Australian Government

UNE THE UNIVERSITY OF NEW ENGLAND

Science, ICT and Mathematics Education in Rural and Regional Australia

The SiMERR National Survey

A research report prepared for the Department of Education, Science and Training

Terry Lyons, Ray Cooksey, Debra Panizzon, Anne Parnell, John Pegg

SiMERR

National Centre of Science, ICT and Mathematics Education for Rural and Regional Australia

University of New England

Australian Government

UNE
THE UNIVERSITY
OF NEW ENGLAND

Science, ICT and Mathematics Education in Rural and Regional Australia

The SiMERR National Survey

A research report prepared for the Department of Education, Science and Training

Terry Lyons, Ray Cooksey, Debra Panizzon, Anne Parnell, John Pegg

National Centre of Science, ICT and Mathematics Education
for Rural and Regional Australia

University of New England

ISBN: 1 86389 997 9

This project was funded by the Australian Government Department of Education, Science and Training as a quality teacher initiative under the Australian Government Quality Teacher Programme. Website: <http://www.qualityteacher.dest.gov.au/Content/

Cover photographs submitted by (from L to R) SiMERR NSW, SiMERR Queensland, SiMERR NT, SiMERR WA, SiMERR NSW.

Australian Government
Department of Transport and Regional Services

SiMERR

UNE
THE UNIVERSITY OF NEW ENGLAND

Australian Government
Department of Education, Science and Training

ACKNOWLEDGEMENTS

The success of any large and complex project depends upon the efforts, support and goodwill of many people, and the SiMERR National Survey was no exception. It is difficult to pinpoint reasons why individuals and groups from around Australia were willing to participate so enthusiastically in the survey. Perhaps it is because the focus is so important, so concerning and so dear to the hearts of many Australians. The authors would like to acknowledge the contributions of the following individuals and organisations:

The Department of Education, Science and Training, for funding the project through the Australian Government Quality Teacher Programme (AGQTP). In particular we are indebted to Mr Scott Lambert, Director, and Ms Anne Curtain, Assistant Director, Future Schooling and Teacher Workforce Section, Quality Schooling Branch, Schools Group.

The Department of Transport and Regional Services, for funding the ongoing work of SiMERR Australia. In particular, we wish to thank Ms Maree Cooper and Mr Des Harris, for their advice and support.

Our SiMERR National Centre colleagues:
Mr Tony Brown, Dr Lorraine Graham, Mr Russel Glover, Ms Debbie Jenner, Dr Chris Reading, Mr Greg Scott, Mrs Debbie Sozou, Ms Terry Wright.

Professor Ross Thomas (Honorary Fellow, University of New England and visiting Professorial Fellow, University of Wollongong), for his expertise in reviewing and proofreading this report.

Associate Professor Stan Bailey (Honorary Fellow, University of New England), for his extensive contribution to the literature review.

The National Survey Advisory Committee of Associate Professor Neil Anderson (James Cook University, SiMERR Qld), Ms Anne Curtain (DEST), Dr Sandra Frid (Curtin University of Technology, SiMERR WA), Mr Des Gorman (New England Regional Director, NSW Department of Education and Training), Mr Graham Hancock (Principal, Sir Henry Parkes Primary School, Tenterfield), Mr Paul Holman (Catholic Schools Office, Armidale), Mr Scott Lambert (DEST), Mrs Barbara Luelf (Isolated Children's Parents' Association), Professor Victor Minichiello (Dean, Faculty of Education, Health and Professional Studies, University of New England), Mr Will Morony (Executive Officer, Australian Association of Mathematics Teachers), and Professor Len Unsworth (University of New England).

Finally, but most importantly, to the teachers and parents/caregivers who took the time to participate in the National Survey. We appreciate your efforts and will do our utmost to ensure that this report leads to significant and effective action.

Professor John Pegg (Project Team Leader and Director, SiMERR National Centre)
Dr Terry Lyons (Project Manager)
Dr Debra Panizzon, (Deputy Director, SiMERR National Centre)
Ms Anne Parnell (Project Officer)
Professor Ray Cooksey (SiMERR Design & Analysis Consultant)

May 30th, 2006

REPORT AUTHORS

Dr Terry Lyons
Project Manager and
Research Fellow
SiMERR National Centre

Professor Ray Cooksey
SiMERR Design and Analysis Consultant
New England Business School
University of New England

Dr Debra Panizzon
Deputy Director
Science Education
SiMERR National Centre

Mrs Anne Parnell
Project Officer
SiMERR National Centre

Professor John Pegg
Project Team leader and
Director of SiMERR National Centre

EXECUTIVE SUMMARY

INTRODUCTION

The SiMERR National Survey was one of the first priorities of the National Centre of Science, Information and Communication Technology and Mathematics Education for Rural and Regional Australia (SiMERR Australia), established at the University of New England in July 2004 through a federal government grant. With university based 'hubs' in each state and territory, SiMERR Australia aims to support rural and regional teachers, students and communities in improving educational outcomes in these subject areas. The purpose of the survey was to identify the key issues affecting these outcomes.

