# CHASMS IN STUDENT ACHIEVEMENT: EXPLORING THE RURAL-METROPOLITAN DIVIDE


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## ABSTRACT

*Australia's education system has attracted much recognition over the last few years due to the above average achievement of our students when compared to other OECD countries in large-scale international tests in science, numeracy and literacy. However, when these results are analysed more closely, large gaps emerge in student achievement between remote, rural and metropolitan schools. In this paper, data highlighting the extent of the problem, particularly in the areas of mathematics and science are presented. Following this we provide some of the strategies being implemented on a national scale to support science, mathematics and information and communication technology (ICT) educators working in rural Australia.*


## INTRODUCTION

Rural and remote communities in Australia have experienced dramatic changes over the last few years with images of drought, closure of local industries and shops, and difficulties in attracting specialist health workers appearing frequently in the media. Of particular concern is the increasing urban drift with only 21% of Australia's population at the end of the 20th century living in rural areas compared with 54% in the 1900s (Squires, 2003). There are numerous factors contributing to this drift including: changes in government policy (e.g., reductions in trade barriers); corporate rationalisation (e.g., closing banks in small towns); climate change; and reduced opportunities for our youth to access higher education (Hammer, 2001; Squires, 2003). While these issues lie outside

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of education generally, schools are not isolated entities but are "often the focal point of the rural community" (Arnold, 2001, p. 34). Consequently, students and staff from rural areas are disproportionately affected by these changes.

There is already an extensive array of literature that identifies common issues being faced by rural communities in relation to schooling. For example, the review by Kannapel and DeYoung (1999) highlighted key factors affecting rural education in the United States, which paralleled those found by Arnold (2001) in the Australian context. A critical factor emerging particularly in Australia is the attraction and retention of teachers in rural and regional areas (Committee for Review of Teaching and Teacher Education, 2003; MCEETYA, 2003, 2005) with the disciplines most affected being science (i.e., physics), mathematics, and information and communication technologies (ICT). Noteworthy, this pattern is not unique to Australia and is prevalent in many OECD countries with a general trend of students away from the sciences and mathematics (FASTS, 2002; Harris, Jensz, & Baldwin, 2005). Unfortunately, if this trend continues this would result in an even smaller pool of science and mathematics teachers in the future.

Aligned with these current teacher shortages is the view of some educators in rural and regional communities that "rural children perform at a lower standard than their urban cohorts" (Arnold, 2001, p. 35). While Arnold identified a number of studies that contradicted this perception (see Melnick, Shibles, & Cable, 1987; Young, 1994), data currently available highlight the existence of a gap between the achievement of students in metropolitan and rural areas. The purpose of this paper is to present these data, which represent large-scale testing programmes conducted at international and national levels. This is followed by the initiatives being undertaken by the National Centre of Science, Information and Communication Technology, and Mathematics Education for Rural and Regional Australia (SiMERR) to support communities in relation to science, information and communication technologies (ICT) and mathematics.

## DEFINING REGIONAL, RURAL AND REMOTE IN AUSTRALIA

In considering comparisons of data across Australia it is necessary to outline a major issue relating to the variety of codes used by government agencies and research groups. In the *Australian Council of Deans of Science* report by Harris et al. (2005), five categories were used based upon the Accessibility/Remoteness Index of Australia (ARIA) codes developed by the Australian Bureau of Statistics. These included Highly Accessible, Accessible, Moderately Accessible, Remote, and Very Remote categories. In an alternative report, the National Education Performance Monitoring Taskforce (NEPMT) based their codes on the geographical location of the home address of students at the time they completed Year 9 (Jones, 2000). This criterion produced Metropolitan, Provincial and Remote categories with a number of sub-categories. To overcome the type of discrepancy identified by these two examples, the

Ministerial Council for Education, Employment, Training and Youth Affairs (MCEETYA) developed the Schools Geographic Location Classifications (Jones, 2004) as a standard in Australia. It consists of eight categories with the first four based on population and the last four on ARIA indices (Table 1).

