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Location, Location, Location:
Implications of Geographic Situation on Australian Student Performance in PISA 2000

John Cresswell
Catherine Underwood

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CONTENTS

CONTENTS (Cont)

TABLES

TABLES (cont)

FIGURES

EXECUTIVE SUMMARY

The primary focus of this report is to examine the effect that geographical location may have on the performance of students from schools from all parts of Australia who participated in the OECD/Programme for International Student Assessment (PISA 2000).

- Approximately 5 477 students from 231 schools across Australia encompassing schools in Major Cities, Inner Regional areas, Outer Regional areas, Remote areas and Very Remote areas participated.
- Results for Australian schools located in Major Cities and Inner Regional areas were above the OECD average in reading literacy. Outer Regional areas and Remote/Very Remote areas were at or below the OECD average.
- In reading literacy:
    - > 18 per cent of students in Major Cities achieved the highest proficiency level (Level 5), compared with 2 per cent in Remote/Very Remote areas.
    - > 72 per cent of Australian students in Major Cities were placed at Level 3 or higher in reading literacy, compared with 67 per cent in Inner Regional areas, 57 per cent of students in Outer Regional areas and 50 per cent of students in Remote/Very Remote areas.
    - > 28 per cent of Australian students in Remote/Very Remote areas did not reach proficiency Level 2, and 11 per cent in Major Cities.
- Although socioeconomic background was associated with performance in reading, the most significant factor is students' engagement with reading. Students in major cities achieved a higher average score on the *engagement with reading index* than students in remote areas;
- Students in remote areas have access to well-qualified teachers;
- Females outscored males in reading literacy in all locations;
- Schools in remote areas tended to have a lower level of resources;
- The level of parent education attained was associated with higher student performance across all locations;
- Across all locations, there was a positive association between students who show positive reading/homework behaviour, exhibit a positive academic self-concept and reading literacy performance.

1. INTRODUCTION

The OECD/Programme for International Student Assessment (PISA) aims to measure how well students nearing the end of their compulsory schooling are prepared for adult life. The assessment is forward looking, focusing on students' ability to meet real-life challenges, rather than testing whether they have mastered a particular curriculum.

The first PISA survey was carried out in 2000 in 32 countries (including 28 OECD member countries), with about 200,000 students doing the assessments. There were stringent sampling requirements in place to guarantee a sample representative of the 15-year-old population in each of the participating countries. In Australia there were nearly 5500 students included in the analysis. The students were chosen in a strictly controlled, two-step sampling process. The sampling plan for each country was approved by the International Sampling Referee to guarantee that the procedures were the same in all countries. The first step was to randomly select the schools. The second step was to randomly select, from the lists supplied by the schools, 32 students. In Australia, it was necessary to over sample the smaller states and territories to allow for meaningful comparisons. To be included in the final report (OECD, 2001a), countries had to obtain agreement from at least 85 per cent of the schools in the defined sample. In addition, there was a minimum requirement of 80 per cent of students needed from the 32 chosen. Australia was able to satisfy these stringent requirements. The full details of Australia's sample and results can be found in the national report, *15-up and counting, reading, writing, reasoning .... How literate are Australia's students? The PISA 2000 survey of students' reading, mathematical and scientific literacy skills* (Lokan, Greenwood, & Cresswell, 2001).

Students were given a two-hour test which assessed their abilities in three main domains: reading, mathematical and scientific literacies. The term 'literacy' is used to indicate a broad notion of knowledge and skills. The survey will take place every three years and each time a different domain will be focused upon. In 2000, reading literacy was the major domain. This means that the majority of testing time was devoted to this domain. In 2003 the major domain is mathematical literacy, and in 2006, scientific literacy. The assessment items are created under the guidance of groups of experts that have been established for each of the domains. The items are extensively trialled in all the participating countries to verify that they are identical in countries and are not culturally or geographically biased. Measures are also taken to monitor the administration of the tests to ensure that the procedures are the same in all countries. The resulting international database (OECD, 2001b) is, therefore, a reliable set of data that can be used for valid between country comparisons and analysis of within country results.

This report focuses on the issue of geographic location and its association with the performance of the 5477 15-year old students from 231 schools from all parts of Australia who participated in the study, with specific emphasis on variables which are most likely to have an impact on or be associated with performance in reading literacy. In PISA reading literacy is defined as: *the ability to understand, use and reflect on written texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate effectively in society.*

The report is divided into two sections:

1. *Characteristics of the schools:* focusing on factors such as school environment, school resources (including teachers) and access to facilities.

2. *Characteristics of the students:* this section focuses on background factors including home wealth measures, parents' occupation, access to cultural activities, access to educational resources including libraries and computers, both at school and outside school, and travel time to school. Students' attitudes to school were also examined.

Location

For the purposes of this paper the Accessibility/Remoteness Index of Australia (ARIA), a geographic classification developed by the National Key Centre for Social Applications of Geographic Information Systems (GISCA) at the University of Adelaide has been used. Remoteness as defined by the Accessibility/Remoteness Index of Australia (ARIA) has been used to measure and classify the remoteness of populated localities in relation to 'service centres' of various sizes (based on the ABS 1996 Census), remoteness is the distance people must travel along a road network to get to areas where they can access goods, services and opportunities for social interaction. ARIA defines five categories of relative remoteness: Major Cities, Inner Regional, Outer Regional, Remote and Very Remote areas of Australia. Data from the Remote Australia and Very Remote Australia categories have been combined in this report, as there were only 0.6 per cent of PISA students attending schools in Remote areas and 0.3 per cent in Very Remote areas. All data reported in this paper are based on the geographic location of the schools participating in PISA (2000), not on the geographic location of individual student's home address. Table 1 provides the ARIA classes and their associated geographic areas and a definition of each classification, with examples.

Table 1 Definition of ARIA Geographic Areas and Location Examples

ARIA Classes	Geographic area	Definition of classification	Examples
Highly Accessible	Major Cities areas	Geographic distance imposes minimal restriction upon accessibility to the widest range of goods, services and opportunities for social interaction.	Camberwell (VIC) Belconnen (ACT) Launceston (TAS)
Accessible	Inner Regional areas	Geographic distance imposes some restriction upon accessibility ……	Coffs Harbour (NSW) Ruffy (VIC) Days Hill (SA)
Moderately Accessible	Outer Regional areas	Geographic distance imposes a moderate restriction upon accessibility ……	Quondong (NSW) Happy Valley (VIC) Bootooloo (QLD)
Remote	Remote areas	Geographic distance imposes a high restriction upon accessibility ……	Buckleboo (SA) Pingaring (WA) Meeleebee (QLD)
Very Remote	Very Remote areas	Geographic distance imposes the highest restriction upon accessibility ……	Mimili (SA) Paraburdoo (WA) Nobles Nob (NT)

Given the geography of Australia, the issue of location is an important factor to take into account when examining differences in student performance. Analyses of geographic location, in terms of achievement level together with various school and student characteristics, allow for a unique insight into the effect that location has on schools and students. The association of location with student performance also provides potential for inequities in the education system to be highlighted.

Geographic profile of Australia

The Commonwealth of Australia is the most sparsely populated of the inhabited continents covering a total area of 7 614 500 sq km, making it also the smallest continental land mass (or largest island) and the sixth largest country in the world. Australia is the lowest, flattest, and, apart from Antarctica, the driest of the continents. It has a population of 19 707 200 (ABS 3101.0: Australian Demographic Statistics, 2002). In contrast, Australia's settlement is one of the most heavily concentrated in the world, with approximately 90 per cent of the population living in about 3 per cent of the land area. The remaining 97 per cent of Australia is extremely sparsely populated with two thirds of the continent being desert. Of the 3 per cent of inhabited land in all, 85 per cent of the population is classified as urban and the remaining 15 per cent as rural.

The distribution of the remoteness areas across Australia is shown in Figure 1.