The National Survey makes six substantial contributions to our understanding of issues in rural education. First, it focuses specifically on school science, ICT and mathematics education, rather than on education more generally. Second, it compares the different circumstances and needs of teachers across a nationally agreed geographical framework, and quantifies these differences. Third, it compares the circumstances and needs of teachers in schools with different proportions of Indigenous students. Fourth, it provides greater detail than previous studies on the specific needs of schools and teachers in these subject areas. Fifth, the analyses of teacher 'needs' have been controlled for the socio-economic background of school locations, resulting in findings that are more tightly associated with geographic location than with economic circumstances. Finally, most previous reports on rural education in Australia were based upon focus interviews, public submissions or secondary analyses of available data. In contrast, the National Survey has generated a sizable body of original quantitative and qualitative data.

DESIGN AND IMPLEMENTATION

The National Survey proceeded in two phases. In Phase One, questionnaires were distributed to primary teachers, secondary science, ICT and mathematics teachers, and parent/caregivers in four geographical regions across Australia: Metropolitan Areas, Provincial Cities, Provincial Areas and Remote Areas[1]. The teachers were asked about the staffing situations at their schools, and the importance and availability of a range of professional development opportunities, resources, and student learning opportunities in their locations. Parents/caregivers were asked for their views on the science, ICT and mathematics education experienced by their children, and the strengths and challenges facing their communities and their children's schools. Survey questionnaires were sent to schools in May 2005, and responses received from 2940 teachers and 928 parents/caregivers.

In the second phase, research groups in the eight state and territory 'hubs' of SiMERR Australia interviewed over 550 teachers, students and parent/caregivers in 38 Provincial and Remote schools. The interviews provided rich, in-depth perspectives to complement the quantitative data. The hub reports are presented in the companion volume, *Science, ICT and Mathematics Education in Rural and Regional Australia: State and Territory Case Studies*.

[1] See Chapter One for details of the MCEETYA Schools Geographical Location Classification.

PRINCIPAL FINDINGS

The SiMERR National Survey generated over 100 findings, of which the following are the most significant.

Supply and demand of teachers

Teachers in Provincial Areas were twice as likely, and those in Remote Areas about six times as likely as their Metropolitan and Provincial City colleagues to report high annual staff turnover rates (>20% p.a.) in their schools.

Primary teachers in Provincial Areas were more than twice as likely, and those in Remote Areas up to six times as likely as those in Metropolitan Areas to report that it was 'very difficult' to fill vacant teaching positions in their schools.

Secondary science, ICT and mathematics teachers in Provincial Areas were about twice as likely, and those in Remote Areas about four times as likely as those in Metropolitan Areas to report that it was 'very difficult' to fill vacant teaching positions in those subjects in their schools.

Attracting and retaining teachers for rural and regional schools

The study found that the teachers tended to gain employment in locations similar to those in which they lived while undertaking pre-service education. In particular, about 73% of respondents who lived in rural centres while completing their initial teacher education are currently teaching in Provincial Area or Remote Area schools. Only 5% of respondents who lived in rural centres during their teacher education are teaching in Metropolitan schools.

The teachers' motivations for initially going to rural and regional schools were very different from their reasons for staying. While the most common motivations for going were job availability and education authority placement, once in the locality they tended to stay because of the quality of lifestyle, community spirit, and the relationships they established.

The influence of different factors on initial decisions to work in rural and regional schools has changed over time. Teachers older than 40 years were more influenced by education authority placement, scholarships and bonds than were younger teachers.

The most common reasons teachers gave for moving from a rural or regional school to a metropolitan school were their partners' employment situations and wanting to increase educational opportunities for their own children. For many teachers, social and professional isolation were also influential in decisions to leave.

In terms of attracting metropolitan teachers to rural and regional schools, smaller class sizes and preference for future transfers had the highest motivational value. Financial incentives such as cheaper housing, rent and travel subsidies and allowances were also influential among younger teachers.

Teacher qualifications and preparedness for teaching in rural and regional schools

The qualifications of primary and secondary science, ICT and mathematics respondents did not vary significantly with age, sex or geographic location.

Science, ICT and mathematics teachers in Provincial Areas indicated they were about twice as likely, and those in Remote Areas more than three times as likely as those in Metropolitan Areas to be required to teach a subject for which they were not qualified.

Teachers who lived in provincial cities or regional centres during their initial teacher education felt better prepared for teaching in rural and regional schools and teaching Indigenous students than did those who were in metropolitan centres.

Professional Connectedness and Isolation

The study compared the professional development needs of teachers in different locations and the degree to which they felt these needs were being met. The findings highlight the inequities in access to professional development opportunities across Australia.

Primary teachers in Remote Areas indicated a significantly higher unmet need for professional development opportunities such as mentoring, release time for professional development (PD) and collaboration with colleagues than did teachers elsewhere. Primary teachers outside Metropolitan Areas indicated a substantially greater unmet need for in-services in science and mathematics than did their metropolitan counterparts.

Science teachers in Provincial and Remote Areas indicated a significantly higher unmet need for a broad range of professional development opportunities than did those in Provincial Cities or Metropolitan Areas. Science teachers in metropolitan schools reported a lower level of unmet need for *every* professional development item.

The professional development needs of primary teachers and secondary science and mathematics teachers in schools with substantial proportions of Indigenous students are not being satisfactorily met. In particular, all three groups indicated a high need for professional development to help them cater for Indigenous, special needs, and gifted and talented students in their classrooms.

