0.14**	(0.03)

() Standard errors appear in parentheses.
Statistically significant correlation coefficients ($p < 0.05$) are displayed in bold.

5.4 Home Resources

Various measures of background characteristics are often associated with student achievement and are a mechanism to compare inequality among students. There is much diversity among family backgrounds within the Pacific region, both within and between countries. This posed a challenge when trying to create a measure of the resources in the students' homes. As PILNA utilised the same questionnaire across all the participating countries and territories, it was important to try to have cross-cultural items.

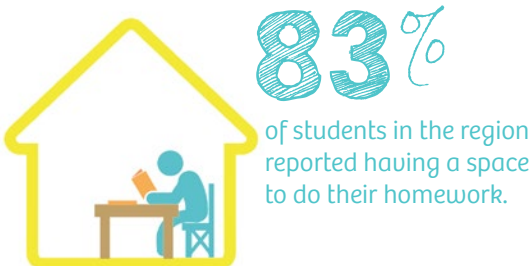
Students who participated in PILNA were asked questions about their home. These questions provided information on study spaces for students, the possessions and facilities found in the home, the building materials of the house, the number of books that were in the home and the meals eaten by students on a normal school day. These factors were combined to provide an indicative measure of the overall home resources available.

LEARNING SPACES

This aspect of the family background – if there is a learning space in the students' homes – is both a component of the

14. Hertel, Silke and Jude, Nina. 2016. Parental support and involvement in school. pp. 209–225 in Kuger S., Klieme, E., Jude, N. and Kaplan, D. (eds). Assessing contexts of learning: An international perspective. Switzerland: Springer.

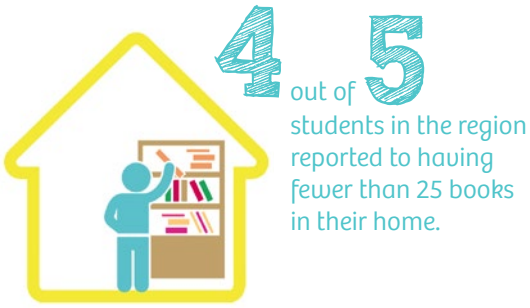
index that makes up home resources, as well as a measure of the support from the home for learning. Students were asked if they had a place to do their homework. Over 80% of students in the region indicated that they had a place to do their homework.



HOME MATERIALS AND POSSESSIONS

PILNA used three questions to assess the financial and cultural resources of the students' home: the possessions and facilities of the home, the number of books in the home, and the materials that the walls of the house were made of.

The number of books in the home provides information about the cultural capital of a family and home educational resources, in addition to adding to the home resources index. The number of books in the home is a common trend scale used in international large-scale assessments. The majority of students (four out of five) in the region reported having fewer than 25 books in their home. This is at the low end of the scale that students were asked to select from, which ranged from "none or very few (0–10) books" to "enough to fill three or more bookcases (more than 200 books)".

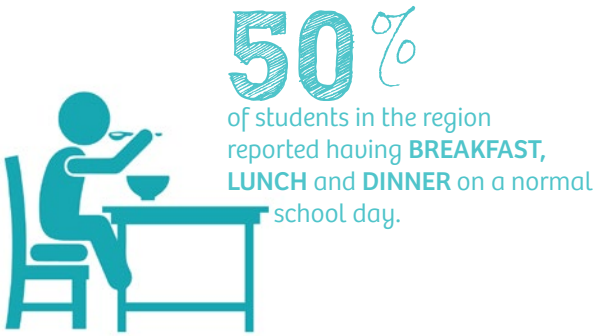


In another question related to home resources, students were asked to indicate which facilities or possessions from a list of items could be found in their home. Ten items were found to be informative enough across all countries to create a scale of home possessions: electricity, radio, television, computer, internet, telephone/mobile phone, refrigerator, car, flush toilet, and tap/running water. Only 36% of the students' homes in the region contained more than seven items from the list. At the country level, the percentage ranged from 10% to 92% of students having more than seven items. This question clearly demonstrated the great diversity of home contexts in the Pacific region.

The materials that the students' home was made of was another component of the home resources indicator. Students were asked to indicate what the outside walls of their home were made of; "sticks/ bamboo/ grass thatch/ leaves", "stones/ mud bricks", "metal/tin /corrugated iron", "wood" or "concrete blocks /cut stones /bricks". About two thirds of students in the region indicated that their homes were made from permanent building materials (metal, wood and concrete).

NUTRITION

To get a picture of students' nutrition, they were asked to indicate if they have breakfast, lunch and dinner on a normal school day. This question provided an indication of whether students were receiving an appropriate frequency of meals. There was no question about the nutritional value of the meals, only whether students were having these meals regularly.



Only half of the students in the region indicated that they had breakfast, lunch and dinner on a normal school day. At the country level, the percentage of students eating breakfast, lunch and dinner ranged from 33% to 77%.

OVERALL HOME RESOURCES

In contrast to other international large-scale assessments, there was no significant association between the combined indicator of home resources and student achievement across the Pacific region.[15] In some countries, however, the association was significant. This suggests that the degree to which home resources influence students' academic outcomes may be largely dependent on the contexts of the country in which they live.

5.5 Student attitudes

Student attitudes to school overall and to specific subject

15. The five home resource questions were pooled together into a linear regression model, using student achievement as an outcome measure.

areas can be considered both an outcome and a factor that contributes to students' academic achievement. This section presents the findings from the student questionnaire that covered the students' attitudes to school, mathematics, reading and writing. Overwhelmingly, the results indicate very positive attitudes from the students which is a good sign for the region (Figure 5.1), although the environment in which they were completing the questionnaires must be considered (in their school, under the supervision of a teacher).

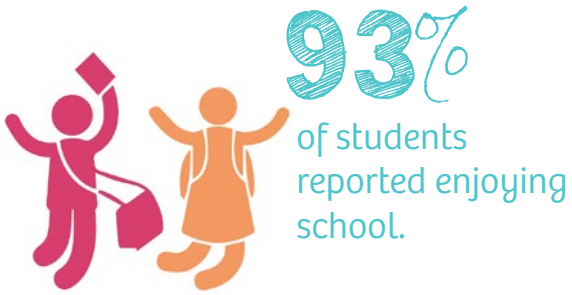
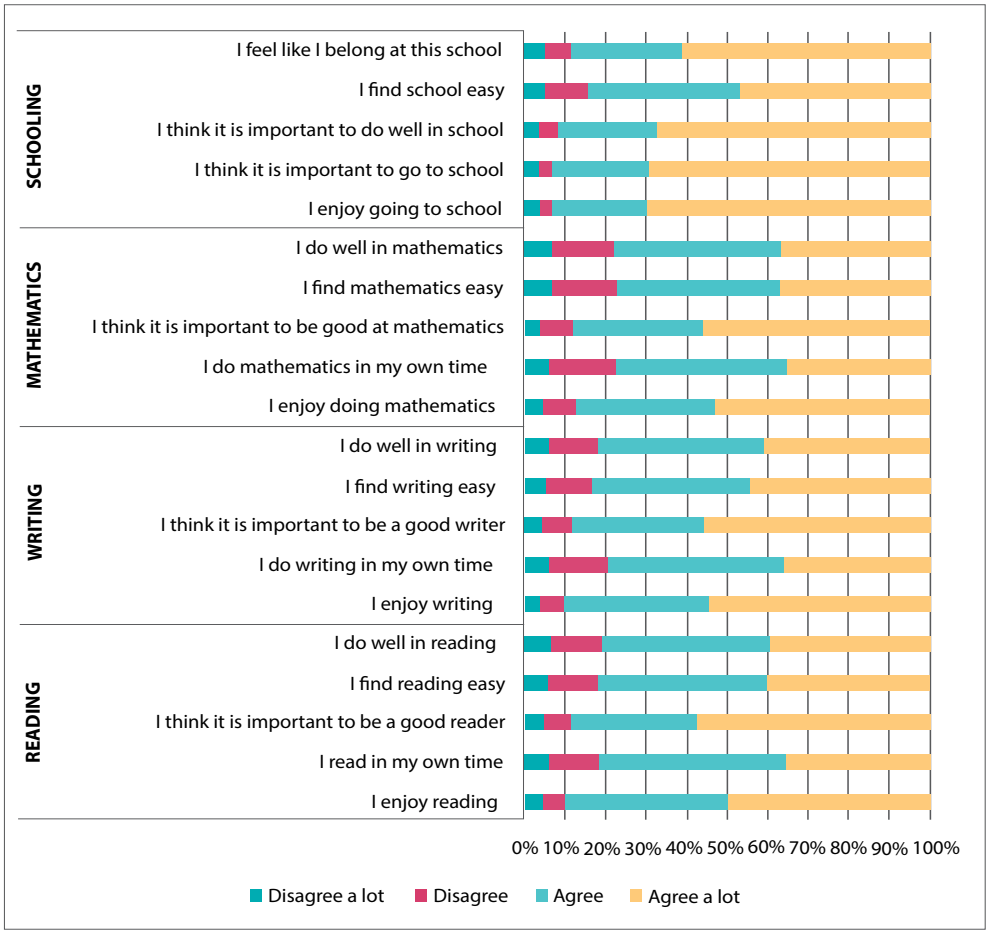


Figure 5.1 Percentage of students expressing agreement with items about reading, writing, mathematics and school



Students were asked the extent to which they agreed with statements related to reading, writing, mathematics and school. These statements asked the students to indicate their enjoyment of the subject, if they worked at the subject in their own time, if they felt it was important to be good at the subject, if they found the subject easy and if they did well in that subject. Over 80% of students in the region indicated agreement with the items, which reflects positive attitudes towards reading, writing and mathematics.

The majority of students expressed positive attitudes towards school. More than 90% of students indicated that they enjoy going to school, that they think it is important to go to school, and that they think it is important to do well in school. Students expressed slightly less agreement on items related to mathematics, with 77% indicating that they worked at mathematics in their own time and found mathematics easy, and 88% of students indicating that they thought it was important to be good at mathematics.

Scales were formed separately for items related to student attitudes to reading, writing, mathematics, and schooling. Strong associations were found between each of these scales and between student attitudes to these areas and achievement for both Year 4 and 6 students (Table 5.2), suggesting a link between student engagement and academic outcomes.

TABLE 5.2 Association between student attitudes toward literacy, mathematics and schooling, and achievement

Attitudes towards reading	Correlation with literacy achievement	Year 4	**0.13**	(0.02)
		Year 6	**0.16**	(0.03)
Attitudes towards writing	Correlation with literacy achievement	Year 4	**0.07**	(0.03)
		Year 6	**0.09**	(0.02)
Attitudes towards mathematics	Correlation with numeracy achievement	Year 4	**0.07**	(0.02)
		Year 6	**0.12**	(0.02)
Attitudes towards schooling	Correlation with literacy achievement	Year 4	**0.13**	(0.03)
		Year 6	**0.16**	(0.02)
	Correlation with numeracy achievement	Year 4	**0.13**	(0.03)
		Year 6	**0.14**	(0.03)

() Standard errors appear in parentheses.
Statistically significant correlation coefficients ($p < 0.05$) are displayed in bold.

5.6 Conclusion

This chapter has presented some of the findings relating to Pacific Island students and their background that was gathered through the PILNA contextual questionnaires. While there is great diversity in the Pacific region, there were some key findings that are significant for the whole region. Most notably, the level of caregiver engagement and interest in students' schoolwork was particularly low and there was a correlation found with achievement scores. This is an area that could significantly improve, especially as it showed a clear association with student achievement in both year levels and in both literacy and numeracy. In addition, there is still progress to be made in the region to strengthen attendance at early childhood education programmes. In the area of resources, it is interesting to note that having more resources available in the home, a possible indicator of the economic status of the family, did not correlate with student achievement for the region. Finally, an encouraging sign for the Pacific region is that students reported overwhelmingly positive attitudes to schooling.

Gaining a deeper understanding of early learning opportunities, caregiver involvement and support, home resources and student attitudes in the region allows for a more nuanced interpretation of student results, with an appreciation for the levels of inequality that are present. It also provides an appreciation of the context from which students enter the formal education system each day, a context that can play a significant role in the performance of students.

6. Getting to know our teachers

TEACHERS play a vital role as key actors in instruction, creating an environment that is conducive to learning and is engaging and nurturing for all students. This chapter examines five areas relating to Pacific teachers.

The five areas were selected based on well-established international research and theory, and through a consultation process with participating countries. Information about each of these themes is important to guide research and inform policy-making that can lead to improvement in the quality of teaching and learning that goes on in classrooms.

Characteristics of Pacific teachers that we explore in this chapter are gender, years of teaching experience and qualifications. The professional skills and know-ledge of teachers are shaped by their initial training and qualifications, and then throughout their career by professional development and experience. Information about the instructional support that teachers receive and the practice of teachers in the classroom, including instruction time, assessment, and planning, are also reported on in this chapter. Teacher self-efficacy, confidence about their teaching ability and content knowledge, is another component that affects learning in the classroom.