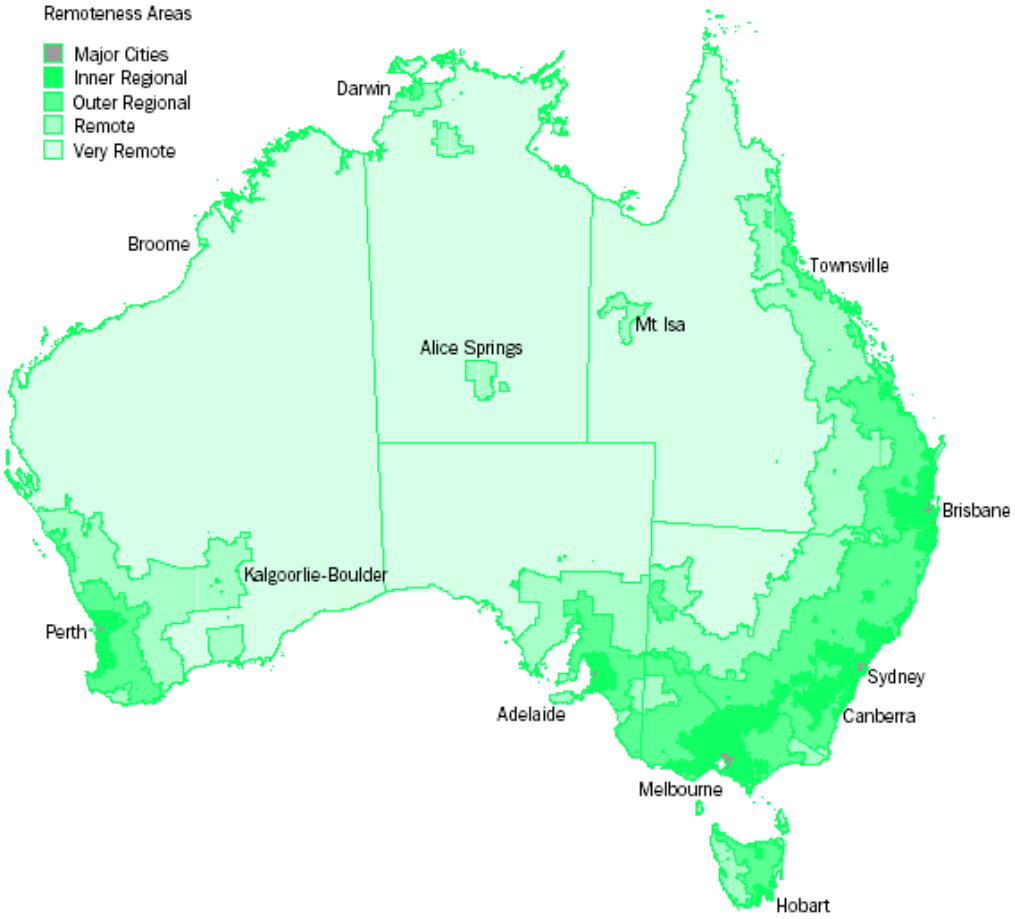

Figure 1 Remoteness areas in Australia

Source: Australian Bureau of Statistics (2003) Australian Social Trends 4102.0

2. CHARACTERISTICS OF THE SCHOOLS

Table 2 shows the distribution of PISA schools and the mean enrolment size of schools based on their geographic location.

Table 2 Distribution of Schools, Students and Enrolments and Mean Achievement Results, by ARIA Geographic Location

Geographic Category	% Schools	% Students	Mean Enrolment	Reading Literacy	Mathematical Literacy	Scientific Literacy
Major Cities Australia	59	63.6	914	535.2	537.9	531.6
				(4.8)	(4.4)	(4.8)
Inner Regional Australia	23	27.0	724	525.6	531.2	527.0
				(5.2)	(6.7)	(5.8)
Outer Regional Australia	14	8.5	551	498.0	507.6	500.1
				(4.7)	(6.3)	(4.5)
Remote/Very Remote Australia	4	0.9	336	471.8	513.9	481.2
				(16.3)	(11.8)	(10.4)

Note: Standard errors of the means are shown in parentheses.

STANDARD ERROR

In this report estimates of population parameters are often presented within the 95 per cent confidence limits. This means that there is a 95 per cent chance that the estimate of a population parameter lies within plus or minus 1.96 standard errors of the sample estimate. For example, if a region's mean student performance is 520 with a standard error of 4 then sampling theory indicates that we can be 95 per cent confident that the mean in the population from which the sample was drawn is between 512 (=520-1.96x4) and 528 (=520+1.96x4). The 95 per cent confidence interval is 512 to 528.

Table 2 shows that in PISA 2000 just under 60 per cent of schools were located in Major Cities, around 23 per cent were Inner Regional, while Outer Regional areas accounted for 14 per cent of schools and there were 4 per cent of schools classified as Remote/Very Remote. Given the small percentage of schools falling into the Remote/Very Remote category, caution is needed in making generalisations.

Teachers in the school

The qualifications, enthusiasm and experience of teachers are important factors in a child's education. In the PISA School Questionnaire, the principals gave an indication of the qualifications of teachers in their schools. The questionnaire did not include items about the number of years of teaching. Table 3 shows the percentage of full-time teachers holding a Bachelor's degree in Education. It also shows the percentage of English teachers with a major in English, Mathematics teachers with a major in Mathematics and Science teachers with a major in Science. Over 50 per cent of teachers, irrespective of geographic location, held a Bachelor of Education, with the largest percentage in Outer Regional schools. In Mathematics and Science, it can be seen that the percentages of teachers with majors in their teaching areas are relatively higher in the larger cities and in the remote areas.

Table 3 Percentage of Full-time Teachers holding a Bachelors' degree in Education, and Major studies in their teaching area

School ARIA location	Bachelor of Education	English Teachers with a Major in English	Mathematics Teachers with a Major in Mathematics	Science Teachers with a Major in Science
Major Cities Australia	69	79	69	86
Inner Regional Australia	52	63	54	76
Outer Regional Australia	74	70	58	75
Remote/Very Remote Australia	68	59	67	88

Overall, there are no major differences between the regions in terms of teacher qualifications and students in remote areas appear to have access to well qualified teachers.

Teachers in Remote/Very Remote areas in Australia are well qualified.

Student-teacher ratio

The student-teacher ratio was calculated in PISA by dividing the total number of students at a school by the number of teachers (including those in administrative positions) at the school. The mean student-teacher ratio for the whole of Australia was calculated to be 13.8 students per one teacher. Schools in Remote/Very Remote areas had the smallest student-teacher ratio (11.6:1), while the largest student-teacher ratio was in the Major city schools in Australia (ratio = 15.4:1).

For each participating PISA school, data were also obtained on school background characteristics, instructional practices (including instructional time, and teacher attitudes) at the school level, and students' patterns of participation in various school programs.

For the purposes of analysing responses to sets of related questions in the School Questionnaire and the Student Questionnaire a number of indices were derived.

Metric for reporting results

Each of the variables from the *PISA School Questionnaire* and *PISA Student Questionnaire* takes the form of an index, standardised to a mean of zero and a standard deviation of one. Values below zero on an index indicate that the mean of responses from a country's principals or students is lower than the mean of responses from other countries in the OECD. Similarly, values above zero indicate that the mean of the responses of the principals or students is higher than the OECD mean. It should be noted that a negative result does not necessarily mean a negative viewpoint or attitude, it only indicates that this is a score below the OECD mean.

In the School Questionnaire, principals were asked about a number of school factors and the extent to which the learning of 15-year-olds in their schools was hindered by such factors. Issues examined in this respect covered the quality of a school's physical infrastructure, the quality of a school's educational resources, teacher shortage, the principal's perceptions of teacher-related factors affecting school climate, and the principal's perceptions of teachers' morale and commitment. The next sections provide an overview of principals' perceptions of these key issues in their schools.

Quality of schools' physical infrastructure

In the School Questionnaire, principals were asked about the quality of their schools' physical infrastructure. In particular, principals were asked to respond to a series of items to ascertain the extent to which they felt their students' learning was hindered by factors such as poor conditions of school buildings, poor heating, lighting and cooling systems, and shortage of classrooms. These items together defined the index of *quality of school's physical infrastructure*.

Principals from schools in Remote/Very Remote areas of Australia indicated their students' learning was most hindered (mean = 0.60) by a combination of factors' such as poor conditions of the school buildings, poor heating, lighting and cooling systems, and a shortage of classrooms. To a lesser extent, principals in Outer Regional areas also responded that they felt their students' learning was hindered by the quality of the school's physical infrastructure (mean = 0.12). In contrast, principals in Major City areas believed their students' learning was the least hindered by the quality of their school's physical infrastructure (mean = -0.02), followed by principals in Inner Regional areas (mean = -0.16).

School principals in Remote/Very Remote areas perceived their students' learning was most hindered by a combination of poor conditions of buildings and a shortage of classrooms.

Quality of schools' educational resources

Principals were asked their views on the extent to which they believed their students' learning was hindered by a lack of instructional resources (an insufficient number of computers, lack of instructional material, not enough computers for instruction, lack of instructional materials in the library, lack of multimedia resources, inadequate laboratory equipment and inadequate facilities for the fine arts). These items were combined to form the index of *quality of school's educational resources*.

School principals in Remote/Very Remote areas perceived their students' learning was most hindered by a shortage of educational resources including a lack of computers and library facilities.

Principals from schools in Remote/Very Remote areas indicated students' learning was severely hindered by the quality of the school's educational resources (mean = 1.53) which is over one and a half standard deviations above the OECD mean. Principals from schools in Outer Regional areas also responded that the quality of their school's educational resources hindered the learning of 15-year olds (mean = 0.35). In contrast, principals from schools in Major Cities scored -0.22 and schools in Inner Regional locations -0.26, indicating less of a concern with educational resources.