Material Resources and Support Personnel

The study compared the resourcing and support needs of teachers in different locations and the degree to which they felt these needs were being met.

Science teachers outside Metropolitan Areas indicated a significantly higher unmet need for a range of resources and assistance including ICT support and maintenance, learning support, and resources to cater for student diversity, than did their metropolitan colleagues.

Primary teachers and secondary science and mathematics teachers in schools with moderate to high proportions of Indigenous students indicated higher levels of unmet need for resources and support, including resources suited to special needs, gifted and talented and Indigenous students than did those in schools with fewer Indigenous students.

The highest need indicated by ICT teachers was for support personnel to help them manage ICT resources and assist teachers and other staff to use these resources effectively. ICT teachers in non-metropolitan schools had a higher unmet need for a range of resources and support, particularly for addressing student diversity and managing ICT resources.

Student Learning Experiences

The surveys asked teachers in different locations about the learning needs of their students and the degree to which they felt these needs were being met.

Primary teachers and secondary science and ICT teachers in non-metropolitan schools indicated a significantly higher unmet need for their students to have access to a broad range of learning experiences including opportunities to visit educational sites, than did their metropolitan colleagues.

Science teachers in non-metropolitan schools indicated a significantly higher level of unmet need for alternative activities to suit gifted and talented, special needs and Indigenous students than did their metropolitan colleagues.

Primary teachers and secondary science and mathematics teachers in schools with higher proportions of Indigenous students indicated that their needs for alternative and extension activities to cater for the diversity of student backgrounds and ability levels in their classes were not being met.

The practice of combining secondary classes (e.g., Year 11 and Year 12 physics) was significantly more common in rural schools. Only 11% of Metropolitan Area respondents, and 17% of Provincial City respondents, reported that composite science, ICT or mathematics classes were held in their schools. By contrast, 36% of those in Provincial Areas and 58% of those in Remote Areas reported this arrangement.

Parent/Caregiver Perspectives

Parents/caregivers considered the commitment and enthusiasm of teachers to be one of the greatest strengths of their children's schools. Perceptions of the levels of enthusiasm teachers brought to class did not vary significantly with geographical location or type of school.

The confidence of parents/caregivers in the capacity of their children's primary schools to attract and retain qualified teachers declined substantially with the size and remoteness of school location. However, this was not perceived in secondary school staffing.

Although parents/caregivers in Remote Areas were generally appreciative of their children's teachers, there were concerns about the inexperience and capabilities of the teachers commonly recruited to these schools, and the long-term effects on the education of children.

The perceptions of parents/caregivers about levels of achievement in science, ICT and mathematics in their children's schools varied substantially with geographic location. Those with children in metropolitan schools were more inclined to agree that children in these schools achieved to a high standard in these subjects than were parents/caregivers with children in non-metropolitan schools. Those with children attending schools in Remote Areas were least inclined to agree.

The greatest concern of parents/caregivers was about whether their children had adequate access to a good range of learning experiences and opportunities, including excursions, visits by experts, and a variety of senior courses from which to choose. Parents/caregivers believed that student access to these experiences and opportunities is considerably greater in larger population centres, and those outside larger centres were concerned that their children were at an educational disadvantage.

RECOMMENDATIONS

It is recognised that efforts have been, and are being made by individual state/territory education authorities and other organisations to address various aspects of the problems identified above, and those of rural and regional education in Australia more generally (MCEETYA, 2005). Nevertheless, the authors assert that a nationally coordinated approach, involving these and other relevant stakeholders, is required to address these issues in a holistic way. We therefore propose that the recommendations from this and similar reports be implemented under the auspices of a National Rural School Education Strategy.

Principal Recommendation

It is recommended that a whole-of-government approach to addressing the issues of rural and regional school education be developed and implemented in the form of a National Rural School Education Strategy. The aim of the strategy would be:

g. To map a coordinated approach across all government and non-government education jurisdictions to addressing geographic disparities in school education.
h. To foster the development of strategic partnerships between stakeholders involved in rural and regional education.
i. To deliver a coordinated, collaboratively-designed and research-supported package of programs to address the needs of rural teachers and students, rather than a collection of separate initiatives.

The concept of the National Rural School Education Strategy is developed in greater detail in Recommendations 21 and 22, and in Chapter 10. The following twenty recommendations relate specifically to the findings of the National Survey, and were also informed by the state and territory case studies.

Recommendations to address staffing concerns

Attraction and retention of teachers for rural schools

1. It is recommended that education authorities review their rural and remote recruitment incentive schemes in the light of motivational factors identified by the National Survey, with a view to:
    a. extending the eligibility of schemes to apply to a broader range of locations
    b. providing a system of progressive incentives that reward retention
    c. including incentives which would appeal to experienced science, ICT and mathematics teachers and school leaders
    d. ensuring greater awareness of such schemes among pre-service and existing teachers.

Components of a progressive incentive scheme could include:

- ongoing career development tied to retention (e.g. targeted leadership training)
- professional development (e.g. qualification for sabbatical after a period of service)
- improved leave entitlements (maturing at intervals of service)
- a progressive rather than flat system of financial incentives
- inbuilt relief in staffing formulae for locations where there is difficulty employing relieving and short term contract teachers.