**Table 1**

**Categories of the MCEETYA Schools Geographic Location Classification (MSGLC)**

| Major Category | | Sub-category | Criteria |
|---|---|---|---|
| **Metropolitan Zone** | 1.1 | State Capital City regions | State capitals (except Hobart, Darwin) |
| | 1.2 | Major urban Statistical Districts | Pop. ≥ 100 000 |
| **Provincial Zone** | 2.1.1 | Provincial City Statistical Districts | Pop. 50 000 – 99 999 |
| | 2.1.2 | Provincial City Statistical Districts | Pop. 25 000 – 49 999 |
| | 2.2.1 | Inner provincial areas | CD ARIA[1] Plus score ≤ 2.4 |
| | 2.2.2 | Outer provincial areas | CD ARIA Plus score > 2.4 and ≤ 5.92 |
| **Remote Zone** | 3.1 | Remote areas | CD ARIA Plus score > 5.92 and ≤ 10.53 |
| | 3.2 | Very Remote areas | CD ARIA Plus score > 10.53 |

[1]ARIA is determined with every location in Australia being given an accessibility/remoteness value between 0 and 15, based on the physical road distance to the nearest service centre. Subsequently, the higher the ARIA value, the more remote and inaccessible the location.

While these MCEETYA categories facilitate comparisons of results within Australia, the codes are not used with international data sets. Therefore, a degree of interpretation is required when attempting to consider results in the Australian context. To explain this point further, the Programme for International Student Assessment (PISA) used five main categories (Table 2) based solely on population size in their international tests.

**Table 2**
**Categorisation used by PISA**

| Category | Population Size |
|---|---|
| 1 | Village (less 3 000) |
| 2 | Small town (3 000 to 15 000) |
| 3 | Town (15 000 to 100 000) |
| 4 | City (100 000 to 1 000 000) |
| 5 | Large city (more 1 000 000) |

However, the population-based criterion ensures that centres in Australia with large variations in terms of accessibility and remoteness are grouped into a single category. Hence, there is great value in implementing the MCEETYA codes based on population and ARIA scores within the Australian context.

## COMPARISONS OF INTERNATIONAL TESTS

In 2003, 15-year-old students in thirty OECD countries including Australia, and eleven partner countries participated in the PISA. The test focused on students' scientific, mathematical, and reading literacy along with their problem-solving ability. These areas were assessed using multiple-choice and extended-response questions. All items were based within a real-world context so that they were topical globally, interesting, and engaging for students. The raw data emerging from the tests were provided to various organisations in each country with the Australian Council for Educational Research (ACER) contracted to analyse the Australian data. Subsequently, only secondary analyses of the data are possible either from the PISA website or from various documents published by the ACER. Both of these sources were utilised for the results presented in this paper.

In 2003, 12 500 students were selected randomly from 321 schools across Australia to complete the PISA test (Thomson, Cresswell & De Bortoli, 2004). Approximately 70% of these schools were in metropolitan areas, 27% in regional areas, and only 3% of schools were located in remote areas of Australia. The OECD mean score was 500, with the Australian means being 525 (science), 524 (mathematics), 525 (reading), and 530 (problem-solving) with few countries outperforming Australia in the four areas assessed (Table 3).

**Table 3**
**Countries Achieving Significantly Higher Results than Australia for PISA 2003**

| **Science** (Aust. $M^1$ = 525) | **Mathematics** (Aust. $M$ = 524) | **Reading** (Aust. $M$ = 525) | **Problem-solving** (Aust. $M$ = 530) |
|---|---|---|---|
| Finland | Hong Kong-China | Finland | Korea |
| Japan | China | | Hong Kong-China |
| Korea | Finland | | Finland |
| | Netherlands | | Japan |

[1]M = mean score

Overall, the PISA results indicated that Australian students achieved more highly or at an equivalent standard to most of our traditional western partners including the United Kingdom and the United States. Analyses across the States and Territories of Australia identified that students in the ACT achieved significantly higher results in each of the four areas (Thomson et al., 2004). However, of particular concern was the disturbing gap that emerged when students' results were considered according to geographical locations across Australia (Figure 1).