Access to computers

Both principals and students were asked about the access that students have to computers at school. Student access to computer facilities is reasonably uniform across geographic locations. The principals were asked about the total number of computers at school (including those for administration and teacher use) and the access the students have to the computers. Students attending Major City schools had access to 69 per cent of a school's computers, while students attending schools in Remote/Very Remote areas of Australia have access to 68 per cent of the school's computers.

Access to computer facilities in schools is fairly uniform across geographic locations.

Table 4 Distribution (%) of Student Access to Computers at School

	Almost every day	A few times each week	1 – 4 times a month	Less than once a month	Never
	%	%	%	%	%
Major Cities	51	31	11	6	2
Inner Regional areas	55	29	10	4	2
Outer Regional areas	56	31	7	4	2
Remote/Very Remote areas	54	35	8	2	0

As can be seen in Table 4, over 50 per cent of students, irrespective of geographic location, were able to access a computer almost every day at school. Students in Major City schools indicated the least access to computers on a daily basis (51 per cent). Students in Remote/Very Remote areas responded that there was never an occasion when they had no access to a computer at school.

Provision of extra resources

Principals were also asked if their school provides extra resources including extra courses on academic subjects for gifted students, special instruction in English for low achievers, special courses in study skills for low achievers, special tutoring by staff members and rooms where the students can do their homework with staff help. Table 5 shows the percentage distribution by geographic location of schools providing extra resources to their students.

Table 5 Percentage Distribution of Schools Providing Extra Academic Resources to Students

	Major Cities	Inner Regional	Outer Regional	Remote/Very Remote
Extra courses on academic subjects for gifted students	49	70	55	83
Extra instruction in English for low achievers	83	94	80	100
Special courses in study skills for low achievers	70	67	74	17
Special tutoring by staff members	73	77	85	17
Room(s) where students can do their homework with staff help	49	37	64	17

The information provided by principals indicated that schools, irrespective of their geographic location, were more likely to provide assistance in the form of extra instruction in English for low-achieving students than other forms of assistance. Principals at schools in Major Cities and Outer Regional areas reported less provision of extra courses on academic subjects for gifted students, (49 per cent and 55 per cent respectively) than the other regions. Schools in remote areas provided lower levels of courses in study skills, special tutoring by staff and rooms set aside for doing homework.

Principals from all Remote/Very Remote schools responded their schools provided extra instruction in English for low achievers. Irrespective of geographic location in excess of 80 per cent of schools provided extra instruction in English for low achievers.

Teacher supply

One of the challenges facing education in Australia is finding qualified teachers in sufficient numbers. Principals were asked the extent to which they believed that the students' learning at their school was affected by a shortage or inadequacy in the supply of teachers. These items contributed to the index of *teacher supply.*

Principals from schools in Remote/Very Remote areas of Australia indicated the highest mean score (mean = 0.88) reflecting a high degree of teacher shortage. A similar result was noted for principals from schools in Outer Regional areas (mean = 0.79). In contrast principals from schools in Major City areas expressed the highest degree of satisfaction with the level of teacher availability at their schools (mean = 0.16), followed by principals from schools in Inner Regional areas (mean = 0.15).

Remote/Very Remote schools reported the highest level of teacher shortage.

In terms of level of dissatisfaction with teacher supply, schools in Remote/Very Remote areas and Outer Regional areas were nearly one standard deviation above the OECD mean. This illustrates, quite clearly, the difficulties encountered by schools in recruiting staff to those areas.

Staff morale

The School Questionnaire also examined the extent to which principals agreed or disagreed with a series of statements about the teachers at their school, (the extent to which the morale of teachers in their school was high, their teachers' work with enthusiasm, their teachers take pride in their school and their teachers value academic achievement). These items defined the index of *teacher morale.*

Principals' from schools in Outer Regional areas reported the lowest level of staff morale (mean = -0.07), followed equally by schools in Major Cities (mean = 0.09), and schools in Remote/Very Remote areas (mean = 0.09). Principals from schools in Inner Regional areas reported the highest level of staff morale within their schools (mean = 0.16).

Principals reported staff morale to be fairly similar irrespective of geographic location.

Principals' perceptions of teacher-related factors affecting school climate

Principals were also asked their perceptions as to whether they felt students' learning was hindered by teacher-related factors that might affect the school climate. Items here were about teachers' expectations of students, teacher-student relations, teacher absenteeism, teachers resisting change, and teachers' strictness with students. These items comprised the index of *teacher-student relations.*

Principals from schools in Remote/Very Remote areas reported that students' learning was hindered to some degree by teacher-related factors affecting the school climate (mean = 0.35) which is above the OECD mean of zero. To a lesser extent, principals from schools in Outer Regional areas also perceived their students' learning was hindered by teacher-related factors (mean = 0.17) followed by schools in Inner Regional areas (mean = 0.02). In contrast, principals from schools in Major Cities indicated students' learning was least hindered by teacher related factors (mean = -0.12).

3. CHARACTERISTICS OF THE STUDENTS

The students participating in PISA comprised 52.6 per cent males and 47.4 per cent females. Table 6 shows the percentage of students by gender and geographic location.

Table 6 Percentage of Students by Gender and Geographic Location

Student Gender	Major Cities N = 3482 %	Inner Regional N = 1480 %	Outer Regional N = 466 %	Remote/Very Remote N = 50 %
Male	51	54	54	67
Female	49	45	46	33

Overall, across the geographic locations the PISA 2000 sample comprised more males than females. This was particularly so in the Remote/Very Remote areas.

The results for reading literacy were divided into 5 main levels of proficiency. At the highest proficiency level (level 5), students are able to carry out complex tasks, obtaining information, interpreting it and reflecting on its impact. Table 7 shows the proportion of students irrespective of gender at each level of proficiency in reading literacy by geographic location. Students' reading results are described in terms of skills at five levels of proficiency. Each proficiency level is associated with tasks of increasing difficulty.

Table 7 Percentage of Students at Each Level of Proficiency on the Total Reading Literacy Scale by ARIA Geographic Location

ARIA Location	Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5
Major Cities	3	9	17	26	27	19
Inner Regional areas	5	8	20	27	25	15
Outer Regional areas	5	14	24	26	22	9
Remote / Very Remote areas	8	19	25	32	15	3

It can be seen in Table 7 that the highest proportion of students' at the lower levels, were students from Remote/Very Remote areas. There were also relatively few of these students at Levels 4 and 5.

Gender

In all countries that participated in PISA, females scored significantly better than males in reading. The Australian females scored an average of 546 and males 513. These results are reflected in a breakdown of mean scores and proficiency levels by gender and location shown in Table 8.

Table 8 Means and Standard Deviations for Students by Gender and Geographic Location

Geographic Category	Reading Literacy		Mathematical Literacy		Scientific Literacy	
	Male	Female	Male	Female	Male	Female
Major Cities Australia	519.8	552.6	540.8	530.3	533.8	533.9
	(5.4)	(6.1)	(6.8)	(7.4)	(7.2)	(7.6)
Inner Regional Australia	514.5	539.4	537.9	523.3	534.8	527.9
	(7.0)	(6.0)	(7.8)	(10.4)	(11.2)	(11.6)
Outer Regional Australia	468.5	532.8	502.6	492.7	475.8	510.3
	(6.5)	(8.1)	(9.2)	(16.6)	(10.8)	(16.3)
Remote/Very Remote Australia	464.8	487.2	548.7	497.7	498.2	492.7
	(8.4)	(15.2)	(16.0)	(33.1)	(33.1)	(45.6)

Table 8 shows that in all locations females achieved a higher mean score on the PISA reading literacy assessment than males, with the greatest difference between males and females (64.3 points) occurring in Outer Regional areas, followed by difference of 32.8 points between females and males in Major City areas. In mathematical literacy, although it appears that irrespective of geographic location males out performed females, in fact, there are no significant differences using a 95 per cent confidence interval (see box on Standard Errors, page 2). In scientific literacy, also the results show very few differences between males and females.

Table 8 also indicates that while the larger proportion of males in remote areas may contribute to a lower mean score in reading for those areas, it also shows the females in those areas scored well below their counterparts in other areas. In fact, the difference between males and females in Remote/Very Remote areas is less than the difference in other locations.

Indigenous students

A further aspect examined in relation to reading achievement and geographic location was the Indigenous status of students[1]. Table 9 shows the number of Indigenous students in each of the geolocations. The largest percentage of Indigenous students was in the Outer Regional area.