2. It is recommended that government and non-government education authorities develop or extend scholarship schemes targeting pre-service or beginning science, ICT and mathematics teachers willing to take up appointments in rural and regional schools. Federal and state/territory governments and relevant non-government bodies should examine current scholarship schemes to determine how they might be made more economically efficient, and be monitored for effectiveness.

Most states/territories already have scholarship schemes in place, and in some cases these have recently been reviewed (MCEETYA, 2005). Evidence from the National Survey supports the expansion of such schemes specifically to target pre-service secondary science, ICT and mathematics teachers willing to work in rural or remote schools.

Potential obstacles to the uptake of such scholarships among pre-service teachers include the personal economic difficulties (employment obligations, accommodation, etc.) they may experience in undertaking practical experiences in rural schools. Scholarship schemes would need to take account of these difficulties, especially among students in metropolitan universities. An alternative approach might be to expand the number of places for pre-service teaching programs in science, ICT and mathematics at rural and regional universities (where they exist). Education authorities should also explore scholarship schemes whereby they pay some or all of a teacher's Higher Education Contribution Scheme (HECS) debt. Research by Roberts (2005) suggests that beginning teachers would be strongly motivated by a significant reduction in their HECS debt.

3. It is recommended that education authorities, in partnership with universities, local councils, industries and businesses develop or improve strategies to promote the advantages of living and teaching in rural communities.

Strategies could include publicity campaigns promoting rural teaching, aimed at both pre-service and experienced teachers. Education authorities could also collaborate with university education faculties to engage experienced rural teachers to address pre-service teachers about the benefits and challenges of rural schools. Another strategy could be the development of programs whereby groups of pre-service students visit rural and remote schools (e.g. *Beyond the Line* in New South Wales) if something similar is not already in place.

Support for rural teachers

4. It is recommended that state/territory education systems sponsor the establishment of a professional Association of Rural Educators, with a central office in a regional area of each state/territory and branches in rural areas. The charter of the association would include:
   a. supporting the orientation of new teachers
   b. supplementary peer support
   c. advocating for rural teachers
   d. enhancing the status of rural service
   e. promoting a sense of collegiality between rural teachers
   f. maintaining the institutional memory of the profession in rural areas.

5. It is recommended that education authorities, in collaboration with universities and professional organisations, establish a Rural School Leadership Program. This program would have both an incentive and a developmental dimension, be highly selective and competitive, and target experienced teachers with significant leadership potential. Components of the program may include:
   a. further university education, such as accredited action research (towards a masters or doctoral degree)
   b. links to international rural teacher networks, with the possibility of an exchange program
   c. fast-tracked entry into regional and state Succession Planning programs
   d. provision of personal online coaches/mentors to assist with professional learning pathways and skill acquisition.

Details of the support mechanisms and financial arrangements underpinning aspects of the program, such as further education, would need to be negotiated by the program partners. Nevertheless, such a program would enhance the attractiveness of rural service among experienced teachers and the status of rural teaching in general.

Pre-service preparation for rural teaching

6. It is recommended that Centres of Excellence in rural and regional pre-service teacher education be established at universities in each state and territory. The National Survey findings clearly support the establishment of such centres in regional universities, where these exist. In states/territories without rural universities, the centres could be established in one or more metropolitan universities committed to rural education.

7. It is recommended that the federal government, in partnership with universities, allocate additional student places in primary teaching and secondary science, ICT and mathematics teaching programs in the aforementioned Centres of Excellence in rural and regional pre-service teacher education.

8. It is recommended that parties involved in the emerging national and state/territory standards frameworks for pre-service education include standards requiring that:
   a. primary teachers are adequately prepared for teaching mathematics, science and ICT
   b. all teachers are able to address the learning needs of students in rural and regional areas, especially Indigenous students.

Recommendations to address professional isolation

Induction/orientation of teachers new to a rural area

9. It is recommended that education authorities, in collaboration with professional organisations (including the Association of Rural Educators), develop and monitor induction and orientation strategies to support the particular needs of teachers new to rural and regional schools including, as appropriate:
    a. teaching Indigenous students, including an awareness of Indigenous cultural issues within local contexts
    b. teaching multi-grade and multi-subject classes
    c. teaching out of curriculum area
    d. working with limited resources including support staff
    e. teaching students with special needs
    f. living in rural communities.

The recommendation that rural teachers be better prepared and supported for teaching outside their curriculum areas is a response to the present realities of rural placement revealed by this and other studies. In the longer term, however, this is not an acceptable compromise and it is hoped that actions taken to improve the science, ICT and mathematics staffing situations in these schools will have mitigated the necessity for this practice.

Continuing professional development

10. It is recommended that education authorities, in partnership with schools and school communities, universities, and professional organisations meet the continuing professional development needs of teachers in rural and regional areas through a range of strategies that ensure equitable access to ongoing quality professional learning. Approaches could include:
    a. the development of flexible staffing and school timetabling arrangements to allow scheduling of professional development
    b. the development of improved systems and strategies for collaborative face-to-face and online modes of professional development for teachers in rural and regional locations
    c. promoting cross-sectoral collaboration in meeting the professional development needs of teachers on a local basis
    d. funding research, development and dissemination of strategies to teach science, ICT and mathematics to the diverse range of students found in rural and regional classrooms
    e. implementing strategies for mentoring rural and regional mathematics, science and ICT teachers at various career stages, e.g., establishment of local networks such as the Association of Rural Educators, and initiatives such as the Rural School Leadership Program, suggested above.