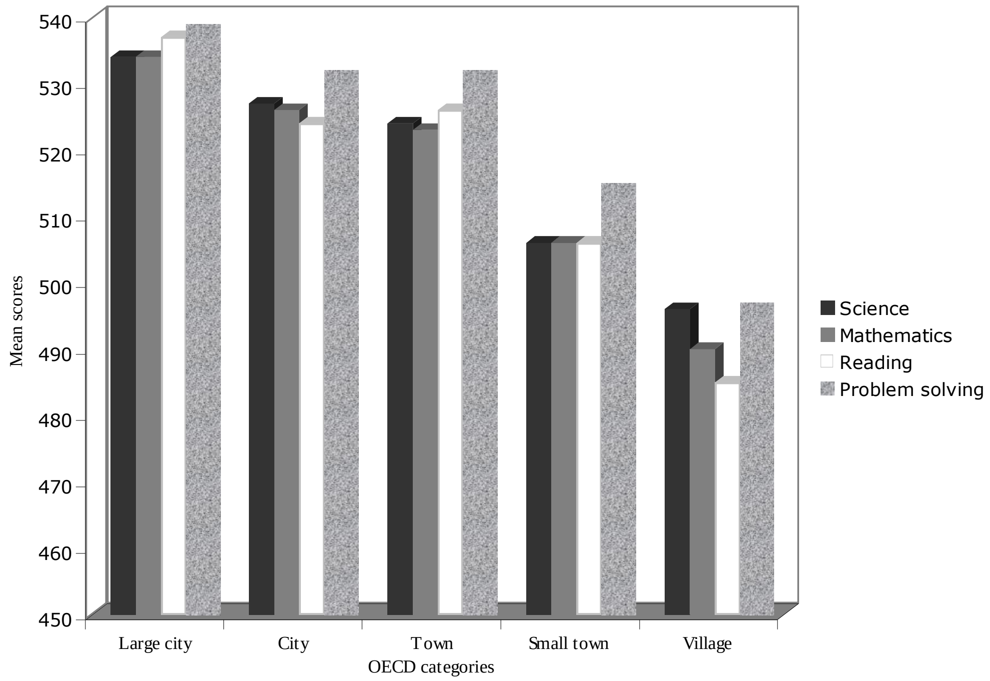


**Figure 1. Mean Scores for Student Achievement in Australia across OECD Categories (Thomson et al., 2004)**

Clearly, differences in student achievement across the five geographical locations are noticeable with major gaps existing between the Town – Small Town, and Small Town – Village categories. Before analysing these results further it is important to consider the categorisations used by the OECD (based solely on population) and their relevance to this particular context. In New South Wales, for example, the Town category includes the centres of Moree Shire, Bellingen, Armidale, and Coffs Harbour displaying a wide variation in the level of accessibility and remoteness of these locations. To overcome this wide variation, the ACER (Thomson et al., 2004) analysed these data using the MCEETYA Schools Geographic Location Classification codes (discussed earlier) focusing on the broadest categories of Metropolitan, Provincial, and Remote (Table 4).

**Table 4**
**Means and Standard Errors for Student Achievement by Geographical Location**

| MS GLC categories | Science $M^1$=525 | | Mathematics $M^1$=524 | | Reading $M^1$=525 | | Problem-solving $M^1$=530 | |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SE* | *M* | *SE* | *M* | *SE* | *M* | *SE* |
| Metropolitan | 529 | 2.6 | 528 | 2.5 | 530 | 2.6 | 533 | 2.2 |
| Provincial | 516 | 4.2 | 515 | 4.4 | 514 | 4.6 | 522 | 4.4 |
| Remote | 489 | 6.8 | 493 | 9.6 | 489 | 7.5 | 503 | 8.4 |

$M^1$= mean score (Thomson et al., 2004)

This pattern of results identifies a decrease in the mean score for each of the four areas assessed with increasing distance from Metropolitan centres. To quantify this gap, the Standard Error (*SE*) expresses variation about the mean. The differences between the *SE*s for the three locations were statistically significant at $p$ = 0.05 level. Therefore, students attending Metropolitan schools achieved significantly higher results than students attending Provincial schools while these in turn demonstrated significantly greater results than students attending Remote schools. A critical realisation is that with the exception of problem-solving, the performance of students in Remote schools for science, mathematics and reading was well below the OECD mean of 500.