Teachers with students participating in PILNA completed a questionnaire, giving information about themselves, their classroom, students in their class, and various aspects related to teaching and learning. Additional information about teachers was gained from questionnaires that school leaders (head teachers and principals) completed.

Since PILNA focuses on students in Years 4 and 6, the results in this chapter are expressed with respect to these students rather than the teachers. For example, one result reports on the percentage of Year 4 and 6 students who have male teachers, rather than on the percentage of teachers who are male. This is an important distinction, as the teacher questionnaires were only completed by Year 4 and Year 6 teachers whose students participated in PILNA; not all teachers at the school across all year levels.

This chapter does not report on associations or correlations between teacher-level factors and student performance in the literacy and numeracy assessments of PILNA. The interaction between many different aspects of the teaching profession, from pre-service training to classroom practice and the support teachers receive, all contribute to the ability of teachers to create an environment for learning to take place. Teacher influences are important in shaping student outcomes, but there are many other influences, e.g. student home background, classroom, school resources, other specialist teachers, that all contribute. Therefore an analysis of the influence of teacher and classroom data on student outcomes should take into account the multiple influences.

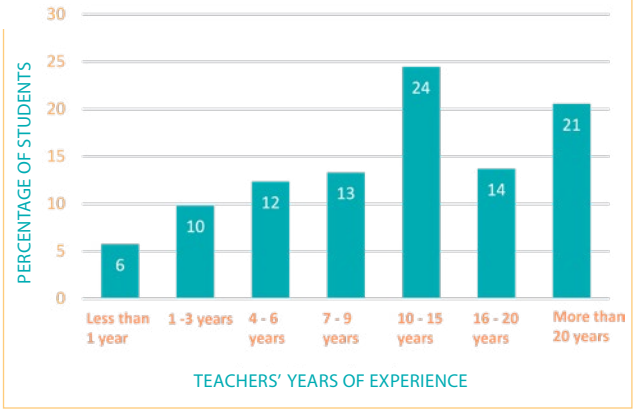
6.2 Characteristics of Teachers

Teachers are an extremely important component of the education system; teacher salaries usually make up the biggest proportion of an education system budget and in many countries teachers are often one of the largest groups in the public service. Their impact on student learning cannot be underestimated.

Within the ranks of teachers are people from different backgrounds, ages, levels of qualification and years of teaching experience. In terms of teaching experience in the region, the teaching population seemed to be well retained in the profession and very experienced (Figure 6.1). A high propor-

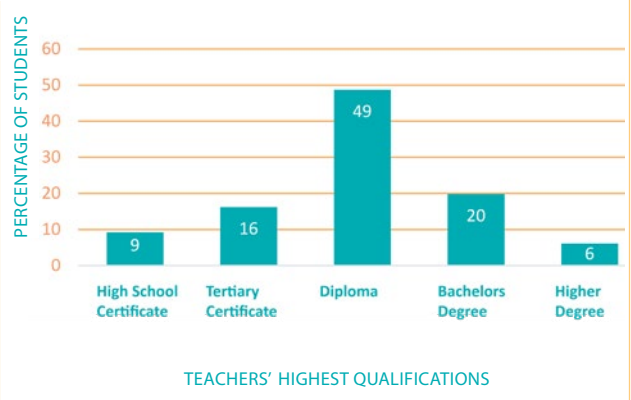
tion of students (59%) had teachers with more than ten years' teaching experience; one in five students (21%) had a teacher with more than 20 years' teaching experience; and a smaller percentage of students (16%) had teachers with less than three years' teaching experience.

FIGURE 6.1 Teaching experience of PILNA students' teachers[16].



The qualifications of teachers are another factor that can inform teacher practice in the classroom. Teacher qualifications speak to the body of knowledge teachers bring to the classroom when they begin their careers. The teachers responding to the survey questionnaire provided information on the level of the highest qualification they had acquired and were asked whether they had completed a teaching training programme. The results are shown in Figure 6.2.

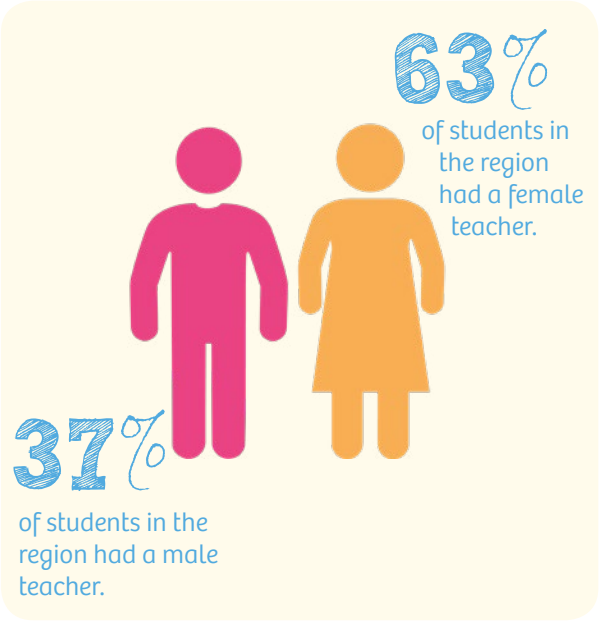
FIGURE 6.2 Highest qualification of PILNA students' teachers[17].



83% of students in the region had teachers who had completed a **teacher-training programme**.

The most commonly held highest qualification was a diploma, with 49% of students having teachers that had achieved this level. The next most commonly held highest qualification was a bachelor's degree; 20% of students had teachers at this level. Six per cent of students had teachers with a higher tertiary qualification, such as a post-graduate diploma, masters or PhD. At the other end of the scale, and a matter of some concern, is that one in four students had teachers whose highest qualification was a certificate or lower: a noticeable proportion (9%) had teachers whose highest qualification was a high school certificate and 16% had teachers whose highest qualification was a tertiary certificate.

It is encouraging to note, however, that a large proportion of students (83%) had teachers who had completed a teacher-training programme while 17% had a teacher who had not completed such a programme.



In terms of the gender of the PILNA students' teachers, the majority (63%) of students had a female teacher while 37% of students had a male teacher.

16. Percentages represent the proportion of students who have teachers with the specified years of experience
17. Percentages represent the proprtion of students who have teachers with the specified qualfications.

6.3 Professional Development

In addition to their initial education prior to entering the teaching profession, teachers can continuously develop their skills and abilities throughout their careers with professional development. Regular professional development for teachers is recognised as crucial for enhancing the quality of teaching and learning in schools.[18] There are many different types of professional development programmes, from school-based to those that are regionally or nationally provided. Professional development activities can include training, mentoring, networking and other activities that foster in-service learning and the professionalisation of teaching.

PROFESSIONAL DEVELOPMENT PROGRAMMES

The PILNA teacher questionnaire collected information about the areas in which teachers received professional development and the frequency of that professional development over the previous three years. The information collected related to three broad areas; subject content (reading, writing and numeracy), pedagogy (curriculum, classroom-based assessment and classroom management) and school support services (student welfare, inclusive education and leadership skills). These results are shown in Table 6.1.

TABLE 6.1 Percentage of students whose teachers attended professional development in the previous three years

PROFESSIONAL DEVELOPMENT AREA	TEACHERS PROFESSIONAL DEVELOPMENT (IN THE PAST THREE YEARS)					
	NEVER		ONCE OR TWICE		THREE OR MORE TIMES	
Reading	20%	(1.1)	40%	(1.2)	40%	(1.2)
Writing	23%	(1.2)	40%	(1.4)	37%	(1.2)
Numeracy	23%	(1.2)	38%	(1.4)	39%	(1.5)
Classroom-based assessment	20%	(1.0)	40%	(1.2)	40%	(1.4)
Curriculum	20%	(0.9)	39%	(1.5)	41%	(1.7)
Student welfare	40%	(1.4)	33%	(1.4)	27%	(1.2)
Classroom management	21%	(1.1)	41%	(1.5)	38%	(1.4)
Inclusive education	33%	(1.0)	40%	(1.6)	27%	(1.5)
Leadership skills	35%	(1.2)	36%	(1.5)	29%	(1.2)

() Standard errors appear in parentheses.

The majority of students had teachers who had attended professional development in reading (80%), classroom-based assessment (80%) and curriculum (80%) at least once in the past three years. However, about one in five students had teachers who had not participated in any professional development programme on reading (20%), writing (23%) or numeracy (23%).

Similarly, four out of five students had teachers who had participated at least once in the past three years in a professional development programme on pedagogy: classroom-based assessment, curriculum content or classroom management.

School support services (student welfare, inclusive education and leadership skills) was the area in which the lowest percentage of the PILNA students' teachers had attended professional development. The percentage of students with teachers who had not attended professional development training on school support services was relatively high; between 33% and 40% indicated they had not attended professional development in the past three years in this area.

89% of students attended schools that used **curriculum delivery workshops** to support teachers.

80% of students attended schools that used **in-service programmes** to support teachers in implementing the curriculum.

91% of students attended schools that used **in-school professional development** to support teachers in implementing curriculum.

At the school level, head teachers and principals were asked about their school's support to teachers in implementing the curriculum. More than four out of five students attended schools that held curriculum delivery workshops, in-service programmes and in-school professional development to support their teachers.

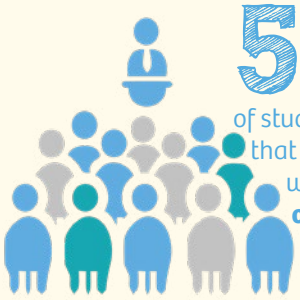
COLLABORATION/ LEARNING COMMUNITIES

Collaborative types of professional development (such as mentoring and teacher networks) are increasingly showing that they can improve teaching practice and learner outcomes. Collaborative professional development activities contribute to strong professional learning communities, which are an important contributor to improving the quality of teaching.[19]

18. Klingebiel, Franz and Klieme, Eckhard. 2016. Teacher qualifications and professional knowledge. pp. 447–468 in Kuger S., Klieme, E., Jude, N. and Kaplan, D. (eds). Assessing contexts of learning: An international perspective. Switzerland: Springer.
19. Klingebiel, Franz and Klieme, Eckhard. 2016. Teacher qualifications and professional knowledge. pp. 447–468 in Kuger S., Klieme, E., Jude, N. and Kaplan, D. (eds). Assessing contexts of learning: An international perspective. Switzerland: Springer.

School leaders surveyed indicated that cluster meetings were used to support implementation of the curriculum. Cluster meetings are a way of bringing teachers in a local area together to discuss and share good practices, as well as issues encountered in delivering the curriculum. This collaborative professional development was more frequently used for teachers within schools than for teachers from multiple schools.

92% of students attended schools that had cluster meetings with teachers **within** their school.



56% of students attended schools that had cluster meetings with teachers from **other** schools.

The teacher questionnaire collected information on the participation of teachers in collaborative professional development activities and their frequency. These included: discussions with other teachers, observation of another teacher's class, collaborative work with other teachers, and mentoring. The results are presented in Table 6.2.

TABLE 6.2 Percentage of students whose teachers undertook collaborative teacher activities

ACTIVITIES RELATED TO COLLABORATION	Frequency teachers undertook collaborative teacher activities					
	NEVER		ONCE OR TWICE A WEEK		THREE OR MORE TIMES A WEEK	
Discussion with other teachers about your class/ lessons	7%	(0.8)	56%	(1.6)	37%	(1.5)
Observe another teacher's class	45%	(1.2)	46%	(1.2)	9%	(1.0)
Work collaboratively with other teachers	4%	(0.6)	36%	(1.2)	60%	(1.3)
Mentor another teacher or be mentored	30%	(1.2)	47%	(1.3)	23%	(1.0)

() Standard errors appear in parentheses.

Certain elements of professional learning communities are particularly strong, such as working collaboratively with other teachers; 96% of students had teachers who collaborated with other teachers at least once a week, 60% of whom did so very frequently. Similarly, 93% of students had teachers who indicated that they held discussions with other teachers about their lessons or classes at least once a week. Observing another teacher's class was the least common collaborative activity, with 45% of students having teachers who indicated they had never done this. Mentoring activities, including being mentored and mentoring other teachers, varied widely. A significant 30% of students had teachers who had never been part of a mentoring activity, but almost half of the students had teachers who participated in mentoring activities a couple of times a week, and a fifth of students had teachers who were doing this very frequently.

The PILNA results suggest that creating professional learning communities in Pacific schools is an area that could be strengthened.

6.4 Instructional Support

Instructional support in schools involves creating environments and opportunities for teachers to improve teaching practice and the quality of teaching. Head teachers and principals indicated what was available to their students and teachers by way of instructional support.

28% of students attended schools that received **assistance from the local community** to support teachers.

72% of students attended schools that received **advisory visits by curriculum officiers** to support teachers.

88% of students attended schools that received **instructional/ curriculum materials** to support teachers.