Table 9 Numbers of Indigenous and Non-Indigenous Students by Geographic Location

Geographic Category	Indigenous	Non-Indigenous
Major City areas	146	3049
Inner Regional areas	136	1219
Outer Regional areas	164	568
Remote/Very Remote areas	47	148
Total	493	4984

[1] The performance of Indigenous students in PISA 2000 is covered in more detail in a related ACER report.

Table 10 Means and Standard Deviations for Indigenous and Non-Indigenous Students by Geographic Location

Geographic Category	Reading Literacy		Mathematical Literacy		Scientific Literacy	
	Indig	Non-Indig	Indig	Non-Indig	Indig	Non-Indig
Major City areas	437.6	536.5	441.5	537.0	450.4	535.1
	(11.0)	(4.7)	(18.2)	(5.6)	(21.8)	(5.8)
Inner Regional areas	473.6	527.2	497.4	532.1	508.8	532.1
	(10.5)	(5.3)	(23.9)	(7.3)	(24.2)	(8.4)
Outer Regional areas	435.8	503.1	451.7	504.4	461.5	488.5
	(8.3)	(4.9)	(14.8)	(8.8)	(13.4)	(8.4)
Remote/Very Remote areas	386.5	476.5	417.2	528.5	411.8	500.0
	(13.6)	(10.6)	(32.7)	(16.8)	(23.8)	(38.6)

Table 10 shows that in all geographic locations, non-Indigenous students achieved a higher mean score on the three PISA assessment domains of reading literacy, mathematical literacy and scientific literacy than Indigenous students. The biggest difference in relation to reading literacy occurred in Major Cities where Non-Indigenous students scored, on average, 98.9 more score points than Indigenous students. In mathematical literacy, Non-Indigenous students out performed Indigenous students, with the greatest difference between Non-Indigenous and Indigenous students occurring in Remote/Very Remote areas, with Non-Indigenous students achieving on average 111.3 points higher than Indigenous students. In scientific literacy the results show that the greatest difference between Non-Indigenous students and Indigenous students also occurred in Remote/Very Remote areas where Non-Indigenous students performed 88.2 points higher than Indigenous students. In all three domains, Indigenous students from Inner Regional areas performed at a higher level than their counterparts in the other locations.

Table 11 Distribution (%) of Reading Proficiency Levels for Indigenous and Non-Indigenous Students by Geographic Location

	Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5
Indigenous students						
Major Cities	15	24	25	23	9	3
Inner Regional areas	9	13	29	34	8	8
Outer Regional areas	12	24	35	21	8	1
Remote / Very Remote areas	32	24	31	8	5	0
Non-Indigenous students						
Major Cities	3	8	17	26	27	19
Inner Regional areas	3	8	20	27	26	16
Outer Regional areas	5	13	23	27	23	7
Remote / Very Remote areas	6	19	24	33	15	3

In terms of proficiency levels in reading, Table 11 shows a higher proportion of Indigenous students compared with non-Indigenous students at Level 1 or below – there are 56 per cent of Indigenous students from Remote/Very Remote areas in the two lowest levels compared with 25 per cent for Non-Indigenous students.

Home language

In addition, the main language spoken at home by students was examined in relation to reading achievement and geographic location.

Table 12 Percentage of Students by Main Language Spoken at Home and Geographic Location

Student group	Major Cities N = 3482 %	Inner Regional N = 1480 %	Outer Regional N = 466 %	Remote/Very Remote N = 50 %
Home language English	77	94	94	96
Home language not English	23	6	6	4

Table 12 shows the percentage of students in each of the locations, categorised by home language. Table 13 shows the results of the percentages of these students at each proficiency level in reading literacy.

Table 13 Distribution (%) of Reading Proficiency Levels by Main Language Spoken at Home and Geographic Location

	Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5
Home language English						
Major Cities	2	8	16	25	28	21
Inner Regional areas	2	9	20	27	26	16
Outer Regional areas	5	13	24	27	22	10
Remote / Very Remote areas	7	19	25	32	15	3
Home language not English						
Major Cities	5	12	23	26	21	13
Inner Regional areas	12	7	26	35	14	7
Outer Regional areas	17	22	25	20	14	2
Remote / Very Remote areas	29	23	12	22	12	2

Table 13 shows that 52 per cent of students from a non-English speaking home background living in Remote/Very Remote areas scored at proficiency Level 1 or below in Reading in PISA 2000. This compared to 26 per cent for Remote/Very Remote students with an English language background. At the higher end of the proficiency levels it can be seen that 14 per cent of Remote/Very Remote students without an English home background score at the Levels 4 or 5, compared to 18 per cent of the Remote/Very Remote students with an English speaking home background.

Table 14 Means and Standard Deviations for Students by Language Spoken at Home and Geographic Location

Geographic Category	Reading Literacy		Mathematical Literacy		Scientific Literacy	
	English	LBOTE*	English	LBOTE*	English	LBOTE*
Major City areas	544.2 (5.1)	507.1 (8.1)	543.7 (4.7)	520.6 (6.7)	541.3 (4.7)	499.7 (10.1)
Inner Regional areas	529.0 (4.9)	481.3 (13.6)	532.9 (6.8)	511.7 (16.9)	531.4 (5.8)	467.4 (22.6)
Outer Regional areas	502.9 (4.7)	437.1 (12.6)	511.5 (5.8)	455.5 (14.5)	504.9 (4.7)	442.1 (11.7)
Remote/Very Remote areas	473.9 (9.9)	415.4 (24.15)	517.1 (11.8)	417.5 (24.6)	482.8 (11.0)	435.9 (27.9)

**LBOTE = Language Background Other Than English*

A further analysis of language background is shown in Table 14. In Australia, all tests were conducted in English. Students were excluded from the sample if they had been resident in Australia for less than 12 months and their language background was not English. An analysis of results based on location and language background is shown in Table 12. It can be seen that, regardless of location, students whose background language is not English, score significantly less than the students who speak English at home. The biggest difference between the two language groups is in the Remote/Very Remote areas, where there is a 100 score point difference in mathematical literacy (caution is needed because of the small sample size and consequent large standard error).

Socioeconomic Status

Students were asked to complete questions about their parents' occupations. The coding of occupations was done using The International Standard Classification of Occupations (ISCO) developed by The International Labour Organisation. An index of socioeconomic status was derived in which values ranged from 0 to 90 with a mean across the OECD of 49 (low values indicate low socioeconomic status and high values indicate high socioeconomic status). Table 15 shows the mean SES levels in Australia, by geographic location.

Table 15 Mean SES Level Based on Parent Occupation by Geographic Location

	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote / Very Remote N = 50	Australia
SES Level Mother	48	45	42	40	47
SES Level Father	48	43	38	40	46
Highest SES Mother or Father	54	50	46	45	52
Score point difference associated with a one standard deviation difference in SES = 32					

Parents of students from schools in Major Cities had the highest socioeconomic status index (54).

Irrespective of geographic location, overall, parental socioeconomic status was positively correlated with students' reading achievement. One way to express this association is to calculate the difference in reading performance that is associated with a change of one standard deviation in socioeconomic status. Across Australia this figure is 32 score points. This suggests some of the variation in reading performance between the geolocations may be explained by differences in socioeconomic status.

Home wealth measures

To establish an alternative measure of family wealth and the extent of educational resources available to students an index of *family wealth* was composed comprising nine items from the Student Questionnaire data (dishwashing machine, room of your own, educational software, links to the internet, and numbers of mobile phones, televisions, computers, motor cars and bathrooms).

Family wealth items and educational resources in the home were positively related to reading literacy achievement.

Students in Major Cities reported having the highest level of home wealth (mean = 0.52), followed by students in Inner Regional areas (mean = 0.31). In contrast students in Outer Regional areas and to a much larger extent students in Remote/Very Remote areas had less home wealth items (mean = 0.04 and –0.21 respectively).

Family possessions – educational resources available to students in the home

In addition, students were also asked a number of questions to establish the extent to which educational resources were available to them in their home that might influence their academic achievement. Table 16 shows the percentage of home education resources by geographic location.

Table 16 Percentage of Home Educational Resources Available to Students by Geographic Location

	Major Cities N = 3482 %	Inner Regional N = 1480 %	Outer Regional N = 466 %	Remote / Very Remote N = 50 %
A dictionary	99	99	97	98
A quiet place to study	91	90	87	78
A desk for study	91	88	85	78
School text books	95	91	81	77
Number of Calculators:				
None	1	1	1	0
One	5	5	11	10
Two	22	21	24	18
Three or more	72	73	64	71

Across the OECD these data were combined into a single measure known as the Index of Home Educational Resources. This index has a mean of zero and a standard deviation of one, and the results for the Australian geolocations are shown in Table 17.