The Trends in International Mathematics and Science Study (TIMSS) is similar to PISA with a focus on students in Years 4 and 8. The last testing period occurred in 2002/2003 with participation by 46 countries. In Australia, approximately 10 000 students from all States and Territories completed the test including 4 675 students from Year 4, and 5 355 students from Year 8.

In terms of the Year 4 mathematics results, the mean for Australian students was 499 while the international mean was 495. This low mean for Australia ensured that students from thirteen countries achieved higher means than Australian students. Year 8 students attained a mean of 505, which was higher than the international mean of 467 with only nine countries outperforming Australian students in this age level.

Results for Year 4 students in science were higher than mathematics with the Australian mean being 521, which was greater than the international mean of 489. Similarly, the mean for Australian Year 8 students was 527, which was higher than the international mean of 474. As a consequence, only eight countries outperformed Australia in science for both years.

In general, the TIMSS results are positive (with perhaps the exception of Year 4 mathematics) suggesting that Australian students are being provided with the necessary learning opportunities to increase their knowledge, understanding, and skills in science and mathematics over an extended period at school. However, closer analysis of these results across geographical locations using the MSGLC categories presents a different perspective (Figure 2).

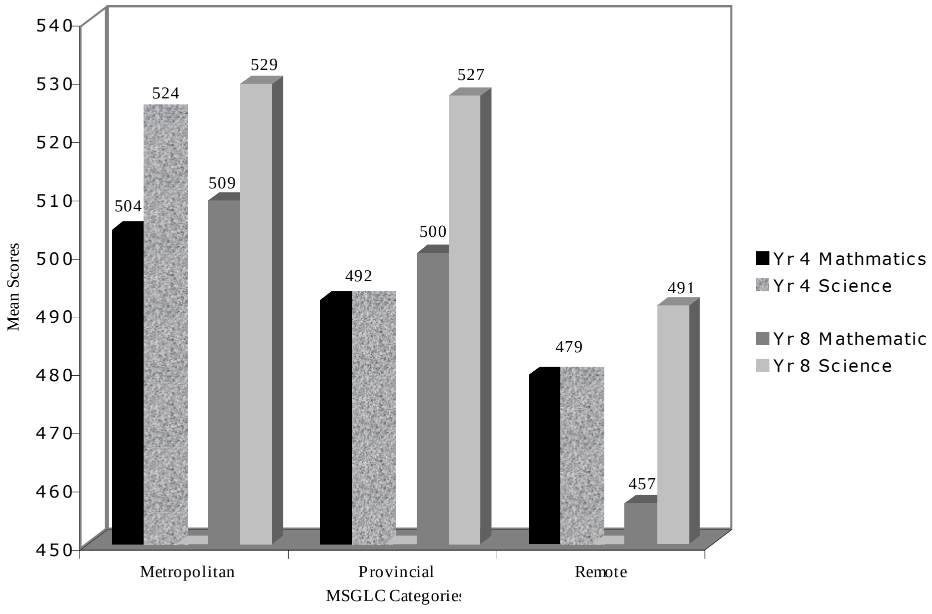


**Figure 2. Mean Scores for Student Achievement in Years 4 and 8 for Mathematics and Science across MSGLC Categories in Australia (ACER, 2006)**

Clearly, there is a decrease in the mean score for students in Years 4 and 8 with increasing distance from the Metropolitan area. Focusing on the Year 4 results in particular, students appear to achieve higher scores in science in Metropolitan areas, with mean scores equivalent for both subjects in Provincial and Remote areas. This same pattern is evident in Metropolitan areas for Year 8 students, although the difference in student achievement between the two subject areas continues in Provincial and Remote areas.