A reflection of the centralised nature of many Pacific Island education systems is the high frequency of support from the system level. Seventy-two per cent of students attended schools where advisory visits had been made by curriculum officers from the education ministry. Another common way of supporting teachers was the provision of instructional and curriculum materials (88%).

Local community involvement in assisting and supporting school remedial programmes was low in the region. Fewer than 30% of students attended schools that had received some support from the local community on its school remedial programmes. Community engagement, as with caregiver involvement (explained in Chapter 5), stands out as an area for improvement in the region.

6.5 Teacher Practice

Evidence suggests that teaching practices have the strongest direct school-based influence on students' learning outcomes.[20] Comprehensive lesson plans provide a basis for teachers to give clear and comprehensive instruction, articulate learning goals, and connect lesson themes. Classroom-based assessment, or formative assessment, provides constructive feedback to students, an important contributor to student motivation and student understanding of the expectations of their teachers. Teacher support is reflected through teacher practices such as listening to students' views, encouraging their progress and providing individual assistance.

Information on teacher practice collected by PILNA is limited in scope, touching only on lesson planning, classroom-based assessment and discussions with students about their performance. Teachers were asked how many times a week they carry out these three activities. While almost all teachers claim to do these activities regularly, the quality of these activities or the time spent on them could not be ascertained.

Teachers often respond to questions about their practice to reflect what they consider socially desirable; this may have been a factor that caused the very high levels of positive response to these questions.[21]

The time that teachers spent on instructional activities and administrative work was another area in which PILNA collected information.

99 %
of students have teachers that do lesson planning at least once a week.

98%
of students have teachers. that conduct classroom-based assessment at least once a week.

94 %
of students have teachers that hold discussions with individual students about their performance at least once a week.

A high proportion of students had teachers who indicated they had enough time to complete required lessons in mathematics (79%), writing (76%) and reading (77%). Thirty-five per cent of students had teachers who indicated they did not have enough time to work with students who required extra support. Eighty per cent of students had teachers who agreed that they spend an appropriate amount of time on administrative work.

TABLE 6.3 Percentage of students whose teachers express agreement with statements on planning, teaching and learning activities

Statements on teachers' time	Percentage of students whose teachers expressed agreement
I spend the appropriate amount of time on administrative work.	80% (1.1)
I get enough time to complete the required lessons in mathematics.	79% (1.7)
I get enough time to complete the required lessons in reading.	77% (1.7)
I get enough time to complete the required lessons in writing.	76% (1.7)
I get enough time to work with students who are slow learners.	65% (1.9)

() Standard errors appear in parentheses.

20. Hattie, J. 2009. Visible learning: A synthesis of over 800 meta-analyses relating to achievement. London: Routledge.
21. Ainley, J. and R. Carstens. 2018. Teaching and Learning International Survey (TALIS) 2018 Conceptual Framework. OECD Education Working Papers No. 187. Paris: OECD Publishing. https://doi.org/10.1787/799337c2-en

6.6 Teacher Self-Efficacy

The beliefs that teachers hold about their own teaching abilities affect learning in the classroom. They provide rich information for professional development planning and can also be related to student learning outcomes. Teacher self-efficacy in relation to instruction of literacy and numeracy was measured in PILNA. Teachers were asked to indicate their confidence in teaching specific aspects of both literary and numeracy.

Table 6.4 shows that most students had teachers who found teaching vocabulary (78%), spelling and punctuation (81%), letter-sound correspondence (76%), reading comprehension (75%) and oral language (speaking and listening) (78%) easy to teach.

Aspects of literacy where students had teachers who expressed less confidence in teaching were quality of ideas (writing) (56%), organisation and structure (writing) (60%), grammar and syntax (68%), and phonemic awareness (69%).

TABLE 6.4 Percentage of students whose teachers expressed confidence in teaching literacy

STRANDS OF LITERACY	Percentage of students whose teachers expressed confidence teaching the strand
Spelling and punctuation	81% (1.0)
Oral language – speaking and listening	78% (1.4)
Vocabulary	78% (1.1)
Letter-sound correspondence	76% (1.1)
Reading comprehension	75% (1.1)
Phonemic awareness	69% (1.3)
Grammar and syntax	68% (1.2)
Organisation and structure (writing)	60% (1.4)
Quality of ideas (writing)	56% (1.4)

() Standard errors appear in parentheses.

Table 6.5 shows the percentage of students whose teachers expressed confidence in teaching numeracy. A large proportion of students in the region had teachers who indicated they found teaching number and patterns (92%), place value (91%) and operations (85%) easy. Two aspects of numeracy where students had teachers who expressed less confidence in teaching were geometry (68%), and data and chance (69%). The lowest performing numeracy strand for both years 4 and 6 was also data and chance.

TABLE 6.5 Percentages of students whose teachers expressed confidence in teaching numeracy

STRANDS OF NUMERACY	Percentage of students whose teachers expressed confidence teaching the strand
Number and patterns	92% (0.8)
Place value	91% (0.9)
Operations	85% (1.2)
Measurement	76% (1.3)
Fractions and percentages	71% (1.2)
Geometry	68% (1.3)
Data and chance	69% (1.3)

() Standard errors appear in parentheses.

6.7 Conclusion

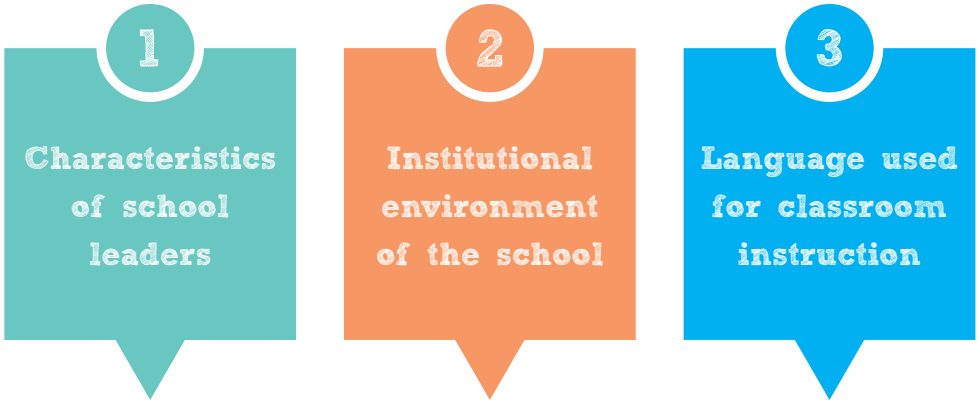
This chapter has presented some of the findings related to Pacific classrooms and teachers, gathered through the PILNA contextual questionnaires. The areas that PILNA collected information relating to teachers and classrooms were based on strong international evidence that linked these areas to student learning outcomes.

Teacher qualifications and professional knowledge were captured from a number of perspectives, including pre-service qualifications and ongoing professional development activities. The most common level of qualification was that of a diploma and the attainment of a teacher training qualification. Teachers, head teachers and principals indicated that professional development activities were taking place with relatively high frequency across a variety of topics and methods. Collaborative teacher practices (or learning communities), which hold much promise, were being followed to some degree at the school level but were limited in scope between schools. Mentoring practices and peer-to-peer classroom observations were much less commonly practised. Support for the classroom was reported at high levels, but in the region it was clear that the engagement of the community remains an area to be improved. There are still improvements to be made at the regional level to ensure that teachers have time with students who require additional support.

7. Getting to know our schools

7.1 Introduction

FOLLOWING on from chapters five and six, which focussed on students and teachers respectively, Chapter 7 provides more information about the schools. The school is the environment in which teaching and learning processes take place. Many interconnected components contribute towards the dynamic institution of a school: school leaders, infrastructure, teaching and learning resources, human resources and their capabilities, community engagement, culture and language, and the student population. While there are varying degrees of school autonomy in the Pacific region, with many systems being highly centralised, it is at the level of the school institution that resources are directly managed. This chapter presents information about three areas that provide greater understanding of the situation in Pacific schools.

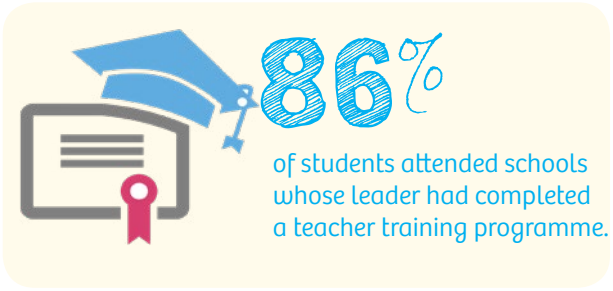


This chapter will provide greater insight into the characteristics of school leaders (head teachers and principals), the school institutional environment (including resources that are available in schools and classrooms, and barriers to learning) and the language used for instruction. This information is valuable to policy makers and for national planning to ensure equitable access to good quality education and as a reference for decision makers.

7.2 Characteristics of School Leaders

School leaders have a critical role in creating conditions that are optimal for teaching and learning processes to take place. Leadership factors have an indirect link to student learning outcomes, mediated by teachers.[22] PILNA collected information about the characteristics of school leaders; these provide important details for planning and they inform policies to strengthen management and governance at the school level, which contributes to improving the quality of schooling.

A large proportion of students attended schools whose leader had completed a teacher-training programme (86%). This is a slightly higher proportion than the proportion who had teachers who had completed a teacher-training programme (83%).



More than half of the students in the region attended schools that had a male school leader (52%). Although this is almost reaching gender parity at a regional level, when compared to the gender distribution of teachers (where 37% of students had a male teacher), it can be implied that women are not being promoted to leadership roles at

22. Robinson V.M.J., Lloyd C.A.and Rowe K.J. 2008. The impact of leadership on student outcomes: An analysis of the differential effects of leadership types. Educational Administration Quarterly 44.5: 635–374. <https://doi.org/10.1177/0013161X08321509>.

the same rate as their male counterparts. However, the proportion of female principals is relatively high compared to some international studies. At the country level, results were very diverse; between 24% and 87% of students attended schools with female leaders.

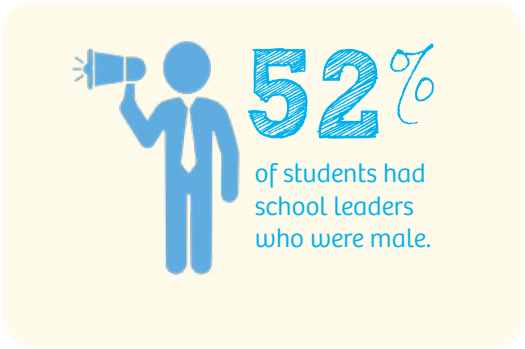
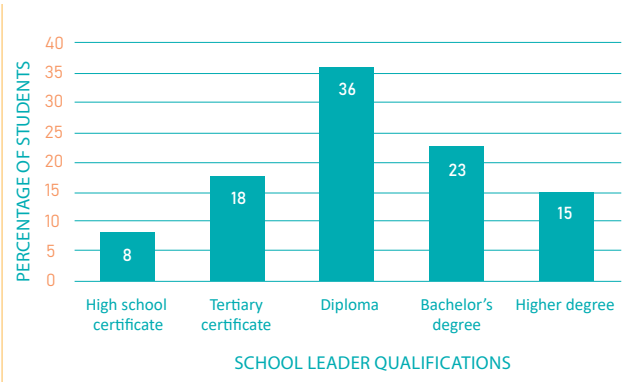


Figure 7.1 shows the levels of qualifications of school leaders who responded to the questionnaire. Three quarters of students attended schools in which the school leader held a diploma or higher qualification. Just under one quarter attended schools whose school leader held a bachelor's degree and 16% attended a school whose leader held a higher degree (post-graduate certificate, master's or doctorate). A smaller portion (8%) of students attended a school whose leader had achieved only a high school certificate.

FIGURE 7.1 Highest qualification of school leaders[23]



7.3 School Institutional Environment

International research evidence indicates that the climate of the school, including the institutional environment, has an influence on student affect and behaviour.[24] The environment of the school is made up of many interconnected aspects that together – in a well-managed system – serve to create conditions conducive to effective teaching and learning. For good classroom instruction, basic resources are essential, including adequate classroom space, literacy and numeracy instructional materials and qualified teaching staff. Other important school resources are the buildings, the facilities and information and communications technology. A positive school environment can lead to greater job satisfaction of teachers and support their retention in the profession.

PILNA collected information about resources available in schools, including the availability of textbooks, workspaces for teachers, student-teacher ratios and institutional resources.

CLASSROOM RESOURCES

Information about physical classroom resources was collected as part of PILNA to gain a better understanding of the classroom context. The resources available to teachers vary greatly between and within countries in the Pacific region. PILNA captured information about the provision of instructional materials, (including literacy and numeracy textbooks and story books), adequate classroom space and a working space for the teacher.

Information about students' access to textbooks for literacy and numeracy was collected from teachers. Table 7.1 shows that, in the region, about 40% of students attended schools where each student had access to their own literacy and numeracy textbook. At the country level, substantial variance was noted; percentages ranged from 0 to 87% for individual access to a literacy textbook and from 1% to 85% for a numeracy textbook. Detailed country variation is shown in Table D.1 in the Appendix D. More than 20% of students in the region attended schools where only the teacher had literacy textbooks (24%) and numeracy textbooks (26%).