Table 17 Index of Home Educational Resources Available to Students by Geographic Location

Geographic Category	Index of Home Education Resources
Major cities	.11
Inner Regional	.03
Outer Regional	-.30
Remote/Very Remote	-.37
Australian mean	.05

Table 17 shows that students in Major City areas had the most access to home educational resources (mean = 0.11), followed by students in Inner Regional areas (mean = 0.03). Students in Outer Regional and Remote/Very Remote areas clearly had the least number of home educational resources (mean = -0.30 and mean = -0.37 respectively). It appears that students from Remote/Very Remote areas were disadvantaged in this respect, having less resources available to them in the home of an educational nature compared to their counterparts in the city.

Students' reading habits and attitudes towards reading

Students were also asked a number of questions regarding their reading habits and attitudes towards reading. The number of books available to students at home has been shown to be a significant factor associated with student performance, independent of other factors. Table 18 shows the percentage distribution of the number of books students had in the home by geographic location.

Table 18 Percentage Distribution of Books in the Home by Geographic Location

	Major Cities	Inner Regional	Outer Regional	Remote / Very Remote
	N = 3482	N = 1480	N = 466	N = 50
	%	%	%	%
None	1	1	3	2
1 to 10 books	4	3	6	8
11 to 50 books	15	14	28	29
51 to 100 books	20	19	17	6
101 to 250 books	23	22	19	29
251 to 500 books	20	21	23	22
More than 500 books	17	20	14	4
Correlation with reading achievement	$r = 0.34$	$r = 0.26$	$r = 0.16$	$r = 0.47$

Across the four geographic locations 39 per cent of students in Remote/Very Remote areas had 50 or fewer books in their home, compared to 37 per cent of students in Outer Regional areas, 18 per cent in Inner Regional areas and 20 per cent in Major City areas.

Irrespective of geographic location there was a positive correlation between reading achievement and number of books in the home. Students in Remote/Very Remote areas showed the strongest positive correlation (*r = 0.47)* – this is important because of the difficulty for Remote/Very Remote students to access books in a library.

The results of the reading diversity index are listed in Table A1 (all tables prefixed with an 'A' are listed in the Appendix) and shows students from Major City areas read the most diverse range of material (mean = 0.07), followed by students from Inner Regional areas (mean = 0.04). Students from Outer Regional areas and Remote/Very Remote areas indicated the least diversity in their choice of reading material (mean = -0.04 and –0.06 respectively). Reading diversity is one of the factors associated with reading performance in PISA.

Engagement with reading

Students in Major Cities showed the highest level of engagement with reading. Students in outer regional areas showed the highest relationship between engagement with reading and achievement.

Students were asked to respond to a series of statements that reflected their level of engagement with reading. Items included: *I only read if I have to*, *reading is one of my favourite hobbies*, *I find it hard to finish books*, *for me reading is a waste of time*, *I read only to get information that I need* and *I cannot sit still and read for more than a few minutes*. These items formed the index of *engagement in reading*. Across the OECD, this factor is the most significant in its association with reading performance. Generally, Australian students have a lower level of engagement with reading than students overseas.

Students from Major City areas show the highest level of engagement with reading (mean = -0.05), just below the OECD mean of zero, followed by students from Inner Regional areas (mean = -0.08). Students from Remote/Very Remote areas show the lowest level of engagement in reading (mean = -0.33), followed by students from Outer Regional areas (-0.23).

Examination of the results by gender showed that females were significantly more engaged in reading than males in all locations. Females in Major Cities were the most engaged (mean = 0.19), followed by females in Inner Regional areas (mean = 0.11), in Outer Regional areas (mean = 0.10) and in Remote/Very Remote areas (mean = -0.01). In comparison males in Inner Regional areas (mean = -0.24) were the most engaged in reading, followed by males in Major City areas (mean = -0.27), in Outer Regional areas (mean = -0.53), and Remote/Very Remote areas (mean = -0.49). The two results for Outer Regional and Remote/Very Remote areas were around

half a standard deviation below the mean of zero in the case of males in Outer Regional areas and nearly half a standard deviation above the mean of zero.

Correlation analysis showed there was a positive correlation between engagement in reading and achievement in all locations. Students in Outer Regional areas had the highest correlation ($r = 0.46$), followed by students in Inner Regional areas ($r = 0.42$), students in Major City areas ($r = 0.41$) and students in Remote/Very Remote areas ($r = 0.42$).

Access to and use of libraries – public and school

To further examine students' interests and attitudes toward reading, they were asked about their use of libraries. Table 19 shows how often students borrow books to read for pleasure from a public library or school library.

Table 19 Percentage Distribution of Students Who Borrow Books to Read for Pleasure from a Public or School Library

	Major Cities N = 3482 %	Inner Regional N = 1480 %	Outer Regional N = 466 %	Remote/Very Remote N = 50 %
Never	37	39	43	33
A few times per year	33	35	30	46
About once a month	19	17	18	17
Several times a month	10	10	9	4

Table 19 shows that students in Remote/Very Remote areas are less likely to borrow books from a library. Access to these facilities is limited in these areas.

Use of the school library

Table 20, on the other hand, shows the frequency by which students responded that they used their school library.

Table 20 Percentage Distribution of Frequency of Students Using the School Library by Geographic Location

	Major Cities N = 3482 %	Inner Regional N = 1480 %	Outer Regional N = 466 %	Remote/Very Remote N = 50 %
Never	10	13	13	11
A few times per year	29	26	23	25
About once a month	26	24	22	28
Several times a month	25	25	28	25
Several times a week	10	12	14	11

It can be seen that remote students tend to use their school library with about the same frequency as their counterparts in other regions.

Time spent reading each day

Students were also asked to indicate the amount of time each day they usually spend reading for enjoyment. Table 21 shows the percentage distribution of time students spent reading for enjoyment by geographic locations.

Table 21 Percentage Distribution of How Much Time Students Spend each Day Reading for Enjoyment by Gender and Geographic Location

	Major Cities N = 3482		Inner Regional N = 1480		Outer Regional N = 466		Remote / Very Remote N = 50	
	Males	Females	Males	Females	Males	Females	Males	Females
I do not read for enjoyment	38	25	39	28	53	24	45	35
30 minutes or less	30	31	30	30	24	30	35	23
31 to 60 minutes	18	25	16	25	14	24	13	18
1 to 2 hours	11	13	11	14	5	17	7	18
More than two hours	3	6	4	3	4	5	0	6

The results show that irrespective of geographic location, a higher proportion of males responded that they do not read for enjoyment - this is most noticeable in Outer Regional areas where 53 per cent of males indicated that they do not read for enjoyment in contrast with 24 per cent of females.

Analysis shows a moderate positive correlation ($r = 0.32$) between time spent each day reading for pleasure and reading achievement.

Access to cultural activities

Students were asked had they participated in the past year in cultural activities such as, visiting a museum or art gallery, going to an opera, ballet or classical symphony concert or watching live theatre. These items comprised the index of *cultural activity*. Table A2 shows the percentage of students attending cultural activities by geographic location and their respective correlation with achievement in reading literacy.

CORRELATION ANALYSIS

An analysis of the correlation between two variables can be used to investigate the association between them. If there is a significant positive correlation, it does not imply that one factor depends on the other or there is a cause-effect relationship between them – it simply means that they occur together. Further analysis and investigation is needed to determine the nature of the association. Correlation values range from –1 (a negative correlation – as one goes up the other goes down) to +1 (a positive correlation – as one goes up so does the other). One of the most commonly used measures is the Pearson correlation coefficient, which is abbreviated as ***r***.

Cultural activities

Students in Remote/ Very Remote areas had the least access to cultural activities.

Students were asked how often they attended cultural activities, such as a classical music concert or live theatre. It was found that students attending school in Remote/Very Remote areas experience the least access to cultural activities (mean = -0.81), followed by students attending schools in Outer Regional areas (mean = -0.56). As expected, students in Major Cities had the most access to cultural activities (mean = -0.27) followed by students from Inner Regional areas (mean = -0.45).

Irrespective of geographic location, students' attendance at cultural activities was positively correlated with students' reading achievement. The highest correlations between attendance at cultural activities and reading achievement were for students in Inner Regional areas ($r = 0.30$) and students in Major Cities ($r = 0.28$).

Use of computers

Figure 2 shows the distribution of students with a computer at home.