Professional Engagement

11. It is recommended that education authorities and curriculum bodies address the professional isolation of rural and regional science, ICT and mathematics teachers by developing and monitoring strategies to ensure equitable access to and involvement in a range of core activities, enabling them to be engaged and contributing members of their professional community. Core professional activities include:
    a. curriculum development
    b. state/territory and system-wide student assessment programs
    c. consultations on pedagogical practice.

Recommendations to address access to resources and support personnel

Provision of compensatory ICT resources

12. It is recommended that education authorities, in collaboration with school communities, industry and business partners, provide improved access for rural and regional students and teachers to ICT hardware and network capacity. The level of access should allow increased use of online learning modes to compensate for reduced resources in other areas.

Access to ICT support personnel

13. It is recommended that education authorities, in collaboration with school communities, industry and business partners, develop and monitor strategies to improve the provision of technical support to rural and regional schools to maximise efficiency of hardware and networks, and to reduce the time spent by teachers in maintaining ICT systems. Initiatives could include:
    c. the establishment of strategic partnerships with other ICT users in the local area
    d. the employment of additional human resources for ICT system support.

Access to curriculum resources

14. It is recommended that education authorities, in collaboration with schools and other government and non-government agencies, develop and disseminate strategies and resources applicable to rural and regional contexts that support primary teachers in catering for students with diverse backgrounds, learning needs and aspirations, including Indigenous students, gifted and talented students, students from non-English speaking backgrounds and students with special learning needs.

15. It is recommended that education authorities, in collaboration with schools and other government and non-government agencies, develop and disseminate strategies and resources applicable to rural and regional contexts that support secondary science, ICT and mathematics teachers in:
    a. integrating ICT into their teaching
    b. catering for students with diverse backgrounds, learning needs and aspirations, including Indigenous students, gifted and talented students, students from non-English speaking backgrounds and students with special learning needs
    c. teaching subjects out of their curriculum areas, including consideration of alternative flexible staffing strategies and online learning to maximise the quality of teaching and learning where the availability of teachers in specialised areas is restricted.

Access to Learning Support personnel

16. It is recommended that education authorities increase the numbers of teacher assistants, Aboriginal and Islander Education Workers (AIEW) and other para-professionals in rural and remote schools to support teachers in catering for the diverse learning needs of students.

The National Survey findings show that the unmet need for support personnel is higher in rural and remote areas, indicating that present funding formulae do not seem to be addressing needs equitably. Calculations should recognise that the need for para-professional support does not relate simply to student numbers, but to the diversity of students, community characteristics and accessibility to services.

Resource funding formulae

17. It is recommended that education authorities review strategies and funding formulae to recognize that there is a greater unmet need for some resources in schools with 21-40% Indigenous students than in schools with higher Indigenous populations. The variation in resource needs among schools with different proportions of Indigenous students suggests a need for education authorities to allow schools greater flexibility in determining their own resourcing priorities.

Recommendations to improve student learning opportunities

18. It is recommended that education authorities, in partnership with schools, rural communities and other agencies, develop strategies, allocate funding, and provide resources to enable rural and regional students to access locally and online a broader range of educational experiences in science, ICT and mathematics comparable to those available to metropolitan locations, such as:

    a. on-site visits

    b. summer schools

    c. opportunities to interact with students from other schools nationally and internationally

    d. mentoring by experts and practitioners in the field

    e. high quality learning materials, including interactive simulations and problem-solving activities

    f. activities that address the learning needs of the range of students in composite classes.

To be effective, the strategies would need to include:

- proportionate funding formulae that reflect difficulty of travelling to major centres
- improved broadband access to facilitate use of web-based simulations, communication with mentors and interaction with other schools.

19. It is recommended that government and non-government schools in rural areas form clusters within which staff are shared to maximise the subjects available to students, particularly in the senior years. These clusters could also coordinate (in collaboration with the Association of Rural Educators) visits by educational outreach programs to minimise costs.

Recommendation to address parent/caregiver concerns

20. It is recommended that the federal government publicly acknowledge the concerns of parents/caregivers in rural and regional areas outlined in this report. Furthermore, in addressing recommendations 1-19, education authorities should ensure that parent organizations are kept informed, and consulted about initiatives and strategies employed in response to the findings. It is clear from the findings that parents/caregivers in rural and regional areas are concerned about student outcomes in science, ICT and mathematics in rural schools, and it is critical that governments be seen to be addressing these concerns in a systematic and effective way.

Recommendations 21 and 22 relate to the principal recommendation of this report, and in particular, to the establishment of two important components of the National Rural School Education Strategy – the initiating Taskforce and a national rural education research network.

21. It is recommended that a National Rural School Education Taskforce be established to coordinate the development of the National Rural School Education Strategy. The Taskforce would facilitate ongoing cooperation between federal and state/territory governments and other stakeholders, and encourage active commitment to coordinate and jointly plan activities and initiatives aimed at achieving equitable access to education by teachers and students.