TABLE 7.1 Percentage of students with access to literacy and numeracy textbooks

Type of access to textbooks	Numeracy Textbook	Literacy Textbook
Each student has a textbook	38%	17%
Two students share one textbook	36%	17%
More than two students share one textbook	11%	14%
Textbook for teacher only	26%	24%
No textbook	8%	9%

In addition to detailed information about textbook access, teachers were also asked about the provision of classroom space, a work space for themselves and access to story books for their students (Table 7.2). A high proportion of students (79%) had teachers who agreed that they had

23. Results are presented as percentages of students who have teachers who had attained a certain level of qualification.
24. Thapa A.et al. 2013. A review of school climate research. Review of Educational Research 83.3: 357–385 <https://doi.org/10.3102/0034654313483907>.

adequate space for students in their classroom. About four out of five students' had teachers who agreed that they had a work space available at school and 69% of students' had teachers who indicated that reading resources were available for students in the classroom.

TABLE 7.2 Percentage of students whose teachers exressed agrement with stataements on planning, teaching and learning resources.

Planning, teaching and learning resources	Percentage of students whose teachers expressed agreement
I have space / room to prepare my lessons / work in the school.	83% (1.2)
I have adequate space in my classroom for all my students.	79% (1.2)
There are storybooks in the classroom for children to read.	69% (1.1)

() Standard errors appear in parentheses.

TEACHER-STUDENT RATIO

Another two characteristics of schools are the ratio of teachers to students and the average class size. Table 7.3 shows student-teacher ratio and class size. The diversity of the region is revealed by the information about these two characteristics and differences within each country (by region or locality) can be further explored. At the country level, the student-teacher ratio[25] ranged from 15:1 to 35:1 and the regional ratio was 27:1. Teachers were asked to indicate how many students were in their class; the average class size was calculated based on teachers' responses. The average class size in the region was 27, while at the country level it ranged from 22 to 34.

TABLE 7.3 Average student-teacher ratio, average class size.

COUNTRY	Student: Teacher Ratio	Class size
A	15:1	22
B	18:1	22
C	25:1	24
D	26:1	26
E	28:1	27
F	32:1	25
G	33:1	30
H	34:1	34
I	35:1	30
SIS	24:1	25
Regional average	27:1	27

SCHOOL INSTITUTIONAL RESOURCES

Information about the varied infrastructure and resource situations of schools in the region was collected from school leaders. Infrastructural decisions are often costly and serve generations of students, but there is limited conclusive evidence as to what school facilities best support student learning. School leaders were asked to indicate which resources were available in their schools from a list. The 10 items in Table 7.4 were combined to form a scale, which was then used to measure associations with student achievement.

In the region, head teacher's office (83%), photocopy machine (83%), school library (66%) and telephone (63%) were the four most commonly available resources. There was statistically significant association between the scale for availability of school resources and student achievement in literacy and numeracy for Year 6 students, and in literacy for Year 4 students (Table 7.5). This indicates that students who were in better resourced schools were also performing at higher levels in achievement tests. A well-resourced school can also be indicative of a stronger socio-economic school community, and other student or home factors that contribute towards higher achievement scores.

TABLE 7.4 Percentage of students attending schools that have specified resources

SCHOOL RESOURCE	PERCENTAGE OF STUDENTS
Photocopy machine	83% (1.5)
Head Teacher's office	83% (1.2)
School library	66% (1.7)
Telephone	63% (1.4)
Internet access	54% (1.2)
Computers for teacher use	51% (1.6)
Computer laboratories for student use	31% (1.5)
Canteen / school shop	31% (1.4)
Safe storage space for use during emergencies	27% (1.8)
Sick room / bay	19% (2.3)

() Standard errors appear in parentheses.

TABLE 7.5 Associations between school resources and student achievement

Correlation with numeracy achievement			
Year 4		**Year 6**	
0.05	(0.02)	**0.07**	(0.02)
Correlation with literacy achievement			
Year 4		**Year 6**	
0.12	(0.03)	**0.13**	(0.03)

() Standard errors appear in parentheses. Statistically significant correlation coefficients ($p < 0.05$) are displayed in bold.

25. The student-teacher ratio is obtained by dividing the number of students at a school by the number of teachers at that school.

To gain a deeper understanding of resourcing challenges and a fuller picture for policy and planning, school leaders were asked about hindrances to instruction their schools were facing. School leaders estimated the extent to which the school's capacity to provide instruction was hindered by resourcing or external issues (shortages of classrooms, instructional materials, teachers, and toilets; lack of qualified teachers; teacher absenteeism; and natural disasters).

A majority of students in the region (54%) attended schools whose school leaders indicated a shortage of instructional materials as a common issue hindering the school's capacity to provide instruction. Shortages of classrooms and teachers were also severe hindrances, each affecting over 40% of students. With at least a third of students affected by a lack of basic resourcing, this is an area for attention in the region. Detailed results are provided in Table 7.6.

TABLE 7.6 Percentage of students attending schools where instruction was hindered by poor resourcing or external issues

HINDRANCE TO INSTRUCTION	PERCENTAGE OF STUDENTS
Shortage of instructional materials	54% (2.0)
Shortage of teachers	42% (2.2)
Shortage of classrooms	42% (2.1)
Shortage or poor conditions of toilets	38% (1.9)
Teacher absenteeism	36% (1.9)
Lack of qualified teachers	33% (2.0)
Natural disasters	31% (1.3)

() Standard errors appear in parentheses.

Not only were there high proportions of Pacific students affected by basic resourcing limitations, but it was also found that these resourcing issues were associated with student achievement (Table 7.7). There was a negative association between resourcing challenges and student achievement in literacy and numeracy for Year 4 students, and in literacy for Year 6 students. Students that attended schools that were facing these resourcing challenges were less likely to perform well in literacy and numeracy.

TABLE 7.7 Associations between school instructional hindrances and student achievement

Correlation with numeracy achievement			
Year 4		Year 6	
-0.08	(0.02)	–0.05	(0.03)
Correlation with literacy achievement			
Year 4		Year 6	
–0.11	(0.02)	**–0.07**	(0.03)

() Standard errors appear in parentheses.
Statistically significant correlation coefficients ($p < 0.05$) are displayed in bold.

7.4 Student readiness to learn

For students to engage in the teaching and learning process, they must have physiological readiness and the prerequisite knowledge to engage with the content. Physiological barriers are hindrances to attentiveness and learning in classrooms and are influenced by both the student's internal psychological activity and the external environment.[26] Potential hindrances to physiological readiness include inadequately addressed disabilities, poor nutrition, sleep deprivation, poor health and inadequate prerequisite knowledge.

Information about student readiness was collected from teachers, who may be faced with students who are unable to attend to instruction because of these barriers. Teachers were asked to indicate what proportion of students in their class were affected by one or more aspects of inadequate readiness. Specific barriers were: lack of basic knowledge or skills, disabilities that had not been adequately addressed (reading impaired, behavioural disorder or auditory or visual impairment), lack of interest (attention), poor health, frequent absenteeism, hunger and sleep deprivation.

The most common issue identified by teachers was a lack of basic knowledge or skills, which is indicative of inadequate preparation for instruction, with teachers indicating that 29% of students were affected by this. Behavioural disorders (26%) and reading impairments (22%) were the next most common barriers, with about a quarter of students being affected, and lack of interest and frequent absenteeism affected over 20% of students. This could also be a reflection of physiological barriers that are manifesting themselves through limited attendance and attention. Finally, teachers indicated that more than 10% of students were affected by physiological barriers of hunger, sleep deprivation or poor health. These results are shown in Table 7.8.

TABLE 7.8 Average percentage of students affected by hindrances to instruction

Student issues faced by teachers	Percentage of students affected
Lack of basic knowledge or skills	29% (1.3)
Behavioural disorders	26% (1.1)
Reading impaired (e.g. dyslexia)	22% (1.4)
Lack of interest	21% (1.2)
Absenteeism	21% (1.2)
Being hungry / hunger	13% (1.1)
Lack of sleep	12% (1.0)
Poor health	11% (0.9)
Auditory or visual impairment	6% (0.8)

() Standard errors appear in parentheses.

26. Mclaughlin M. et al. 2005. Student content engagement as a construct for the measurement of effective classroom instruction and teacher knowledge. Washington: American Institutes for Research.

The findings from PILNA 2018 indicate that, in addition to their high frequency, physiological and knowledge barriers are related to lower student achievement. There is a negative association between issues affecting students and achievement in literacy and numeracy achievement for both Year 4 and 6 students (Table 7.9). Students' lack of physiological readiness and demonstrated barriers to learning are associated with lower student achievement in both domains and levels.

TABLE 7.9 Associations between student issues at the school level and student achievement

Correlation with numeracy achievement			
Year 4		Year 6	
-0.10	(0.02)	**-0.19**	(0.02)
Correlation with literacy achievement			
Year 4		Year 6	
-0.14	(0.02)	**-0.20**	(0.02)

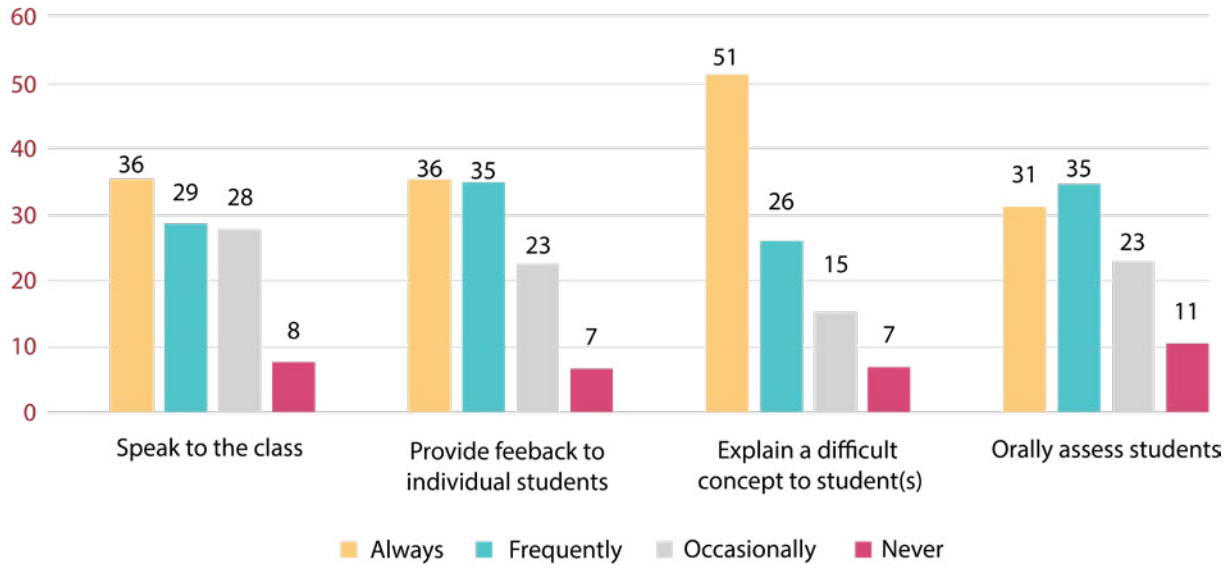
() Standard errors appear in parentheses.
Statistically significant correlation coefficients ($p < 0.05$) are displayed in bold.

7.5 Language of Instruction

Because the Pacific is a linguistically diverse region, both within and across countries, while also being part of a globally connected world, language is critical for the preservation and promotion of cultural heritage and also knowledge acquisition through the formal school system. International research has consistently demonstrated that students who do not speak the language of instruction in the home have lower achievement in school.[27] Each Pacific country has its own language policy, which generally consists of a vernacular (particularly in early grades) and introducing English or French as a second language. The language of instruction that is officially mandated is mirrored in assessment practice. PILNA sought to collect information about the language used for classroom instruction to ascertain alignment with national policy and whether students were receiving instruction in the same language as assessments.

Teachers were asked to indicate how often they used a language other than the language of instruction in four different teaching and learning scenarios. These were: to speak to their class, to provide feedback to individual students, to explain a difficult concept and to orally assess students. Figure 7.2 shows the results at regional level. More information on this issue is reported in the country reports because of its relevance to national language policy and implementation.

FIGURE 7.2 Percentage of students whose teachers use a language other than the language of instruction for the specified activities



27. See for example: Schnepf, S.V. 2007. Immigrants' educational disadvantage: An examination across ten countries and three surveys. Journal of Population Economics, 20 (3): 527–545.

In the region, half the students had teachers that always used a language other than the language of instruction to explain a difficult concept to students. Only about 10% of students had teachers who indicated that they used the language of instruction exclusively to speak to the class, provide feedback, explain difficult concepts and assess students orally. This could be reflective of teachers' beliefs about student understanding and their own confidence levels in using the language of instruction. Large differences between the language of instruction and the language used for assessment could be a factor limiting student performance.