The finding of most concern is the low achievement of Year 8 students in Remote areas in mathematics and science. It could be argued that these results do not represent a single cohort of students over the four-year period and so introduces a number of variables relating to the students that may explain this dramatic decrease in achievement. However, the findings are based on a stratified random sample of 5 355 Australian students.

It would appear from this level of analysis that the relatively high mean scores for Australian students for PISA and TIMSS actually hide the lower achievement of students in Remote and to a lesser extent Regional (Provincial) areas. This suggests that the Australian mean could be increased substantially with some concerted educational and financial support provided by government authorities to rural schools and their communities.

## INVESTIGATING STATE-WIDE TESTS

The National Benchmarks for Reading and Numeracy provide further evidence of a gap in student achievement across geographical regions. These benchmarks represent agreed minimal standards for Years 3, 5 and 7 students. Table 5 identifies the percentages of students in these year levels achieving the numeracy standards in 2005 along with the confidence levels for interpreting these data.

**Table 5**
**Percentage of Years 3, 5, and 7 Students in 2005 achieving the Numeracy Benchmarks (with 95% Confidence Limits)**

| Year | Metropolitan | Provincial | Remote | Very Remote |
|---|---|---|---|---|
| 3 | 94.6 ± 1.0 | 93.8 ± 1.3 | 87.1 ± 3.7 | 72.3 ± 5.6 |
| 5 | 91.8 ± 1.2 | 90.1 ± 1.5 | 79.0 ± 3.8 | 54.5 ± 5.2 |
| 7 | 83.1 ± 0.9 | 79.9 ± 1.2 | 72.4 ± 3.7 | 49.4 ± 4.7 |

(MCEETYA, 2007)

The general pattern for numeracy is consistent with those results described for PISA and TIMSS with a decrease in the percentage of students achieving the benchmarks in each year level as the distance from Metropolitan areas increases. The other critical finding to emerge is the greater percentage of students achieving the benchmarks in Year 3 compared to Year 7.

To interpret these data further, a mean score for numeracy of 83.1 ± 0.9 (Yr 7 Metropolitan students) indicates that there is a 95% chance that the actual percentage lies between 82.2 and 84. The lack of overlap between the confidence limits in the results suggests wide variations between the Provincial – Remote, and Remote – Very Remote locations. However, confirmation of the level of significance is not provided in the MCEETYA report (2007). It should be noted that the broader confidence limits particularly with the Very Remote location is related to the smaller sample compared to Metropolitan and Provincial areas. Additionally, these findings suggest a less homogenous population resulting in a greater spread of scores.

Similarly, Table 6 provides the percentages of students in Years 3, 5, and 7 across Australia achieving the reading standards in 2005. These results corroborate the general pattern identified above for numeracy with a higher percentage of students achieving the benchmarks for reading in each location.

**Table 6**
**Percentage of Years 3, 5, and 7 Students in 2005 achieving the Reading Benchmarks (with 95% Confidence Limits)**

| Year | Metropolitan | Provincial | Remote | Very Remote |
|---|---|---|---|---|
| 3 | 93.5 ± 1.4 | 91.7 ± 2.0 | 85.6 ± 3.9 | 68.6 ± 5.8 |
| 5 | 88.6 ± 1.7 | 86.3 ± 2.0 | 77.6 ± 3.8 | 59.3 ± 5.5 |
| 7 | 91.0 ± 0.8 | 88.6 ± 1.1 | 78.5 ± 3.5 | 53.2 ± 5.3 |

Clearly, the lower attainment of students meeting benchmarks by students in Remote and Very Remote locations would be influenced by the poor performance of Indigenous students in these areas. However, Federal data are not available that disaggregates Indigenous and non-Indigenous results across location. It would appear to the authors that the size of the Indigenous population is not large enough to explain fully the pattern of results in Table 6. Nevertheless, at very little cost, a more targeted analysis of the National Benchmark data would help in providing a deeper understanding of inequities in education provision in Remote and Very Remote communities.