It is envisaged that the Taskforce be a dedicated national body, having an operational arm in DEST and given high level direction through the Council of Australian Governments (COAG) or the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA). This would give the National Strategy unequivocal support from peak political bodies reporting to federal, state and territory governments and their instrumentalities. There should also be input from other relevant government departments, such as the Department of Transport and Regional Services, the Department of Employment and Workplace Relations, and the Department of Health and Ageing.

22. It is recommended that a National Rural Education Research Network be established and funded over the life of the National Strategy. Consistent with the National Strategy, the research would need to be conducted though a body or bodies having a coordinated national focus, a presence at universities in each state and territory with strong links to local education agencies and organizations, and expertise in rural and regional education, particularly, though not exclusively, in science, ICT and mathematics education.

The Rural Education Research Network would have a strategic focus as well as a coordinating and initiating role. Members of the Network would undertake high-quality research, synthesise research findings so they are made available through the Network, add to our knowledge of how to teach in rural and regional areas, provide guidance to governments and other education authorities on policy, and disseminate research and good practice through conferences, publications, media releases and network websites. The Research Network would also constitute a national forum for addressing issues in rural and regional education, including those relating to science, ICT and mathematics, and student diversity.

Participant universities should be located in regional areas, or where this is not possible, have a demonstrated commitment to rural education. Preferably, the universities should also be Centres of Excellence in rural and regional pre-service education. The Centres would build upon the significant infrastructure already in place in regional universities.

CONTENTS

ACKNOWLEDGEMENTS iii
EXECUTIVE SUMMARY v
LIST OF TABLES xix
LIST OF FIGURES xxii

CHAPTER ONE - INTRODUCTION TO THE SiMERR NATIONAL SURVEY 1
1.1 BACKGROUND 1
1.2 OUTLINE OF THE NATIONAL SURVEY 1
1.3 SIGNIFICANCE OF THE NATIONAL SURVEY 1
1.4 DEFINITIONS OF RURAL AND REGIONAL 2
1.5 STRUCTURE OF THE REPORT 4
1.6 ACRONYMS 5

CHAPTER TWO - THE CONTEXT OF RURAL AND REGIONAL EDUCATION IN SCIENCE, ICT AND MATHEMATICS 6
2.1 INTRODUCTION 6
2.2 IMAGES OF RURAL AND REGIONAL AUSTRALIA 7
2.3 PROFESSIONAL AND SOCIAL ISSUES FOR RURAL AND REGIONAL TEACHERS 8
2.4 DEMAND AND SUPPLY OF SCIENCE, ICT AND MATHEMATICS TEACHERS 12
2.5 STRATEGIES TO ADDRESS RECRUITMENT AND RETENTION PROBLEMS 17
2.6 STUDENTS LIVING IN RURAL AND REGIONAL AUSTRALIA 20
2.7 INDICATORS OF RURAL STUDENT ACHIEVEMENT IN SCIENCE AND MATHEMATICS 24
2.8 RURAL AND REGIONAL ICT EDUCATION 27
2.9 A FRAMEWORK FOR THE SiMERR NATIONAL SURVEY 29

CHAPTER THREE - DESIGN AND IMPLEMENTATION 30
3.1 INTRODUCTION 30
3.2 IDENTIFYING THE STUDY POPULATION 30
3.3 DATA COLLECTION INSTRUMENTS 31
3.4 RESEARCH INTEGRITY 33
3.5 RESPONSE RATES 34
3.6 VARIABLES AND DATA PREPARATION 40
3.7 DATA ANALYSIS 41
3.8 HOW TO INTERPRET TABLES AND FIGURES IN THIS REPORT 43

CHAPTER FOUR - STAFFING ISSUES IN SCIENCE, ICT AND MATHEMATICS 46
4.1 INTRODUCTION 46
4.2 SCHOOL STAFFING PROFILES 46
4.3 DESTINATION SCHOOLS OF CITY AND COUNTRY EDUCATED TEACHERS 53
4.4 MOTIVATIONS FOR TEACHING IN RURAL AND REGIONAL SCHOOLS 57
4.5 PERCEPTIONS OF TEACHER EDUCATION AND PREPARATION 71
4.6 TEACHING QUALIFICATIONS 79

CHAPTER FIVE - PROFESSIONAL CONNECTEDNESS AND ISOLATION 82
5.1 INTRODUCTION 82
5.2 PROFESSIONAL DEVELOPMENT NEEDS OF PRIMARY TEACHERS 82
5.3 PROFESSIONAL DEVELOPMENT NEEDS OF SCIENCE TEACHERS 87

5.4 PROFESSIONAL DEVELOPMENT NEEDS OF ICT TEACHERS 91
5.5 PROFESSIONAL DEVELOPMENT NEEDS OF MATHEMATICS TEACHERS 93

CHAPTER SIX - MATERIAL RESOURCE AND SUPPORT NEEDS OF TEACHERS 97
6.1 INTRODUCTION 97
6.2 MATERIAL RESOURCE AND SUPPORT NEEDS OF PRIMARY TEACHERS 97
6.2 MATERIAL RESOURCE AND SUPPORT NEEDS OF SECONDARY SCIENCE TEACHERS 101
6.3. MATERIAL RESOURCE AND SUPPORT NEEDS OF SECONDARY ICT TEACHERS 106
6.4 MATERIAL RESOURCE AND SUPPORT NEEDS OF SECONDARY MATHEMATICS TEACHERS 111