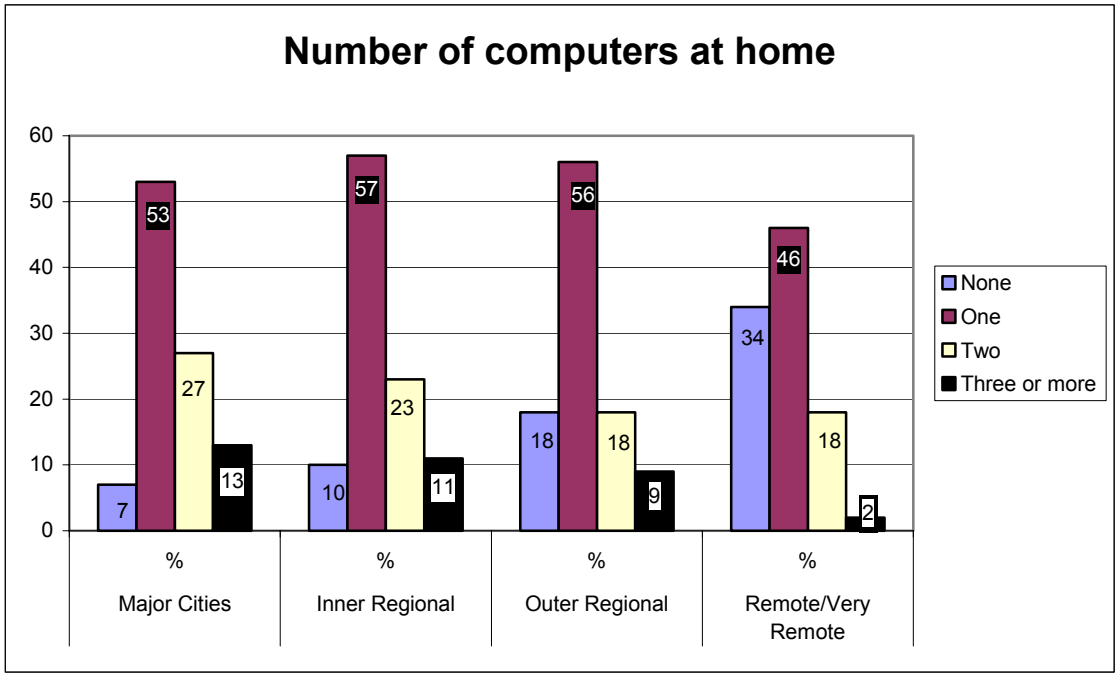

Figure 2 Percentage Distribution of Students Having a Computer at Home

The largest proportion of students who had at least one computer at home lived in Inner Regional areas.

It can be seen in Figure 2 that the pattern of computers at home shows that students in remote areas have fewer than their counterparts in the city. Thirty-four per cent of students in remote areas do not have a computer at home compared with 7 per cent of students in Major Cities. Students in Major Cities also had the highest percentage of two, or three or more computers at home (27 per cent and 13 per cent respectively) of all geographic locations. In contrast, students in Remote/Very Remote areas had the least frequency of having two, or three or more computers at home, (18 per cent and 2 per cent respectively). Of students with a computer at home, Table 22 shows the percentage of students who have educational software and/or a link to the Internet.

Table 22 Percentage of Students with Access at Home to Computer Software

Computers	Major Cities N = 3482 %	Inner Regional N = 1480 %	Outer Regional N = 466 %	Remote/Very Remote N = 50 %
Educational software	84	80	74	71
Link to the Internet	72	63	49	41

Irrespective of geographic location, over 70 per cent of students had access at home to educational software, with the highest proportion of students being in Major Cities. Students in Major Cities had greater access to a link to the Internet, with students in Remote/Very Remote areas having the least access to the Internet. However, with the development of remote access technology, it could reasonably be expected that this number will increase in the future.

Use of Computers at home and at school

Students were also asked how often they used a computer at home and at school. Table A5 shows the percentage of students using a computer at home in comparison with computer use at school by geographic location.

Irrespective of geographic location students who reported using a computer every day were more likely to use a computer at home rather than at school, although Remote/Very Remote students access computers at school less than students in other geographic areas.

Students were asked a series of questions relating to how comfortable they felt in using a computer (using a computer, in general, using a computer to write an essay, and taking a test using a computer). These items comprised an index of *comfort and perceived ability with computers.*

Students in Major Cities responded they perceived they were the most comfortable using computers (mean = 0.45), followed by students in Inner Regional areas (mean = 0.43), then students in Remote/Very Remote areas (mean = 0.35). Students in Outer Regional areas perceived they were the least comfortable using a computer (mean = 0.33). These means are well above the OECD mean of zero.

Students irrespective of geographic location perceived they were comfortable in their ability to use a computer.

Time taken to get to school

Students were asked how long it takes them to get to school.

Table 23 Percentage of Time taken to Get to School

Amount of time	Major Cities N = 3482 %	Inner Regional N = 1480 %	Outer Regional N = 466 %	Remote/Very Remote N = 50 %
Less than 15 minutes	48	43	54	65
Between quarter and half an hour	28	27	23	17
Half an hour to one hour	18	20	17	2
One hour to an hour and a half	5	7	6	12
More than an hour and a half	1	3	4	4

Table 23 shows that the vast majority of Australian students took less than half an hour to get to school. There were 82 per cent of remote students who took less than half an hour and 76 per cent of students in major cities. Balanced against this, 16 per cent of remote students took over an hour to get to school compared with 6 per cent of students in Major Cities.

Future Educational Plans

In many studies, it has been found that educational aspirations are correlated with student performance. Students were asked about their future educational plans. Tables A3 and A4 show the highest level of secondary school students plan on completing.

Irrespective of geographic location the majority of students planned on completing Year 12 (in excess of 70 per cent). Broken down by gender, a slightly greater proportion of females planned on completing Year 12 than males. The biggest difference between males and females in planning to finish Year 12 was in Inner Regional and Outer Regional areas. Overall, the results are consistent with other studies that show females are more likely to finish Year 12 (Cresswell, Rowe, & Withers, 2002).

This pattern is repeated to a degree when students were asked to indicate their educational aspirations beyond secondary school. Table A4 shows the educational aspirations of males and females by geographic location. There was a relatively large proportion of females from Remote/Very remote areas (19 per cent) who planned to have no education beyond school.

Table A4 also shows that, irrespective of geographic location, a higher proportion of males than females aspired to complete an apprenticeship. In contrast, a higher proportion of females irrespective of geographic location aspired to complete a TAFE certificate or diploma, a 3-or 4-year university degree, or a 5-or 6-year university degree.

Students' learning preferences and behaviours

Students were asked to respond to a series of statements about their preferred learning styles, behaviours and abilities. A number of scales were created from this information. A full list of the correlations with reading performance is included in Table A17.

Control strategies

The index of *control strategies* (defined as involving checking what has been learned and working out what still needs to be learned to ensure learning goals are reached), showed students from Major City areas had a preference for using control strategies as their preferred learning style, while students in Remote/Very Remote areas showed the least preference for this style of learning. It can be seen in Table A6, for example, that students in Major City areas preferred working out exactly what they need to learn when studying (67 per cent) in contrast with 43 per cent of students from Remote/Very Remote areas.

Correlation analysis also showed a weak to moderate positive correlation between the use of control strategies and reading achievement irrespective of geographic location. Students from Remote/Very Remote areas and Outer Regional areas showed the highest correlation ($r= 0.29$) between the use of control strategies and reading achievement.

Elaboration strategies

The index of *elaboration strategies* (defined as involving exploring how prior knowledge learned in other contexts relates to new material), showed students from Remote/Very Remote areas used elaboration strategies the least (mean = -0.17). The areas reporting the highest use of elaboration strategies were Major Cities (mean = 0.10), followed by Outer Regional areas (mean = 0.07). Students in Inner Regional areas reported the second lowest use of use of elaboration strategies (mean –0.00).

Table A7 shows that, in terms of using elaboration techniques, 60 per cent of students from Major City areas responded that when they learn they try to understand the material better by relating it to things they already know compared to 48 per cent of students in Remote/Very Remote areas.

Memorisation strategies

The index of *memorisation strategies* (defined as involving verbatim representations of knowledge stored in the memory with little or no further processing), showed students in Major City areas used memorisation strategies more frequently than students from the other geographic locations. It can be seen in Table A8 that 71 per cent of city students responded that when they study they memorise as much as possible in contrast with 55 per cent of students in Remote/Very Remote areas.

Students irrespective of geographic location used memorisation strategies more often than control or elaboration strategies.

Effort and perseverance

The index of e*ffort and perseverance* (defined as requiring a will to learn throughout the entire learning process), showed that students in Major Cities showed the highest level of effort and

perseverance (mean = 0.07), followed by students in Outer Regional areas (mean =-0.07), and similarly students in Inner Regional areas (mean = -0.07). Students in Remote/Very Remote areas showed the lowest level of effort and perseverance (mean = -0.48).

Table A9 shows that 38 per cent of students from Remote/Very Remote areas responded that they put in their best effort when studying. In contrast 64 per cent of students from Major City schools responded that they put in their best effort when studying and they work as hard as possible.

Self-efficacy

Students in major cities reported the highest level of self-efficacy; reading literacy achievement and self-efficacy was positively related among students from remote/very remote schools.