7.6 Conclusion

This chapter has presented findings related to the school environment based on information that was collected as part of the PILNA contextual questionnaires. The picture that emerges of our Pacific schools is of notable resourcing needs and great diversity in the region. The findings have clearly found an association between school resourcing and student performance in both literacy and numeracy. Similarly, teachers are reporting that about a quarter of the student body are presenting readiness issues that are barriers to learning and teaching processes. This is indicated by the negative association between these issues and lower performance in literacy and numeracy.

8. Conclusions & Recommendations

8. 1 Introduction

THE 2018 PILNA regional report provides an in-depth analysis of the numeracy and literacy assessment outcomes of Year 4 and Year 6 students in 15 Pacific Island countries. It also reports on trends in student achievement in literacy and numeracy across the three PILNA cycles: 2012, 2015 and 2018.

> The data suggest that there are links between student participation in **EARLY CHILDHOOD EDUCATION** and performance in the cognitive domains.

The data on the cognitive outcomes in the regional report includes information on gender in order to get comparative information about learning outcomes. The categorisations of locality (urban and non-urban) and school authority (government and non-government) are not included in the regional and SIS reports because of the differing definitions of these characteristics in each of the PILNA countries. Similarly, the in-depth discussion of language of instruction is not included in the regional and SIS reports because of the differing language policies in each of the PILNA countries.

The data suggest that there is significant improvement across the region in numeracy at Year 6, as well as improvement in numeracy over the 2012, 2015 and 2018 PILNA cycles. The data also suggest that there is improvement across the region in literacy at both Year 4 and Year 6, particularly when looking over the span of the three PILNA cycles.

Looking at the gender subgroups, girls outperformed boys in both numeracy and literacy at both year levels again in 2018, as well as over the three PILNA cycles. Mean scores for girls in the literacy domain and strands were, on average, higher than those for boys. In numeracy, the average difference in mean scores was quite small, and fairly consistent across the strands and year levels.

The data from the coding of student responses in literacy and numeracy has not been reported in an aggregate way in this report but has been used to inform the findings from the two cognitive domains. Specific examples from the coding have been shared in chapters 3 and 4 to provide information to teachers about student understanding of item concepts as well as common student misconceptions leading to incorrect responses.

This report also provides an in-depth analysis of the data collected through contextual questionnaires for students, teachers and school leaders. The data suggest that there are links between student participation in early childhood education programmes and performance in the cognitive domains. There is also a strong association between the involvement of caregivers (parents) in students' school work and subsequent student performance in literacy and numeracy.

The majority of teachers across the region reported that they are confident and feel supported in teaching numeracy across the region, but they reported being less confident and supported in teaching literacy, particularly the areas of reading comprehension and writing. The data also suggest that there are systemic challenges that face teachers and students in terms of availability of resources, including an adequate supply of qualified teachers in some parts of the region.

8. 2 Methodological Framework

Chapter 2 discusses key methodological inputs for PILNA 2018. The overall methodology of PILNA 2018 provides a comparative analysis of data with the Pacific regional benchmarks, student performance on PILNA 2012 and 2015, and student performance of countries in the region as a whole. An important element is that country-to-country comparison is NOT a component of the programme, as explicitly directed by FEdMM in 2014.

As described at the outset of this report, the Pacific region is one of the world's largest and most diverse regions. Given the extreme variations across the countries participating in PILNA, the sampling design is a complex process. It uses a census approach for the relatively smaller countries, and a sampling approach for a number of the larger countries included in the study.

Participating countries were given the opportunity to have the 2018 PILNA instruments translated, in line with the definition of literacy in the regional benchmarks. After considering their individual language policies and the language of instruction/ testing at both Year 4 and Year 6, nine countries opted for a translation.

Student outcomes were reported on a single uniform metric scale that was constructed to achieve two main goals: first, to provide descriptions of what students can do at various points along the scale; and second, to show student achievement by year level in a way that can be reported and interpreted consistently across all participating populations. A set of proficiency scale levels developed in the analysis of PILNA 2015 were refined and extended, based on the item-to-skill mapping and placing the items on a Guttmann Structure (i.e. ordering the items by difficulty and establishing level cut-offs based on skill and content grouping of the items). The proficiency scale levels give education stakeholders information about what students know and can do at particular points in their learning.

Finally, expected minimum proficiency levels in literacy and numeracy were developed in 2015 to provide a reference point for the countries to indicate the minimum standard of achievement for students who have gone through four and six years of schooling. The process of setting the expected levels entailed discussing the learning outcomes on the proficiency scale, focusing on the specific skills and knowledge that are represented at each level of the scale. These expected levels have been applied retroactively to PILNA 2012 results and are applied again to PILNA 2018 results, providing a constant comparator across the three PILNA cycles.

8.3 Summary of Cognitive Results

The numeracy results discussed in Chapter 3 of this report, and the Literacy results discussed in Chapter 4 paint a picture of the overall performance of Year 4 and Year 6 students in Literacy and Numeracy. The chapters go into significant detail about the distribution of students across the proficiency levels, the performance in each of the strands within literacy and numeracy, and the gender disaggregated performance of students. There are some significant points to note overall across the region.

NUMERACY

At the regional level there has been an upward trend instudent performance in numeracy between 2012 when the first PILNA was conducted and 2018, the most recent PILNA administration. In 2018, considerably more countries performed above the baseline (2015) regional mean than was the case in 2012. Moreover, the overall performance of the region, both as a whole and country by country, reveals generally increasing mean scores in numeracy over time, particularly at Year 6.

When looking at the distribution of students across the numeracy levels, the percentage of students reaching the higher levels (well above minimum expected levels) is also increasing from 2012 to 2018, indicating that many students are able to successfully answer even the most difficult items on the numeracy assessments. It is important to note that, while more students are achieving higher levels of numeracy proficiency in both Year 4 and Year 6 than was the case in 2012 or 2015, the lowest-performing students still lag behind their peers at the same rate as they progress through the year levels. Roughly 20% of boys, or one in five boys, at both Year 4 and Year 6 are performing below the minimum expected levels.

Broken down by strand, the numeracy performance of students across the region is quite uniform within the four numeracy strands. Both boys and girls in Year 4 and Year 6, had the best performance in the *operations* strand in terms of having the highest mean scores in each group, while the *data and chance* strand posed the most difficulty for students at both year levels with the lowest mean scores in each group. Between year levels, there is a difference of about 50 points in mean scores and that difference remains relatively constant across the strands and between genders, as one would expect, representing the growth that students experience in the time between Year 4 and Year 6.

LITERACY

As was the case with numeracy, literacy performance at the regional level has been trending upward since the

> ... the overall performance of the region, both as a whole and country by country, reveals generally increasing mean scores in numeracy over time, particularly at Year 6.

first PILNA administration in 2012. In 2018, the majority of countries have mean literacy scores above the 2015 baseline value with significantly more countries achieving above that baseline than in the two previous PILNA cycles, particularly at Year 6.

While the percentage of students achieving or exceeding minimum expected proficiency levels in literacy has risen since the first administration of PILNA in 2012, there are still significant numbers of students struggling. Over half of boys, and two out of five girls in Year 4 are not meeting minimum proficiency levels in literacy.

Across both Year 4 and Year 6, Pacific Island students perform slightly better in writing than they do in reading. This could be partially due to the fact that even very weak writing can be measured using the PILNA instruments. There was a deficit of lower-difficulty reading items that left the lowest performing 30% of students with no way to show even rudimentary reading competence.

8.4 Significance of results

On average, girls are performing significantly higher than boys in both domains (literacy and numeracy) and across strands. However, the size of the difference varies. In numeracy, the difference between boys' and girls' performance is relatively small at both year levels and across strands, with the exception of Year 4 *Operations* strand, where moderate differences between boys and girls are observed. In literacy, the gender differences are moderate for Year 4 across both strands (reading and writing), while large differences were noted in both reading and writing at Year 6.

While statistical significance is only one measure of whether results being compared are truly different from one another, it is an indicator of real difference and should be taken into consideration when looking at the results overall. When the Year 4 results show *small* differences between boys and girls and the Year 6 results show *large* differences between the gender groups, we need to understand why boys are not performing as well as girls as they move into the upper primary levels.

CODING AND ITEM ANALYSIS

PILNA has included item analysis using the Item Response Theory (IRT) from 2015 onward. Analysis of items at the field trial stage helps to ensure that all items used in the main studies perform well, measure the constructs they are intended to measure and do not bias particular groups within the test population. Analysis of the 2018 cognitive items showed that those items performed as expected, and that there are strong links between items for Year 4 and Year 6, as well as the links to previous PILNA assessments.

Coding provides a different kind of perspective on student responses to items. The coding data that was discussed in the previous chapters starts to paint a picture for teachers about where students struggle, and where students may have misconceptions about concepts. For example, the coding data for numeracy at the regional level showed that students demonstrated a fairly good grasp of place value concepts *in general* but when those ideas were paired with money concepts – solving problems involving money or using currency values in operations – the understanding

of place value seemed to be less strong. While there are many factors that can inform student responses at the regional level, at the national level the coding information coupled with item analysis and the comparison of sub-population data (geographic location, school authority and student language) provides more detailed insights into student learning.

8.5 Summary of Contextual Information

Chapters 5, 6 and 7 of the PILNA 2018 Regional Report add detail to the story of the PILNA results. Students who participated in PILNA, their teachers and the school leaders at their schools responded to questionnaires that, when analysed, provided context to the results exhibited through the cognitive instruments. While the questionnaire data provides general trend and association information at a regional level, the real strength of contextual data is in the information they can provide at national and sub-national levels — helping stakeholders to understand factors that impact on student literacy and numeracy achievement. The datasets from the questionnaires are rich, varied and complex and provide valuable information not only for the initial PILNA 2018 reporting but also for secondary reporting and investigation into student results in the months following the release.

> ...the real strength of **contextual data** is in the information they can provide at national and sub-national levels — helping stakeholders to **understand factors** that impact on student literacy and numeracy achievement.

STUDENTS AND THEIR CONTEXTS

Data from student questionnaires revealed that many students across the Pacific region have been involved in some form of early childhood education programme and some association was found between attendance in ECE programmes and performance on the literacy and numeracy assessments. Association was also observed between performance in literacy and numeracy and the involvement of caregivers in students' education. Student attitudes towards reading, writing, numeracy and school in general were also measured, with positive attitudes widely expressed by students across the region.

TEACHERS AND THEIR CONTEXTS

Teacher responses to questionnaires confirmed there is diversity across the region with respect to the number of years of teaching experience and qualifications held by teachers. The responses also showed that, although professional development has been provided to many teachers, as many as one in five of the students assessed were in classrooms where teachers had not participated in a professional development programme on reading (20%), writing (23%) or numeracy (23%). Teachers also indicated high levels of collaborative professional learning activity such as collaborating with other teachers within the school. However, many teachers reported never having had the opportunity to observe another teacher's teaching, to be mentored by another teacher or to mentor another teacher.

In terms of teacher practice, very high proportions responded positively to questions about lesson planning, assessment and providing individual feedback to students. Teachers also responded positively to questions about adequate time to teach reading, writing and numeracy. At the same time, 35% of students' teachers reported they did not have sufficient time to support the needs of slow learners.

Teachers reported that their confidence in teaching numeracy was considerably higher across the region than in teaching literacy.

SCHOOLS AND THEIR CONTEXTS

School leaders and teachers were asked about several aspects of school context that relate to resources available and barriers to student learning. Some questions were directed towards specific elements that can be quantified while other questions focused more on the perceptions of the respondents.

Resource availability ranged widely across the region. Approximately 40% of students had access to textbooks individually (one textbook to each student), while over 30% of students attended schools where either only the teacher had a textbook (25%) or there were no textbooks at all (8%).

In responding to barriers to student learning, school leaders identified shortages of instructional materials, as well as shortages of teachers, underqualified teachers and teacher absenteeism as factors hindering instruction for students. The PILNA 2018 data showed a negative correlation between the factors hindering instruction and student performance in literacy and numeracy, providing support to the perceptions of the teachers and school leaders

discussed previously.

8.6 Framing the Results

Student learning outcomes have long been a priority for education systems in the Pacific region. When PILNA was conceptualised prior to 2012, it was in response to a desire by elected officials and heads of education systems to understand the current state of student learning in literacy and numeracy. The second administration of PILNA in 2015 and the development of the PILNA programme of large-scale assessment was borne of a sense of urgency to address the findings of that first PILNA administration. In addition to understanding the current state of student learning in order to act in ways to make improvement, there are several key documents that frame how PILNA results are situated within the regional education context.