CHAPTER SEVEN - STUDENT LEARNING OPPORTUNITIES AND EXPERIENCES 115
7.1 INTRODUCTION 115
7.2 PRIMARY TEACHERS' VIEWS ON STUDENT LEARNING NEEDS 115
7.3 SCIENCE TEACHERS' VIEWS ON STUDENT LEARNING NEEDS 119
7.4 ICT TEACHERS' VIEWS ON STUDENT LEARNING NEEDS 123
7.5 MATHEMATICS TEACHERS' VIEWS ON STUDENT LEARNING NEEDS 126
7.6 STUDENTS LEARNING IN COMPOSITE CLASSES 129

CHAPTER EIGHT - PARENTS/CAREGIVERS' PERSPECTIVES ON THEIR CHILDREN'S SCIENCE, ICT AND MATHEMATICS EDUCATION 132
8.1 INTRODUCTION 132
8.2 CHARACTERISTICS OF PARENT/CAREGIVER RESPONDENTS 132
8.3 TRAVEL TIME TO SCHOOL 134
8.4 PARENTS/CAREGIVERS' ASPIRATIONS FOR THEIR CHILDREN 134
8.5 PERCEPTIONS OF CAPACITIES OF SCHOOLS TO ATTRACT AND RETAIN TEACHERS OF SCIENCE, ICT AND MATHEMATICS 135
8.6 PERCEPTIONS OF ACHIEVEMENT AND TEACHER ATTITUDES IN SCIENCE, ICT AND MATHEMATICS EDUCATION 138
8.7 PERCEPTIONS OF STRENGTHS AND OBSTACLES IN SCIENCE, ICT AND MATHEMATICS EDUCATION 145

CHAPTER NINE - CONCLUSIONS AND RECOMMENDATIONS 149
9.1 INTRODUCTION 149
9.2 STAFFING ISSUES IN SCIENCE, ICT AND MATHEMATICS 149
9.3. PROFESSIONAL CONNECTEDNESS AND ISOLATION OF TEACHERS 157
9.4. MATERIAL RESOURCE AND SUPPORT NEEDS OF TEACHERS 161
9.5 STUDENT LEARNING OPPORTUNITIES AND EXPERIENCES 165
9.6 PARENTS/CAREGIVERS' PERSPECTIVES ON THEIR CHILDREN'S SCIENCE, ICT AND MATHEMATICS EDUCATION 168
9.7 CONCLUSION 171

CHAPTER TEN - RURAL EDUCATION: A FRAMEWORK FOR ACTION 172
10.1 INTRODUCTION 172
10.2 WHERE TO FROM HERE FOR RURAL EDUCATION? 172
10.3 CATALYSTS FOR A NATIONAL RURAL SCHOOL EDUCATION STRATEGY 173
10.4 DEVELOPING A NATIONAL RURAL SCHOOL EDUCATION STRATEGY 175
10.5 CONCLUSION 178

REFERENCES 180
APPENDICES 187

LIST OF TABLES

Table 1.1: Categories of the MCEETYA Schools Geographic Location Classification 3
Table 1.2: The four collapsed categories of the MCEETYA Schools Geographic Location Classification (MSGLC) used throughout the report 3
Table 2.1: Intended field of university study, by student location 21
Table 3.1: Characteristics of schools invited to participate in the National Survey 31
Table 3.2: Timetable of contact with schools 35
Table 3.3: Response rates of invited schools by Type, System, State/Territory and MSGLC category 35
Table 3.4: Breakdown of teacher survey respondents by State/Territory, School System and MSGLC Categories of School...37
Table 3.5: Breakdown of Sex and Age of Respondent, by individual teacher-related variables. 38
Table 3.6: Overview of parent/caregiver respondent characteristics..39
Table 3.7: Breakdown for the parents/caregivers sample, by State/Territory and School System 39
Table 3.8: Variable Categories 40
Table 3.9: Reported rates of staff turnover in schools in different MSGLC categories 44
Table 3.10: Mean ratings by science respondents on Professional Interaction and Development item components, broken down by MSGLC categories...44
Table 4.1: Rates of staff turnover and difficulty of filling vacant positions in schools in different MSGLC categories 47
Table 4.2: Reported percentage of teachers leaving the school each year, by Type of School..........48
Table 4.3: Reported difficulty of filling vacant primary teaching positions and secondary science, ICT and mathematics teaching positions 49
Table 4.4: Reported difficulty of filling vacant primary and secondary science, ICT and mathematics teaching positions in different MSGLC categories 50
Table 4.5: Breakdown of current MSGLC categories of respondents, by locations where they undertook high school study..54
Table 4.6: Breakdown of current MSGLC categories of respondents, by locations where they lived while completing their initial teacher education 55
Table 4.7: Overall average ratings, standard deviations and valid N for the initial decision items 57
Table 4.8: Mean ratings on teacher motivation components regarding respondent's initial decision to teach in a rural or regional school, broken down by Sex, Age of Respondent and School System..58
Table 4.9: Overall average ratings, standard deviations and valid N for the continuance decision items 62
Table 4.10: Mean ratings on teacher motivation components regarding respondent's decision to continue teaching in a rural or regional school, broken down by Sex and Age of Respondent 63
Table 4.11: Overall average ratings, standard deviations and valid N for the 'decision to leave' items 65
Table 4.12: Mean ratings on teacher motivation components regarding respondent's decision to move from a rural/regional school to a metropolitan school, broken down by respondents' sex and age, school system and MSGLC categories...................................66
Table 4.13: Overall average ratings, standard deviations and valid N for the motivation to take up a rural or regional teaching position items 68
Table 4.14: Mean ratings on teacher motivation components regarding what would motivate respondents to take up a teaching position in a rural or regional school, broken down by respondents' age 69
Table 4.15: Overall average ratings, standard deviations and valid N for preparation items 71