In conclusion, the National Benchmarking 2005 results support the differences identified in relation to PISA and TIMSS with a lower proportion of students in Remote and Very Remote schools achieving both the numeracy and reading benchmarks. However, the other aspect of concern in reviewing the pattern of results is the decrease in the number of students achieving the minimum standards between Years 3 to 7. Unfortunately, the 2004 and 2003 National Benchmarking results corroborate those presented here in relation to 2005 indicating that these are not atypical but rather the norm for Australia.

## FINDING A WAY FORWARD

In the last few years there has been a national focus on issues around the predicted lack of a qualified science, mathematics and ICT workforce in Australia. A number of important reports and policy documents have been driving the agenda including *Australia's Teachers: Australia's Future – Advancing Innovation, Science, Technology and Mathematics* (DEST, 2003) (as part of the Backing Australia's Ability Agenda) and *Australian Science: Investing in the Future* (FASTS, 2002). However, Australia is not in isolation here with many countries experiencing similar trends (see *Before it's too late: A report to the Nation from the National Commission on Mathematics and Science Teaching*, 2000). Given this global emphasis and the evidence available regarding the lower achievement of students in Rural and Regional Australia in these subject areas a National Centre of Science, ICT, and Mathematics Education for Rural and Regional (SiMERR) Australia was established at the University of New England.

The primary aim of the Centre was to create a national focus to improve the quality of Rural and Regional students' learning by encouraging and supporting primary, secondary and tertiary educators in the areas of mathematics, ICT, and science. To achieve this goal, Hubs consisting of a minimum of four academics (i.e., a representative for each of the three disciplines in addition to student diversity) were established in every State and Territory at:

- Charles Darwin University
- James Cook University
- Deakin University
- Australian Catholic University – Signadou Campus in the ACT
- University of Tasmania
- Flinders University/University of South Australia/Australian Science and Mathematics School
- Curtin University
- University of New England

In addition to this national collaboration between universities, links were established with a number of national organisations including Department of Education, Science and Training (DEST), Australian Science Teachers' Association (ASTA), Australian Association of Mathematics Teachers (AAMT), Australian Council for Computers in Education (ACCE), Australian Science Innovations (ASI), Rural Education Forum Australia (REFA), and Isolated Children's Parents Association (ICPA).

A major initiative of the SiMERR National Centre was to conduct a National Survey in 2005. This consisted of five separate surveys for primary teachers, secondary mathematics, science and ICT teachers, and parents/caregivers with a focus on Rural and Regional areas. The justification for this was that prior studies undertaken in the area of rural education had not explored issues pertaining to these specific discipline areas (Alloway, et al., 2004; DEST, 2001; Roberts, 2005; Vinson, 2002). However, this literature did provide valuable baseline data identifying the attraction and retention of teachers (MCEETYA, 2005), accessibility by teachers to professional development (Herrington & Herrington, 2001), the provision of adequate teaching resources (Cresswell & Underwood, 2004; Vinson, 2002), and the availability of diverse learning opportunities as being problematic.

Another key factor highlighted in the earlier studies was the impact of socio-economic status. This issue was raised within the Australian context by Arnold (2001) and in international studies where it was recognised as a confounding variable (Canadian Council on Learning, 2006; Fan & Chen, 2006; Howley, 2003) when investigating student achievement across geographical locations. Subsequently, these factors were considered in the development of surveys by the SiMERR National Centre so that data were collected relating to the:

- Demand and supply of teachers in rural and regional schools;
- Destination schools of city and country educated teachers;
- Motivations for teaching in rural and regional schools;
- Perceptions of teacher education and preparation;

- Teacher qualifications;
- Professional development needs of teachers;
- Material resource and support needs of teachers;
- Availability of student learning opportunities and experiences.

The surveys were completed either in hardcopy or online with access codes provided to individual schools to ensure that the collected data were authentic and could be collated within the appropriate MSGLC category for analysis. A summary of the research sample across these codes is provided in Table 7.

Each survey consisted of two Likert scales with foci on the *Importance* and *Availability* of a particular item. In addition, respondents were able to provide written comments to elaborate their views. To address the socio-economic issue identified earlier, steps were undertaken in the statistical analyses to ensure that results were more tightly associated with geographical location than with the socio-economic background of the school.