PACIFIC REGIONAL LITERACY AND NUMERACY BENCHMARKS

In 2006, curriculum officers from Pacific Island countries gathered to agree on expected learning outcomes for students at the end of 2, 4, 6 and 8 years of education. These outcomes were built from a consensus among the countries present as to what was expected at each year level, based on the curriculum documents and policies of the day. The resulting documents were collectively known as the Pacific Regional Literacy and Numeracy Benchmarks. These benchmarks provided the basis for the development of items and the analysis of student performance for the first PILNA cycle in 2012.
In 2016, curriculum officers specialising in literacy and numeracy from each of the 15 PILNA countries gathered to review the benchmarks, which were at that point 10 years old. While the descriptors were refined somewhat to reflect the language of outcomes-based curricula and a less quantitative approach to the expectations, the group found that for the most part, the expectations with respect to literacy and numeracy had remained reasonably constant, in spite of renewal of curriculum in many countries during the 10 year period from 2006 to 2015. The instruments and analysis of PILNA 2018 are based on the Pacific Regional Literacy and Numeracy Benchmarks as agreed by the curriculum officers and endorsed by the heads of systems at the Pacific Board for Education Quality (PBEQ) meeting in March 2017.

PACIFIC REGIONAL EDUCATION FRAMEWORK (PACREF)

The Forum Education Ministers' Meeting (FEdMM) provided the mandate to develop and administer the original PILNA study in 2012. FEdMM provided the mandate again in 2014 for the 2015 PILNA administration and the development of a longer-term regional assessment programme. This mandate continues under the 2018 Pacific Regional Education Framework (PacREF) wherein one of the four key priority areas is *student outcomes and wellbeing*. PILNA provides a tool to track student outcomes at two key levels: the end of four years and the end of six years of formal education. PILNA is also a set of instruments to collect and provide a wide range of data to help education systems around the region to understand student performance, the issues those systems face and possible ways in which to address those issues.

SUSTAINABLE DEVELOPMENT GOAL 4

The Millennium Development Goals of 2000 attracted a focus on the issue of access to education. While notable progress was made in terms of getting students into school over the period from 2000 to 2015, many students were still leaving primary school without the basic literacy and numeracy skills needed for future success. With the development of SDG4, attention has now shifted to the quality of education, as well as access. Target 4.1 focuses on universal primary and secondary education: that is by 2030, ensure that all girls and boys complete free, equitable and quality primary and secondaryeducation leading

to relevant and effective learning outcomes. Under this target, PILNA is one of nine cross-national learning assessments identified by the UNESCO Institute for Statistics that meet the criteria to measure SDG4 Indicator 4.1.1, the proportion of children and young people achieving minimum proficiency in reading and mathematics.

NADI DECLARATION (CCEM 20, 2018)

The Nadi Declaration, coming out of the Conference of the Commonwealth Education Ministers (CCEM) in February 2018, also highlights the need for member states to pay close attention to literacy and numeracy outcomes for students, and to addressing the gender gaps that exist in the performances of boys and girls. PILNA is one tool that highlights student performance overall and brings focus to performance differences between subgroups of students – by gender, by geography and by school authority.

Common across all of the various declarations, frameworks and strategies is the desire to understand and respond to challenges at all levels and to improve the quality of literacy and numeracy education for students in the Pacific region.

8.7 Discussion of the Findings

This report has discussed in depth the literacy and numeracy performance of students who have completed four and six years of schooling. In general, results showed improvement in literacy performance over the three PILNA cycles at both year levels and improvement in numeracy performance over the three PILNA cycles for Year 6. The results also showed the continued prevalence of a gender gap wherein girls are outperforming boys in both literacy and numeracy at both year levels. This section discusses the overall findings of PILNA 2018 across domains and with the inclusion of information from the contextual questionnaires and coding of cognitive items.

In total, the results of 19,247 Year 4 students and 19,171 Year 6 students were analysed for the 2018 PILNA numeracy test while the results of 19,041 Year 4 students and 19,084 Year 6 students were analysed for the 2018 PILNA literacy test.

GROWTH NOTED IN BOTH LITERACY AND NUMERACY OVER THE THREE PILNA CYCLES (2012, 2015, 2018)

The 2018 PILNA results can be viewed based on the proficiency levels described in Chapter 2 of this report and in doing so, one can see trends emerging across the three PILNA cycles. The expected minimum proficiency level described in each domain for each year level provides a sense of what students at that particular point in their education should know and be able to do in both literacy and numeracy. By definition, these are minimums and it is fully expected that a large proportion of students at each level will exceed the minimum expectations, which is why we look at the distribution of students at the higher proficiency levels as well. The regional trend has seen a greater proportion of students reaching the highest levels in both literacy and numeracy over the three PILNA cycles. This is a positive trend. Similarly, the proportion of students who are not yet performing at the minimum expected levels in literacy at both Year 4 and Year 6 is decreasing, suggesting that efforts to address the needs of the lowest performing students are having a positive impact overall.

In the numeracy domain, the proportion of students achieving or exceeding the minimum expected proficiency level is already quite high at both Year 4 and Year 6. While the trend towards higher proficiency levels is evident in Year 6, possibly in part due to the previously discussed revisions to the instruments to include more *geometry,* and *data and chance* content, the distribution of students across the proficiency levels in Year 4 has remained constant from 2015. At the same time, there is still considerable improvement from the first PILNA administration in 2012.

In the literacy domain, the proportion of students achieving or exceeding the minimum expected proficiency level is considerably lower than in numeracy with only 53% of Year 4 and 63% of Year 6 students reaching those levels regionally. There is still a trend towards improvement over the three PILNA cycles, as indicated both by the distribution of students across the proficiency levels and in the scores across the strands of reading and writing. However, the distribution of student results mapped against the individual PILNA literacy items shows that the lowest performing 30% of students are unable to engage with even the simplest reading items on the instruments, indicating performance that is well below the minimum expected proficiency levels. The development of PILNA items for future cycles that reach well below the minimum expected proficiency levels for Year 4 students will allow for the measurement of what those lowest achieving students are able to do with respect to reading comprehension. Overall, addressing the needs of those lowest achieving students remains a serious concern for the region.

It is encouraging to note that teachers report they are confident in their teaching of numeracy across the region with over 90% of students' teachers finding numbers and patterns and place value easy or very easy to teach. These two areas correspond with the *numbers* strand in PILNA which, at a regional level, along with *operations* and *measurement and geometry,* were consistently performed by students. Students had the lowest performance across the region on the Data and Chance strand. Students' teachers expressed high levels of confidence in teaching operations as well as measurement concepts but teachers

reported considerably lower levels of confidence in teaching fractions, geometry, data and chance.

In teaching literacy, teachers report high levels of confidence in some aspects of reading and writing, particularly those dealing with the fluency of reading and the mechanics (grammar, spelling, punctuation) of writing. Teachers expressed lower levels of confidence about the teaching of reading comprehension, and in writing they also reported lower levels of confidence in teaching both the quality of ideas in as well as organisation and structure. While over 80% of students' teachers have indicated participation in professional development in reading and in writing at least once over the past three years, student results and teacher expressions of confidence indicate a need for further teacher support, particularly in the areas of reading comprehension and quality of writing ideas and organisation.

Almost 90% of teachers indicated having had access to teaching support over the past three years through curriculum delivery workshops, in-school professional development and the provision of instructional/curriculum materials.

MANY STUDENTS STRUGGLE TO ACHIEVE MINIMUM EXPECTED LEVELS IN NUMERACY AND LITERACY

Greater proportions of students at both Year 4 and Year 6 are reaching the higher proficiency levels and are at or above the expected proficiency levels. And, as would be expected, substantial improvement is observed as students progress from Year 4 to Year 6. The mean scores in numeracy for Year 6 students across the domains of literacy and numeracy and in each domain strand is approximately 50 points higher for Year 6 students than for Year 4 students. However, as discussed previously, groups of students still struggle to achieve at the minimum proficiency levels in both numeracy and literacy. UNESCO highlights a figure of more than a quarter of a billion students worldwide failing to achieve basic literacy and numeracy skills by the end of primary school.[28] Unfortunately, 37% of Year 6 students in the Pacific region are failing to achieve in literacy, and 17% of Year 6 students are failing to achieve in numeracy.

Between Year 4 to Year 6, we would expect students overall to show growth in terms of their literacy and numeracy skills. It would also be expected that as students mature and progress through the school system, interventions would support students in achieving the minimum expectations in greater numbers over time. In literacy, this appears to be the case; 47% of students at Year 4 did not meet expected minimum proficiency levels and that dropped to 37% at Year 6. In numeracy however, the 17% of students not meeting minimum expected proficiency remained constant from Year 4 to Year 6. These results suggest that education systems need to address the needs of the region's lowest performing students.

Teachers acknowledge the challenge of addressing the needs of the lowest performing students in their responses to the PILNA questionnaire. Just under 80% of teachers indicated having sufficient time to teach literacy and numeracy, but only 65% of teachers indicated that they had sufficient time to work with slow learners. This indicates that when teachers have limited time, those students who need more teacher time and support are likely to be negatively affected.

Teachers and head teachers also identified lack of instructional resources as a barrier to learn-

28. UNESCO Global Education Monitoring Report 2019, p. 120

Critical thinking and problem solving remain issues for students in both literacy and numeracy.

ing in classrooms and schools across the region. In 2018, 54% of students attended schools where lack of instructional resources was identified as a barrier to learning, while 48% of students attended schools where a shortage of qualified teachers was identified as a barrier to student success. For students who are already struggling, shortages of resources,whether they be teachers or textbooks, adds to the challenges they must overcome. Twenty-nine per cent of students attended schools where lack of student background knowledge and skills was identified as a barrier to student learning, regardless of whether that lack was a product of home, school or community factors.

Teacher self-efficacy is a possible factor when considering those students struggling to meet the minimum expected levels of proficiency. While teachers indicated that they found many aspects of literacy and numeracy easy to teach, they also indicated less facility with the area of reading comprehension. For students who struggle, this presents a considerable obstacle to learning in both literacy and numeracy. The analysis of the PILNA 2018 results revealed a strong association between reading comprehension and the capacity of students to engage with numeracy items in the form of word problems. If time, resource and teacher capacity issues are also present, those lowest performing students will continue to be underserved by the education systems.

A significant cohort of students stand out as being particularly at risk of being unserved by the education systems of the region. The PILNA 2018 results show that one in four (24%) Year 6 students did not even meet the minimum expectations for Year 4 in literacy, seriously limiting their prospects for educational success into the future.

GIRLS OUTPERFORM BOYS SIGNIFICANTLY AROUND THE REGION IN BOTH LITERACY AND NUMERACY

Similar numbers of boys and girls in Year 4 and Year 6 participated in PILNA 2018. At the regional level, girls outperformed boys in numeracy in both Year 4 and Year 6, although the difference was minimal. Girls also performed better than boys at both year levels in all the strands. There was a slight difference in the distribution of boys and girls across the proficiency levels: a slightly higher proportion of girls than boys in the upper proficiency levels in both Year 4 and Year 6, and more boys than girls in the lower proficiency levels at Year 4 and Year 6.

In literacy, the differences by gender were much more pronounced. The mean scores in literacy for girls in Year 6 were 26 points higher than those of boys in reading and 35 points higher than boys' mean scores in writing. While those numbers may not seem large, it is worth noting that the difference in mean scores between Year 4 and Year 6, reflecting two additional years in school, is only 50 points. At the Year 4 level, the mean score differences between boys and girls were similar, girls achieving mean scores 24 points higher than boys in reading and almost 30 points higher than boys in writing. The proportion of boys achieving minimum expected proficiency levels in literacy was 15% lower than that of girls in Year 4 and 16% lower than that of girls in Year 6.

While the gender differences in the distribution of stu-

dents across the proficiency levels in numeracy remained relatively proportional, the same cannot be said of literacy. At the minimum expected literacy levels for both Year 4 and Year 6, boys and girls were equally represented. Moving up the levels, however, there were considerably more girls at the highest levels of the literacy scale and considerably more boys at the lowest levels. Thirty-one per cent of Year 6 boys were still below the minimum proficiency levels for Year 4 literacy compared to 17% of Year 6 girls. What this means is that almost one in three boys in Year 6 have not met the minimum expectations for Year 4 in literacy.

CRITICAL THINKING AND PROBLEM SOLVING REMAIN ISSUES FOR STUDENTS IN BOTH LITERACY AND NUMERACY

Coding of student responses, an addition to PILNA that was fully implemented for the first time in the 2018 administration, provided information about gaps in understanding as well as misconceptions across the set of PILNA items. While looking at items individually has minimal value in the context of a regional report, the coding stories found in chapters 3 and 4 serve to illustrate some of the findings of the coding process.

Looking at the set of 2018 PILNA items, there are some themes that emerge in literacy and numeracy, as well as across the domains, that paint a picture of students' persistence as well as their achievement. As described in the earlier chapters, codes were applied to capture student responses to each item. In each case, a Code 9 was used if a student did not attempt to answer a question. The frequency of Code 9 in literacy was very low across both Year 4 and Year 6 suggesting that students made an attempt at answering all the questions, engaging with them in some way. In numeracy, however, between 10% and 15% of both Year 4 and Year 6 students did not attempt to answer the word problems, particularly those involving multiplication or division.