The index of *self-efficacy* (defined as relating to one's own ability to effectively handle learning situations and overcome difficulties) showed that students in Major Cities had the highest level of self-efficacy (mean = 0.14), while students in Remote/Very Remote areas showed the lowest level of self-efficacy (mean = -0.06). Details are listed in Table A10.

Correlation analysis showed there was a weak to moderate positive correlation between self-efficacy and reading achievement. The highest correlation between reading literacy achievement and level of self-efficacy was reported by students from Remote/Very Remote areas (r = 0.33), followed by Outer Regional areas (r = 0.30), Inner Regional areas (r = 0.24) and Major Cities (r = 0.22).

Control expectations

The index of *control expectations* (defined as relating to students' feelings that they have control over their learning and subsequent expectations of their ability to learn), showed that students in Major Cities had the highest level of control expectations (mean = 0.15), followed by students in Inner Regional areas (mean = 0.01). Students in Remote/Very Remote areas showed the lowest level of control expectations (mean = -0.06), followed by students in Outer Regional areas (mean = -0.03).

Table A11 shows the variation in students' responses about how often they use these particular methods. The results indicate students were more positive in their responses to learning expectations when they are in control of a situation, such as deciding to learn something well. Overall, the results show that students in Major City areas feel they have more control expectations than students from the other geographic locations.

Correlation analysis also showed a weak to moderate positive correlation between reading achievement and control expectations. Students from Remote/Very Remote areas tended to display a stronger degree of control over their expectations as to how they might perform in the reading literacy assessment ($r = 0.33$). In contrast students from Major City areas displayed the weakest correlation ($r = 0.18$) between control expectations and reading literacy achievement.

Instrumental motivation

The index of *instrumental motivation* is defined as relating to students' motivation to learn being influenced by the prospect of external rewards such as employment prospects.

Table A12 shows that students from Remote/Very Remote areas showed the lowest level of instrumental motivation in their studies. Forty-seven per cent of students from Remote/Very Remote areas responded that they study to get a good job. Overall, it appears that students from Outer Regional areas and Major City areas showed the highest level of instrumental motivation.

Academic self-concept

The index of *academic self-concept* is defined as students' belief in their own competence and confidence in their ability in their school subjects.

It can be seen in Table A13 that students in Remote/Very Remote areas had a positive attitude toward their academic abilities. Ninety-two per cent perceived they learn things quickly in most school subjects, while 67 per cent of students from Remote/Very Remote areas responded that they do well in most school subjects in comparison with 77 per cent of students from Major City areas.

Given the moderate positive correlations between self-efficacy and reading achievement amongst students from Remote/Very Remote areas and students from Outer Regional areas, the results are consistent in relation to academic self-concept and reading achievement in that there was a weak to moderate positive correlation between academic self-concept and reading achievement. The highest correlation between the two variables was reported by students in Remote/Very Remote areas (r = 0.36), followed by Outer Regional areas (r = 0.34), Inner Regional areas (r = 0.33) and Major Cities (r = 0.32).

Verbal self-concept

The index of *verbal self-concept* (defined as students' confidence in their use of language and communication in their school subjects) showed that students from Remote/Very Remote areas had by far the highest level of verbal self-concept (mean = 0.51), far in excess of students from Major City areas (mean = 0.15), followed by students from Inner regional areas (mean = 0.10). Students from Outer Regional areas showed the lowest level of verbal self-concept (mean = 0.07). Further details of verbal self-concept are shown in Table A14.

Preference for competitive learning

The index of *competitive learning* (defined as a learning style in which students prefer to learn independently and are motivated to compete against other students to achieve success), showed that students from Major City areas and Remote/Very Remote areas had equally the highest means (mean = 0.14) in terms of agreeing that they would like to be the best at something, followed by students from Inner Regional areas (mean = 0.05). Students from Outer Regional areas were the only group of students who showed the lowest inclination toward agreeing to liking to be the best at something (mean = -0.06).

Table A15 shows that, irrespective of geographic location, in excess of 80 per cent of students indicated they would like to be the best at something. Students in Outer Regional areas reported the least inclination toward a preference for competitive learning behaviour, i.e., liking to try to be better than other students (63 per cent), and 'trying to be better than others makes me work well' (54 per cent).

Preference for cooperative learning

The index of *cooperative learning* (defined as a learning style in which students prefer to learn in a group with others and share ideas and help each other), showed that students from Remote/Very Remote areas reported the highest mean (mean = 0.16), based on the extent to which they agreed they liked working with other students, followed by students from Major City areas (mean = 0.04) and students from Inner Regional areas (mean = 0.03). Students from Outer Regional areas (mean = -0.02) showed the lowest level of agreement in terms of their level of agreement with liking to work with other students.

Table A16 shows that irrespective of geographic location in excess of 87 per cent of students like to work with other students; this was particularly evident in Remote/Very Remote areas and Inner Regional areas (92 per cent respectively). Sixty seven per cent of students from Major Cities and 69 per cent of students from Inner Regional areas responded that when they study they learn the most when working with other students.

4. MULTIVARIATE ANALYSIS

A further analysis was carried out by building up a model of factors that are associated with student performance in reading. This type of regression analysis gives a better indication of the independent significance of each factor when the other factors have been accounted for.

One way to compare the association of each factor with performance in reading is to calculate the effect that a change of one standard deviation in the factor would have on the reading score.

Table 24 Multivariate Analysis of the factors associated with reading performance

	Associated change in reading score for a one standard deviation increase in factor in 5 different models				
Factor	**1**	**2**	**3**	**4**	**5**
Co-efficient	552.6	535.4	544.2	496.6	479.5
Location*	-16.2	-13.8	-11.1	-8.8	-2.5ns
Indigenous status		-74.8	-66.7	-56.0	-46.2
Gender (female)		33.6	14.5	14.3	17.9
Engagement with reading			40.1	31.0	27.3
Cultural possessions at home				12.3	7.4
Number of books at home*				9.1	4.0
Home education resources				8.5	4.5
Socioeconomic background					15.9
Father's education					7.7
Cultural communication with family					10.6
Variance explained by model	1.2	5.2	20.5	26.2	31.2

**A change in category – not a change in standard deviation*

Table 24 considers a number of different factors associated with reading performance in PISA. There are five combinations of factors known as models. The table shows that, when location alone is considered as a factor associated with reading performance (Model 1), a one category change (for example, from Major Cities to Inner Regional or from Outer Regional to Remote/Very Remote) is associated with a decrease of 16.2 score points on the reading scale. It can be seen also that the amount of variance in student performance explained by location is 1.2 per cent.

Factors are added in an attempt to see what might reduce or explain the effect of location. So it can be seen in Model 2, that the effect of location is decreased from 16.2 to 13.8 when the students' Indigenous status and gender are taken into account - this is still a significant effect. It can be seen in Model 3, that consistent with previous calculations regarding student performance in reading (Kirsch et al., 2002), a factor significantly associated with reading performance is engagement with reading, where a one standard deviation increase is associated with a 40.1 score point increase. Again the effect of location is decreased. In models 4 and 5 home background characteristics are added and the effect of location becomes non-significant. 31.2 per cent of the student variance is explained by this model.

The implication from this is that the negative effect of student location can be partly explained by other factors.

5. CONCLUSION

Given the vast size of Australia and its extremely low population density, there are many challenges facing those responsible for the delivery of education services across the country. The OECD/Programme for International Student Assessment (PISA) project which was carried out in 2000 provides analysis which should inform the provision of education in remote areas.

It was found in PISA that students in remote areas are not achieving at the same level as their city counterparts. In PISA, levels of proficiency were described, Level 1 being the most basic and Level 5 the most complex. It was found that 27 per cent of students from remote areas were achieving at the two lowest levels, compared to 12 per cent of students from major cities. At the other end of the scale, 18 per cent of remote students achieved at the two highest levels, compared to 46 per cent of the city students.

There are many possible factors that may help to explain this situation. This paper has considered factors associated with school characteristics and factors associated with student characteristics.

Principals were asked to detail major hindrances they perceived to educating 15-year-old students in their schools. They report that their students' learning is hindered by a combination of factors including the poor physical condition of the buildings at their schools. They reported also that the students' learning was hindered by a shortage of educational resources, including a lack of instructional material, lack of multi-media resources and inadequate laboratory facilities. Students do appear, however, to have the same access to computers in remote schools as they do in city schools.

An analysis of teachers' qualifications, however, shows that there are few differences between those in the remote areas and those in the cities – teachers in remote areas are well qualified. It should be noted, that, in PISA, there were no measures of teachers' number of years of experience.

The most important factor positively associated with success in reading literacy has been found to be students' engagement with reading. This was measured by asking students about their reading habits including how often they read, what material they prefer reading and their interest in reading. It was found that students from remote areas scored lower on this factor (lower than the OECD mean) than students from city areas. This is a particular challenge for parents and teachers of those students.