**Table 7**
**Teacher Survey Respondents across Disciplines and MSGLC Categories**

| MSGLC Category of School | | Secondary Science | Secondary Maths | Secondary ICT | Primary | Overall |
|---|---|---|---|---|---|---|
| Metropolitan Area | **Count** | **148** | **142** | **60** | **230** | **580** |
| | % of Row | 25.5 | 24.5 | 10.3 | 39.7 | 100.0 |
| | % of Column | 25.5 | 26.0 | 25.3 | 14.6 | 19.7 |
| Provincial City | **Count** | **120** | **132** | **47** | **362** | **661** |
| | % of Row | 18.2 | 20.0 | 7.1 | 54.8 | 100.0 |
| | % of Column | 20.7 | 24.1 | 19.8 | 23.0 | 22.5 |
| Provincial Area | **Count** | **266** | **240** | **110** | **809** | **1425** |
| | % of Row | 18.7 | 16.8 | 7.7 | 56.8 | 100.0 |
| | % of Column | 45.9 | 43.9 | 46.4 | 51.3 | 48.5 |
| Remote Area | **Count** | **46** | **33** | **20** | **175** | **274** |
| | % of Row | 16.8 | 12.0 | 7.3 | 63.9 | 100.0 |
| | % of Column | 7.9 | 6.0 | 8.4 | 11.1 | 9.3 |

(Lyons, Cooksey, Panizzon, Parnel & Pegg, 2006)

A critical component of each teacher survey was the collection of demographic data (Lyons et al., 2006). This data is useful in that it provides numerical evidence to guide the strategies being developed by educational authorities and government departments as they attempt to address the current staffing issues being experienced in rural and regional schools across Australia. Some significant findings and the implications for government departments include:

- Almost twice as many teachers in Provincial area schools and about six times as many in Remote area schools reported a high staff turnover rate (i.e., > 20% p.a.) compared with their colleagues in Metropolitan schools.

This result quantifies the extent of the problem of teacher retention in schools located outside Metropolitan areas of Australia.

- Teachers tended to seek employment in locations similar to those in which they lived while undertaking their preservice teacher education. Approximately 73% of teachers who lived in rural centres while completing their teacher education course were working in Provincial or Remote area schools at the time of the survey. Alternatively, only 5% of teachers who lived in rural centres during their teacher education were employed in Metropolitan schools. These results demonstrate the important contribution of regional universities in preparing future teachers who are more likely to seek employment in schools located in rural and regional areas of Australia. Therefore, it is critical that teacher education in regional universities continues to be supported by government.
- Teachers' motivations for accepting positions in rural and regional schools included job availability, educational authority placement, and having lived previously in the same or a similar location. Subsequently, any change in government policy to abolish the placement of graduate teachers could lead to further teacher shortages in rural and regional schools based upon the evidence provided by this data.
- The influence of motivational factors varied with gender. Male teachers were generally more attracted to financial and advancement opportunities while females placed greater priority on family factors, such as the employment of a spouse or the location of other family members. These gender-related results indicate that a 'one size fits all' model to address the attraction and retention of teachers to rural and regional schools is unlikely to have an impact and that strategies need to be considered that meet the different priorities identified by male and female teachers.

In addition to these general demographic findings, the results emerging from science and mathematics teachers identified critical issues requiring attention if these teachers are to be supported in enhancing the educational opportunities of their students. A number of key findings around professional development emerging from the survey (Lyons et al., 2006) and their ramifications include:

- Science and mathematics teachers in rural and regional schools highlighted the main priority areas as being release from face-to-face teaching for programming and other collaborative activities, and more effective communication with educational authorities. Yet, releasing teachers from face-to-face is difficult given that many communities do not have access to a pool of casual science and mathematics teachers to replace the absences.
- The unmet need for professional development opportunities increased substantially with distance from Metropolitan and Provincial Cities for science teachers but not for mathematics teachers in these same locations. In particular, science teachers in remote schools felt professionally

isolated when it came to opportunities to contribute to syllabus development and being able to participate in the marking/moderation of external science examinations. These data highlight that professional development must be tailored to meet the specific needs of teachers in particular disciplines and raises questions about the value of generic professional development programmes.