Reading comprehension questions found in the PILNA instruments are classified into three areas according to what is being measured. Students in both Year 4 and Year 6 generally performed well on items requiring them to identify information from a text. Students performed less well on items that required them to interpret what they had read (sometimes called 'reading between the lines') and those items requiring critical thinking. In both interpretation and critical analysis questions, over 50% of students were unable to provide the expected response. In the case of critical analysis questions, students were frequently unable to provide a reason or an explanation for a response.

> The PILNA 2018 results revealed a **strong association** between **READING COMPREHENSION** and the capacity of students to engage with **NUMERACY** items in the form of **WORD PROBLEMS**.

A similar trend was observed in the coding of numeracy items. In Year 4, students struggled with items focused on place value, particularly those requiring comparison and/or rounding of numbers that require making judgements about the numbers in question. At Year 6, students overwhelmingly (often 70% or more) struggled with questions that required interpretation and reasoning, such as problems requiring students to decide on and apply an operation. In both a literacyand numeracy, the coding suggests that students struggle when required to think critically in order to respond to questions. The link between reading comprehension and numeracy performance is part of the issue, but PILNA data indicates that problem solving and critical thinking skills appear to be a challenge for many students in the Pacific region.

Questionnaire data previously discussed also relates to the challenges revealed through the coding. Lower levels of confidence in teaching reading comprehension suggest that interpretation and critical thinking are potentially more difficult for teachers to address with students than the skills for identifying information. Shortages of resources may also contribute to the challenges when students are unable to access materials to support and review their learning beyond the specific point in time at which the teacher addresses the material with the class. Additionally, language may affect student learning about difficult concepts. Across the region, countries selected the language for the PILNA instruments based on their own language policies regarding the language of instruction. When teachers were asked about language use in the classroom over 75% responded that they frequently use a language other than the language of instruction to explain difficult concepts to students. Since assessment occurs in

the language of instruction, there may be added challenges for students when encountering those same concepts in assessment situations.

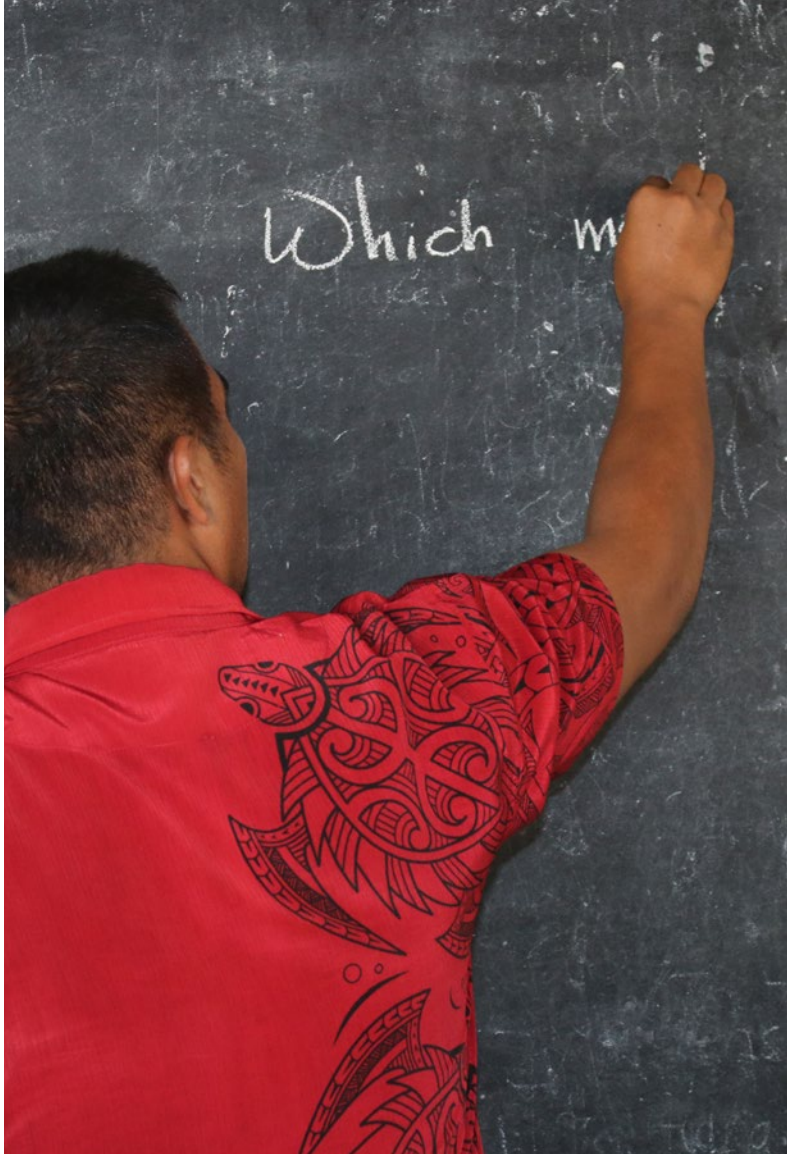
8.8 Recommendations

Tracking the evolution of student learning outcomes in literacy and numeracy over time can help the Pacific region monitor how students are improving in relation to the regional benchmarks renewed in 2016. Importantly, PILNA addresses targets identified in the PacREF, Nadi Declaration and SDG4 by analysing and measuring results that provide evidence of education quality for national governments and regional organisations to develop interventions that have the potential to support students in improving their skills in literacy and numeracy. The following recommendations are broad and applicable across the region. Action on any of these recommendations could be taken up by individual countries; or, perhaps two or more countries could work in partnership to develop intervenions or frameworks to work toward improving student learning outcomes.

Educational stakeholders are advised to review PILNA evidence and trends across the three PILNA cycles both regionally and nationally, and consider intervention strategies for students performing at the lower end of the proficiency scale, particularly in literacy.
Data provided at PILNA country and regional levels provide a robust evidence base to support decision-making and policy development at the system, school and,potentially, classroom levels.

Education authorities from the PILNA countries and EQAP are advised to include literacy items to reach students performing at the lower end of the proficiency scale. PILNA data shows that in spite of efforts to ensure the lowest performing students could engage with the simplest reading text, 30% of students were unable to do so. Items at the lower end of the scale will provide more specific information on the literacy proficiency of those students and better inform efforts to provide interventions to support those learners.

To make certain that results are available and used for targeted intervention, education authorities are advised to expand their dissemination approaches when reporting the results of the study, making certain that results reach the classroom for targeted intervention as well as key stakeholder groups such as teacher training institutions and national education sector programmes. At the country level, PILNA has also investigated the performance of students based on school authority and school location as well as with respect to language. Country level data, both



cognitive and contextual, provides a key source of information on student learning outcomes and contexts that could support potential intervention strategies.

Education stakeholders and EQAP, are strongly encouraged to explore the PILNA data as it applies to gender differences. While the regional report identifies persistent performance gaps between boys and girls, the PILNA coding data and contextual data can be further mined and analysed to provide additional information about gender differences.

Education authorities are strongly encouraged to identify and adopt intervention strategies that improve the achievement of boys, especially in literacy. In the process of identifying strategies, it is recommended that deeper analysis of PILNA regional and national results as well as other data be undertaken in an effort to understand the underlying issues facing boys in literacy in the region. Targeted intervention should be designed based on evidence from a range of sources, with PILNA providing a key source of data on student learning outcomes.

Education stakeholders and EQAP are strongly encouraged to continue the implementation of contex-

tual questionnaires as part of a long term assessment-programme, including the addition of country-specific items. Questionnaire data enables deeper investigation of difference observed by gender, school type, school location or language. In the future, locally determined questionnaire items can support education authorities in their exploration of performance of subgroups of students and the possible impacts of factors on the student learning outcomes.

Education authorities and teacher training institutions are advised to review PILNA evidence, particularly as it relates to teacher self-efficacy and pedagogy, to support teachers in meeting the diverse needs of students. Pre-service teacher education programmes and in-service professional development programmes are well situated to address challenges identified by teachers and school leaders as well as providing teachers with skills to address student misconceptions and gaps in learning.

Education authorities and education stakeholders are strongly encouraged to utilise the PILNA coding data to support interventions that will lead to improved student achievement in literacy and numeracy. A coding process provides information about why some incorrect responses are more frequently provided by students than others. This process has the potential to enable teachers and school leaders to understand how and why their students may be responding to questions in particular ways. Such information can be shared with classroom teachers who can use the data to address misconceptions by students on specific topics, with teacher training and professional development providers to support teachers in addressing students facing persistent challenges and with curriculum officers to provide support to schools and teachers.

Regional and national education leaders and FEdMM are strongly encouraged to continue the use of the regional uniform metric as a way to track progress and trends in student learning outcomes. Measuring learning outcomes on a proficiency scale enables all education stakeholders – teachers, students, parents, local, national and regional authorities – to gather evidence about what students know and can do at a particular stage in their learning development.

Education authorities from the PILNA countries and EQAP are advised to expand and extend the regional uniform metric to capture the extremes of student performance. The current proficiency scale is based on the Pacific Regional Benchmarks for Literacy and Numeracy. The PILNA 2018 data suggest that in numeracy in particular, student performance may in fact extend beyond the upper limits described by the scale and the range of student performance could be better described through the extension of the scale.

Regional education stakeholders are strongly encouraged to support an ongoing PILNA that has the power to provide robust evidence to policymakers with richer data from which to develop policies and intervention strategies to improve student learning outcomes. Innovations implemented in 2015 and 2018 such as coding, on contextual questionnaires and the developing of a regional uniform metric enable policymakers to explore in-depth the data about student learning outcomes and make decisions about aspects of a country's education situation.

Education stakeholders are advised to investigate ways in which the robust and valid data provided by PILNA can support the improvement of student learning outcomes. Government commitment can provide support and guidance

to teachers in translating data into useful information for better results in students' achievement. A variety of reports pitched at different stakeholders (parents, teachers, students,
provincial authorities and national authorities) has the potential to provide broad community and political support. This recommendation also has the potential to provide more in-depth information about student learning outcomes and student background in the future.

This 2018 report has provided an analysis of the literacy and numeracy skills of students who have completed four and six years of formal schooling. PILNA developed a regional uniform metric in 2015, and thereby explored changes in student achievement in the Pacific over time, between 2012 and 2018. The analysis of trends over the three cycles of PILNA, together with the contextual and coding information collected in 2018, has the potential to enable policy-makers to make informed, evidence-based decisions about how to improve the learning outcomes of students across the Pacific region.

“(PILNA) has the potential to enable policy-makers to make informed, evidence-based decisions about how to improve the learning outcomes of students across the Pacific region.

APPENDIX

APPENDIX A:

2016 Regional Benchmarks for Literacy and Numeracy

The Literacy and Numeracy components of PILNA are based on the Regional Benchmarks for Literacy and Numeracy which were developed collaboratively in 2006 by SPBEA (now EQAP), UNESCO, UNICEF and the Heads of Education Systems or their representatives from 15 countries in the Pacific. The literacy and numeracy benchmarks were derived from the curriculum skill components, elements and learning outcomes that were determined to be common across the national English and Mathematics curricula in the 15 countries. In 2007, at the Forum Education Ministers (FEdMM), the benchmark standards were endorsed by the Ministers as the Regional Benchmark for Literacy, Numeracy for Years 2, 4, 6 and 8 for the Pacific. Apart from the benchmarks in literacy and numeracy, the benchmarks for life-skills was also endorsed in 2007.

The 2006 Regional Benchmarks were used as the basis for the 2012 and 2015 PILNA cycles.

Since 2006, revisions have been made to primary curricula in some countries and it was imperative that Pacific countries come together again to review the Regional Benchmarks before the next cycle of PILNA.

Overview

The review of the 2006 benchmarks was collaboratively carried out by EQAP, ACER and two (1 literacy and 1 numeracy) curriculum representatives from each of the 15 Pacific countries in the week of 26th to 30th September, 2016 at Tanoa Hotel in Nadi.

Literacy and Numeracy are more than just "reading, writing and arithmetic" which these have been traditionally associated with. The understanding now is that literacy includes the capacity to read with understanding, write and critically appreciate various forms of communication, including spoken language (in whatever language one is comfortable with), printed text and media. Numeracy is not limited only to the ability to use numbers, use the four operations (addition, subtraction, multiplication and division) but numeracy also encompasses the ability to use mathematical understanding and skills to solve problems in everyday life. Numeracy includes the ability to think and communicate quantitatively, make sense of data, have spatial awareness, understand patterns and sequences and to recognise situations where mathematical reasoning can be applied to solve problems. These benchmarks encompass the common broad learning outcomes that set out the knowledge, skills, understanding, values and capacities that Pacific students should have the opportunity to learn and develop in literacy and numeracy.

2016 REGIONAL BENCHMARK FOR LITERACY

These benchmarks are not curriculum in itself but contains indicators in areas of language and mathematics curriculum which are necessary in understanding other aspects of
learning in order to effectively participate in society.