Although the pattern of use of school libraries was similar in all areas, students from remote locations did not have access to cultural activities such as live theatre. Cultural activities have been found to be positively correlated with performance in reading.

Multivariate analysis was carried out to identify those factors that have the strongest independent association with reading performance. It was found that, after a number of factors such as engagement with reading, gender and home background were taken into account, the effect of location was much less significant.

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APPENDIX A

Table A1 Percentage Distribution of Frequency of Students Choice of Reading Material by Geographic Location

Reading material	Major Cities N = 3482 %	Inner Regional N = 1480 %	Outer Regional N = 466 %	Remote/Very Remote N = 50 %
Magazines				
Never or hardly ever	4	3	5	8
About once a month	24	23	22	17
Several times a week	27	30	31	33
Comic books				
Never or hardly ever	60	61	63	50
About once a month	10	10	6	17
Several times a week	4	4	5	6
Fiction (novels, narratives, stories)				
Never or hardly ever	21	23	28	23
About once a month	21	21	18	17
Several times a week	13	14	13	8
Non-fiction books				
Never or hardly ever	27	28	31	29
About once a month	23	20	18	24
Several times a week	5	6	5	2
Emails and Web pages				
Never or hardly ever	18	19	21	21
About once a month	12	15	11	19
Several times a week	38	31	39	28
Newspapers				
Never or hardly ever	8	6	8	15
About once a month	17	15	11	19
Several times a week	31	41	45	30

Table A2 Percentage of Students Attending Cultural Activities

		Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
Visited a museum or art gallery					
	Never	53	61	67	81
	1 or 2 times a year	38	32	28	19
	3 or 4 times a year	6	6	3	0
	More 4 times a year	3	2	2	0
Opera, ballet or classical symphony					
	Never	87	90	92	90
	1 or 2 times a year	10	8	6	6
	3 or 4 times a year	2	1	1	4
	More 4 times a year	1	1	1	0
Watched live theatre					
	Never	64	71	76	88
	1 or 2 times a year	30	23	20	12
	3 or 4 times a year	5	5	3	0
	More 4 times a year	2	1	1	0
Correlation with reading achievement		0.28	0.30	0.05	0.22

Table A3 Future Educational Plans by Gender and Geographic Location

Highest Level of School Planned	Major Cities N = 3482		Inner Regional N = 1480		Outer Regional N = 466		Remote/Very Remote N = 50	
	Male %	Female %	Male %	Female %	Male %	Female %	Male %	Female %
Year 9 or 10	7	4	13	9	22	5	6	6
Year 11	5	2	7	3	8	7	7	6
Finish Year 12	88	94	80	88	70	88	87	88

Table A4 Educational Aspirations Beyond Secondary School by Gender and Geographic Location

Level of Educational Aspiration	Major Cities N = 3482		Inner Regional N = 1480		Outer Regional N = 466		Remote/Very Remote N = 50	
	Male %	Female %	Male %	Female %	Male %	Female %	Male %	Female %
No education beyond school	6	4	9	6	16	6	6	19
Finish an apprenticeship	15	4	25	6	33	8	50	6
Finish a TAFE certificate or diploma	19	21	13	29	13	23	12	31
Finish a 3-or 4-year university degree	33	42	34	41	24	43	16	31
Finish a 5- or 6- year university degree	19	22	14	16	10	16	3	12
Finish a Masters or a PhD degree	7	6	5	2	3	4	12	0

Table A5 Comparison Between Frequency of Computer Use at Home and School by Geographic Location

Frequency of Computer use	Major Cities N = 3482		Inner Regional N = 1480		Outer Regional N = 466		Remote/Very Remote N = 50	
	Home %	School %	Home %	School %	Home %	School %	Home %	School %
Every day	47	13	39	16	37	25	36	30
Few times each week	30	34	31	36	25	40	28	45
Once a week to once a month	12	26	12	21	13	21	4	13
Less than once a month	4	18	5	18	6	10	0	13
Never	7	9	12	8	18	4	32	0

Table A6 Percentage of Students Responding Often/Always Agree to Statements Relating to Control Strategies

When studying……	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
I start by working out exactly what I need to learn.	67	60	59	43
I force myself to check if I remember what I have learned.	55	49	50	38
I try to work out which concepts I still haven't really understood	61	56	57	50

Note: Percentages based on Often and Always responses.

Table A7 Percentage of Students Responding Often/Always Agree to Statements Relating to Elaboration Strategies

When studying……	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
I try to relate new material to things I have learned in other subjects.	47	45	50	42
I think about how the information might be useful in the real world.	46	44	52	36
I try to understand the material better by relating it to things I already know.	60	55	56	48

Table A8 Percentage of Students Responding Often/Always Agree to Statements Relating to Memorisation Strategies

When studying……	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
I try to memorise everything that might be covered.	59	53	54	39
I memorise as much as possible.	71	67	63	55
I memorise all new material.	35	33	41	35

Note: Percentages based on Often and Always responses.

Table A9 Percentage of Students Responding Often/Always Agree to Statements Relating to Effort and Perseverance

When studying……	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
I work as hard as possible	64	60	56	44
I keep working even if the material is difficult	56	50	50	42
I put in my best effort	64	59	60	38

Note: Percentages based on Often and Always responses.

Table A10 Percentage of Students Responding Agree/Strongly Agree to Statements Relating to Self-Efficacy

Statement	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
I'm certain I can understand the most difficult material presented in texts	48	40	40	43
I'm confident I can do an excellent job on assignments and tests	66	62	60	56
I'm certain I can master the skills being taught	62	57	59	52

Note: Percentages based on Often and Always responses.

Table A11 Percentage of Students Responding Often/Always to Statements Relating to Control Expectations

Control Expectations	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
If I decide not to get any bad marks, I can really do it.	68	62	62	57
If I decide not to get any problems wrong, I can really do it.	49	44	46	42
I want to learn something well, I can.	73	66	65	69

Note: Percentages based on Often and Always responses.

Table A12 Percentage of Students Responding Often/Always to Statements Relating to Instrumental Motivation

When studying……	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
I study to increase my job opportunities.	57	57	63	53
I study to ensure that my future will be financially secure.	55	52	54	45
I study to get a good job.	64	61	64	47

Note: Percentages based on Often and Always responses.

Table A13 Percentage of Students Responding Agree/Strongly Agree to Statements Relating to Academic Self-Concept

Statement	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote / Very Remote N = 50
I learn things quickly in most school subjects	79	79	79	92
I'm good at most school subjects	85	84	83	89
I do well in tests in most school subjects	77	74	73	67

Note: Percentages based on Agree and Strongly Agree responses.

Table A14 Percentage of Students Responding Agree/Strongly Agree to Statements Relating to Verbal – Self-concept

When studying……	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
I'm hopeless in English lessons	17	21	21	31
I learn things quickly in English lessons	74	68	71	74
I get good marks in English	78	78	73	85

Note: Percentages based on Agree and Strongly Agree responses.

Table A15 Percentage of Students Responding Agree/Strongly Agree to Statements Relating to Preference for Competitive Learning

When studying……	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
I like to try to be better than other students.	72	68	63	73
Trying to be better than others makes me work well.	64	61	54	66
I would like to be the best at something	89	86	82	89
I learn faster if I'm trying to do better than the others.	57	54	58	62

Note: Percentages based on Agree and Strongly Agree responses.

Table A16 Percentage of Students Responding Agree/Strongly Agree to Statements Relating to Preference for Cooperative Learning

When studying……	Major Cities N = 3482	Inner Regional N = 1480	Outer Regional N = 466	Remote/Very Remote N = 50
I like to work with other students.	88	92	87	92
I learn most when I work with other students.	67	69	71	85
I like to help other people to do well in a group.	83	81	77	87
It is helpful to put together everyone's ideas when working on a project.	88	87	84	96

Note: Percentages based on Agree and Strongly Agree responses.

Table A17 Correlations between Reading Achievement and Students' Learning Preferences

	Major Cities	Inner Regional	Outer Regional	Remote / Very Remote
	N = 3482	**N = 1480**	**N = 466**	**N = 50**
Control strategies	0.23	0.26	0.29	0.29
Elaboration strategies	0.11	0.16	0.22	0.19
Memorisation strategies	0.07	0.12	0.24	0.23
Effort and perseverance	0.15	0.19	0.25	0.23
Self-efficacy	0.22	0.24	0.30	0.33
Control expectation	0.18	0.28	0.32	0.33
Instrumental motivation	0.03	0.10	0.21	0.21
Academic self concept	0.32	0.33	0.34	0.36
Verbal self concept	0.13	0.06	0.27	-0.10
Preference for Competitive learning	0.16	0.23	0.22	0.09
Preference for Co-operative learning	0.02 NS	0.09	0.15	0.12