- There was a clear indication from both science and mathematics teachers in rural and regional locations of the need for professional development opportunities to help them cater for Indigenous, gifted and talented, and special learning needs students.
- In relation to supporting Indigenous students, science and mathematics teachers in schools where Indigenous students comprised 21 to 40% of the student population identified a greater need for general in-service opportunities and support than all other schools including those with Indigenous populations of >40% (Lyons et al., 2006). This result is particularly valuable in that it suggests that teachers in schools with Indigenous populations of 21 to 40% are missing out on appropriate professional development opportunities when compared with their colleagues in schools with lower and higher Indigenous populations.

In terms of material resources the most significant findings were (Lyons et al., 2006):

1. Science and mathematics teachers in general consider ICT infrastructure and support as the highest priority areas for resourcing regardless of location. However, teachers in non-Metropolitan schools appear to have a higher need for a range of resources and assistance than their Metropolitan colleagues. This is particularly the case for ICT support and maintenance, learning support, and resources to cater for student diversity.
2. An interesting contrast in the ICT needs of Remote Area science and mathematics teachers was identified in the data. While their need for computers for students' use was lower than that of teachers in other geographical areas, their need for ICT support staff was considerably higher. Furthermore, teachers in these disciplines experienced difficulty in accessing computers for student use (i.e, they recognised the difficulty of having to book computer rooms in advance for use with students). This finding suggests that teachers in remote schools may have adequate hardware, but lack access to the technical support to properly maintain and utilise it. Also, the problem of access is more about infrastructure (timetabling of computer rooms) rather than a lack of computers generally.
3. As with professional development, science and mathematics teachers in schools with relatively high proportions of Indigenous students appeared to have a greater level of need for most resources. However, this need was not always highest among teachers in schools with the largest proportions of Indigenous students. For many items, teachers in

schools with 21-40% Indigenous students indicated a higher level of need than did those with populations of >40% of Indigenous students. One possible explanation is that schools with the highest populations of such students qualify for extra support and/or funding. However, further research is needed to investigate this finding in greater detail (Lyons et al., 2006).

These results provide some of the findings that emerged from the National Survey. A copy of the final report including all data is available online from http://simerr.une.edu.au/national_survey/index.html. The value of these findings is that they identify clearly areas of schooling that are being met adequately in rural and regional areas while highlighting areas where more needs to done. Some examples of how some of these areas of concern have been addressed as a result of these findings include:

- Use of the findings and recommendations by government departments to inform the development of strategies to support the work of teachers in rural and regional areas (e.g., DEST funding the *Quicksmart* program to help address the needs of students achieving low numeracy and literacy benchmarks);
- Identification of specific issues requiring further research to inform the knowledge base (e.g., the greater need for professional development and resourcing by teachers in schools with Indigenous populations between 21-40% than any other group of teachers); and
- Opportunity for greater collaboration with government associations across a united front breaking down the barriers across States and Territories (e.g., *Implementation of ICT into Science Classrooms* is being funded by SiMERR but conducted across Australia by members of the Australian Science Teachers' Association).

## CONCLUSION

The comparison of PISA, TIMSS, and the National Benchmarking data across geographical locations indicates that there is a chasm between the level of achievement of students in Metropolitan, Regional (provincial), and Rural areas of Australia. Our purpose here is not to cast blame but to highlight the inequity that is present using valid and reliable data that has international and/or national validity. In so doing, it provides sound numerical evidence to use in discussions with various government and educational authorities regarding the needs and support required by Rural and Regional communities.

The establishment of the SiMERR National Centre with its Hubs in every State and Territory has set out to raise the profile of the issues impacting student achievement in these three discipline areas. While much of the media would suggest that teachers are largely responsible, the National Survey conducted by the Centre has identified that the situation is a great deal more complicated because of the intricate relationship between school, various stakeholders and the broader community. Therefore, any attempt to address the needs of science, mathematics and ICT students and teachers in Rural and Regional Australia requires a collaborative and unified approach across all sectors.

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