PACIFIC DEFINITION OF LITERACY:

"Knowledge and skills necessary to empower a person to communicate through any form of language of their society and the wider world, with respect to all aspects of everyday life."

A person is considered to be functionally literate if she/he has the necessary knowledge and skills to be able to:

- effectively communicate in various forms for a variety of purposes.
- use critical and creative thinking strategies when engaging in a range of contexts.
- gain meaning from a range of oral, written and visual texts become an active lifelong learner to contribute and participate in and beyond her/his society

A literacy status of a person between the ages of 6 to 14 years will be determined nationally and regionally (if required) by referencing his/her literacy skills to the benchmark indicators outlined below. However, a person is considered to be functionally literate if he/she has completed four years of formal education and has met the literacy benchmark outlined for Year 4.

STRAND	YEAR 2	YEAR 4	YEAR 6	YEAR 8
READING	Understand and respond to texts with simple content and a highly predictable structure.	Understand and engage with a variety of texts with some complexity of ideas and a less predictable structure.	Use comprehension strategies to interpret and evaluate a variety of texts of increasing complexity in content and structure.	Use higher order thinking skills to respond critically to a variety of texts that have subtle and/or unfamiliar content, and complex language structures and textual features.
WRITING	Illustrate and write ideas using basic writing conventions.	Present ideas and information using mostly simple sentences and paragraphs to create a range of texts.	Use a variety of writing conventions to present ideas and information on a wide range of topics and text types.	Use more complex language structures to present ideas and information about a wide range of topics/experiences for different purposes.
LISTENING	Use listening strategies to understand and respond to aural/spoken texts of limited complexity.	Use listening strategies to understand and respond to aural/spoken texts of some complexity from a variety of settings, experiences and learning contexts.	Use listening strategies to understand, evaluate and respond to a wide variety of aural/spoken texts of increasing complexity in content and structure.	Use listening strategies to understand and engage critically with a wide variety of aural/spoken texts with subtle and/or unfamiliar content and a complex structure.
SPEAKING	Use basic language structures to express ideas and personal experiences.	Use language structures of some complexity to convey ideas and experiences in a variety of contexts.	Use more complex language structures to effectively communicate ideas and experiences in a variety of contexts.	Use increasingly more complex language structures to effectively communicate ideas and experiences in a wide variety of contexts.

2016 REGIONAL BENCHMARK FOR NUMERACY

PACIFIC DEFINITION OF NUMERACY:

"Knowledge and skills necessary to empower a person to to be able to use mathematical processes, as well as the language of mathematics, for a variety of purposes, with respect to everyday life."

A numerate person is empowered to:

- develop strong number sense through application of knowledge, skills, concepts and processes.
- communicate using the language of mathematics to share information and ideas.
- make connections within and outside of mathematics contexts.
- solve problems by employing creative, strategic and critical thinking to reason mathematically and justify findings.
- apply knowledge to investigate, interpret, explain and make sense of the world in which they live.

The numeracy status of a person between the ages of 6 to 14 years will be determined nationally and regionally (if necessary) by referencing his/her numeracy skills to the benchmarks indicators outlined below. However a person is considered numerate if he/she has completed four years of formal education and has met the numeracy benchmark outlined for Year 4.

	YEAR 2	YEAR 4	YEAR 6	YEAR 8
NUMBERS	• Recognise and represent groups of objects with numbers and symbols. • Identify and interpret patterns, number sequences and relationships. • Recognise the face value of money in the local currency.	• Recognise, represent and compare quantities. • Use place value to show an understanding of the number system. • Interpret number sequences using simple rules to solve problems. • Understand equivalence between fractions.	• Demonstrate understanding of numbers and their magnitude, properties and relationships. • Interpret relationships and properties of number sequences and fractions expressed in different forms.	• Apply and use rational numbers and relationships between them in real life situations. • Identify and demonstrate understanding of number sequences and number patterns to solve problems set in a range of different contexts.
OPERATIONS	• Recognise and apply basic arithmetic operations by using a range of counting, grouping and equal sharing strategies with whole numbers.	• Use various representation and demonstrate mathematical skills to solve problems involving arithmetic operations.	• Demonstrate mathematical skills in linking various arithmetic operations to solve problems set in a range of familiar • situations.	• Apply and express mathematical skills in solving problems involving arithmetic operations using a range of strategies.
MEASUREMENT & GEOMETRY	• Use mathematical language to represent a range of measurable quantities. • Use spatial knowledge and skills to describe and compare physical attributes of common and familiar objects in real life situations.	• Develop awareness of different measurable quantities, units of measure and conversion between them, and measurement tools. • Show spatial and geometric skills by measuring and calculating with physical attributes of common objects and events, and by comparing and working with properties of shapes and figures.	• Develop and use patterns and rules to facilitate calculation with measurable quantities • Work with properties of geometric figures and objects.	Use formulae to represent measurable properties of shapes and figures and relationships between those properties and to perform calculations.
DATA	Collect, classify and represent sets of familiar objects in different ways and interpret the results through discussion.	• Collect, organise, represent and interpret data in various ways.	• Collect and represent data in tables and graphs • Interpret and analyse results. • Recognise and use mathematical language related to common and familiar chance events.	• Calculate and use different measures of central tendency and dispersion for a dataset • Represent and interpret variation in data to analyse and make inferences about information represented. • Calculate probability of events from simple experiments and make inferences.

TABLE B.1 Students' reported attendance at an early childhood education programme and associations with achievement

COUNTRY*	PERCENTAGE OF STUDENTS THAT ATTENDED PRE-SCHOOL										Correlation with numeracy				Correlation with literacy			
	Overall		Grade 4		Grade 6		Girls		Boys		Grade 4		Grade 6		Grade 4		Grade 6	
A	62	(1.3) ▼	61	(1.5) ▼	63	(2.1) ▼	64	(1.7) ▼	61	(1.6) ▼	-0.02	(0.03)	-0.02	(0.03)	0.02	(0.03)	0.02	(0.04)
B	65	(1.4) ▼	67	(2.0) ▼	62	(1.7) ▼	66	(1.7) ▼	63	(1.4) ▼	-0.03	(0.02)	-0.01	(0.02)	-0.03	(0.03)	0.03	(0.03)
C	74	(1.3)	76	(2.2)	72	(2.0)	76	(1.3)	72	(1.7)	0.04	(0.05)	-0.03	(0.04)	-0.02	(0.04)	0.03	(0.04)
D	75	(1.3)	72	(9.8)	79	(5.2)	80	(1.4)	69	(4.9)	-0.14	(0.34)	**0.42**	(0.12)	-0.03	(0.28)	**0.61**	(0.07)
E	76	(1.4)	76	(2.1)	76	(2.0)	77	(1.7)	75	(1.9)	0.01	(0.05)	0.06	(0.04)	0.07	(0.04)	**0.14**	(0.05)
F	76	(5.1)	85	(3.5)	70	(6.9)	89	(3.9)	63	(8.4) ▼	0.16	(0.15)	0.24	(0.15)	-0.10	(0.13)	-0.04	(0.22)
G	80	(1.9)	73	(2.7)	85	(3.4)	82	(2.2)	77	(3.3)	0.03	(0.06)	0.06	(0.06)	0.02	(0.10)	0.00	(0.07)
H	80	(1.2)	76	(2.1)	84	(3.3)	81	(1.8)	79	(1.5)	0.08	(0.05)	0.09	(0.05)	0.09	(0.05)	-0.02	(0.05)
I	83	(10.7)	82	(12.7)	85	(8.1)	88	(12.2)	79	(11.1)	**0.25**	(0.04)	0.34	(0.61)	0.05	(0.03)	0.10	(0.39)
J	85	(1.0)	86	(1.1)	84	(1.4)	87	(1.1)	83	(1.2)	**0.12**	(0.03)	0.05	(0.03)	**0.12**	(0.03)	**0.07**	(0.03)
K	87	(1.2)	86	(1.6)	88	(1.7)	90	(1.2)	84	(1.7)	0.05	(0.06)	0.03	(0.03)	**0.14**	(0.05)	**0.10**	(0.04)
L	87	(0.8)	86	(1.0)	88	(1.0)	88	(1.1)	87	(0.8)	**0.05**	(0.02)	**0.08**	(0.03)	0.05	(0.03)	**0.09**	(0.03)
M	88	(1.5)	89	(2.2) ▲	87	(1.5)	88	(2.6)	88	(1.5) ▲	0.11	(0.07)	0.05	(0.10)	**0.12**	(0.06)	0.06	(0.07)
N	88	(1.0)	89	(1.3) ▲	87	(1.3)	89	(1.3)	88	(1.0) ▲	0.05	(0.03)	0.04	(0.04)	0.03	(0.03)	0.05	(0.04)
O	89	(2.4) ▲	87	(1.4)	91	(3.5) ▲	89	(2.7)	88	(3.2) ▲	**0.16**	(0.08)	-0.05	(0.07)	0.11	(0.06)	0.05	(0.07)
Small Island States	82	(0.9)	80	(1.8)	85	(1.9)	84	(1.1)	80	(1.7)	0.07	(0.05)	**0.22**	(0.06)	0.06	(0.04)	**0.22**	(0.05)
Regional average	79	(0.7)	78	(0.7)	79	(1.0)	80	(0.7)	77	(1.0)	0.04	(0.02)	**0.05**	(0.02)	**0.05**	(0.02)	**0.07**	(0.03)

* Countries arranged in ascending order of student percentage that attended pre-school.

() Standard errors appear in parentheses.

Statistically significant correlation coefficients ($p < 0.05$) are displayed in bold

▲ More than 10 percentage points higher than regional average

▼ More than 10 percentage points lower than regional average

APPENDIX C:

TABLE C.1 Percentage of students attending schools where early childhood education is available in the school and/or the community

COUNTRY*	PRINCIPAL REPORTS OF EARLY CHILDHOOD EDUCATION AT SCHOOL (%)			AVAILABILITY OF EARLY CHILDHOOD EDUCATION IN COMMUNITIES											
				COMMUNITY-BASED EARLY CHILDHOOD EDUCATION (%)			HOME-BASED EARLY CHILDHOOD EDUCATION			GOVERNMENT-BASED EARLY CHILDHOOD EDUCATION			EARLY CHILDHOOD EDUCATION AVAILABILITY IN COMMUNITY OVERALL		
A	43	(6.7)	▼	88	(6.5)	▲	50	(8.9)	▲	27	(6.0)	▼	89	(6.0)	▲
B	48	(3.8)	▼	43	(4.2)	▼	21	(3.2)		38	(3.4)		64	(3.7)	▼
C	49	(4.0)	▼	57	(5.0)		20	(5.1)		29	(3.7)	▼	69	(3.7)	
D	59	(3.5)		60	(3.7)		19	(2.9)		22	(2.3)	▼	70	(3.5)	
E	72	(17.9)		67	(12.3)	▲	18	(9.9)		54	(16.6)	▲	88	(4.2)	▲
F	83	(2.6)	▲	74	(3.8)	▲	7	(3.5)	▼	33	(4.6)	▼	84	(3.3)	
G	86	(3.4)	▲	15	(2.9)	▼	6	(2.8)	▼	84	(3.4)	▲	88	(3.2)	▲
H	90	(1.8)	▲	59	(3.8)		26	(4.5)		57	(4.7)	▲	78	(3.7)	
I	96	(1.9)	▲	65	(5.0)		32	(4.2)	▲	54	(5.3)	▲	88	(3.0)	▲
SIS	56	(4.6)	▼	38	(3.9)	▼	3	(0.9)	▼	35	(3.8)		60	(4.8)	▼
Regional average	68	(2.1)		57	(1.8)		20	(1.7)		43	(2.1)		78	(1.3)	

* Countries arranged in ascending order of principal reports of early childhood education at school.

() Standard errors appear in parentheses.
▲ *More than 10 percentage points higher than regional average*
▼ *More than 10 percentage points lower than regional average*

APPENDIX D:

TABLE D.1 Percentage of students whose caregivers have involvement in their school work

	GRADE	NEVER		SOMETIMES		MOST OF THE TIME		ALL OF THE TIME	
Check that your home-work is complete	4	18	(0.6)	36	(0.8)	13	(0.5)	32	(0.9)
	6	15	(0.6)	39	(0.7)	15	(0.3)	30	(0.8)
Help you with your homework	4	15	(0.7)	40	(0.8)	16	(0.5)	29	(0.7)
	6	13	(0.4)	45	(0.7)	18	(0.4)	24	(0.5)
Ask you about your school work	4	16	(0.6)	36	(0.7)	17	(0.7)	31	(0.7)
	6	12	(0.4)	36	(0.6)	19	(0.5)	33	(0.6)
Ask you about what you read	4	25	(0.8)	36	(0.7)	14	(0.5)	24	(0.8)
	6	23	(0.5)	40	(0.7)	16	(0.5)	22	(0.5)

Standard errors appear in parentheses

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