Table 4.16: Breakdown of the two teacher preparation components, by Age of Respondent and Location During Initial Teacher Education 72
Table 4.17: Overall average ratings, standard deviations and valid N for the teacher education preparation items for secondary respondents 74
Table 4.18: Breakdown of the two secondary teacher preparation components, by Age of Respondent, Location During Initial Teacher Education and Survey Respondent Type 75
Table 4.19: Level of teaching qualifications of primary teachers and secondary science, ICT and mathematics teachers 79
Table 4.20: Secondary respondents indicating that they are required to teach a subject for which they are not formally qualified, compared by MSGLC categories 80
Table 5.1: Overall average 'need' scores, standard deviations and valid N for primary respondents' ratings of the Professional Interaction and Development items 83
Table 5.2: Mean ratings by primary respondents on Professional Interaction and Development item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 84
Table 5.3: Overall average 'need' scores, standard deviations and valid N for science respondents' ratings of the Professional Interaction and Development items 87
Table 5.4: Mean ratings by science respondents on Professional Interaction and Development item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 88
Table 5.5: Overall average 'need' scores, standard deviations and valid N for ICT teachers' ratings of the Professional Interaction and Development items 91
Table 5.6: Mean ratings by ICT respondents on Professional Interaction and Development item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 92
Table 5.7: Overall average 'need' scores, standard deviations and valid N for mathematics respondents' ratings of the Professional Interaction and Development items 93
Table 5.8: Mean ratings by mathematics respondents on Professional Interaction and Development item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 94
Table 6.1: Overall average 'need' scores, standard deviations and valid N for primary respondents'for Material Resources and Support Personnel items 98
Table 6.2: Mean ratings of primary respondents on Material Resources and Support Personnel item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 99
Table 6.3: Overall average 'need' scores, standard deviations and valid N for science respondents' ratings of the Material Resources and Support Personnel items 101
Table 6.4: Mean ratings of science respondents on Material Resources and Support Personnel item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 102
Table 6.5: Overall average 'need' scores, standard deviations and valid N for ICT respondents' ratings of the Material Resources and Support Personnel items 106
Table 6.6: Mean ratings of ICT respondents on Material Resources and Support Personnel item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 107
Table 6.7: Breakdown of ICT respondents' time management issues by MSGLC categories of school 110
Table 6.8: Overall average 'need' scores, standard deviations and valid N for mathematics respondents' ratings of the Material Resources and Support Personnel items 111
Table 6.9: Mean ratings of mathematics respondents on Material Resources and Support Personnel item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 112

Table 7.1: Overall average 'need' scores, standard deviations and valid N for primary respondents' ratings of the Student Learning Experience items 115
Table 7.2: Mean ratings by primary respondents on Student Learning Experience item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 116
Table 7.3: Overall average 'need' scores, standard deviations and valid N for science respondents' ratings of the Student Learning Experience items 119
Table 7.4: Mean ratings of science respondents on Student Learning Experience item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 120
Table 7.5: Overall average 'need' scores, standard deviations and valid N for ICT respondents' ratings of the Student Learning Experience items 123
Table 7.6: Mean ratings of ICT respondents on Student Learning Experience item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 124
Table 7.7: Overall average 'need' scores, standard deviations and valid N for mathematics respondents' ratings of the Student Learning Experience items 126
Table 7.8: Mean ratings of mathematics respondents on Student Learning Experience item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds 127
Table 7.9: Science, ICT and mathematics respondents reporting senior courses taught in composite classes, by MSGLC categories....................................130
Table 8.1: Distribution of parent/caregiver respondents by State/Territory, School System and MSGLC categories of School....................................133
Table 8.2: School-related characteristics of families....................................133
Table 8.3: Parents/caregivers estimates of time taken for children to travel to school 134
Table 8.4: Breakdown of the parent/caregiver aspiration items, by MSGLC categories and School System 135
Table 8.5: Breakdown of the item focusing on perceptions of school capacity to attract and keep qualified primary teachers, by MSGLC categories and Type of School 136
Table 8.6: Breakdown of items focusing on schools' capacity to attract and keep suitably qualified secondary teachers, by MSGLC categories and Type of School 137
Table 8.7: Breakdown of parent/caregiver perceptions of achievement levels and teacher attitudes in science, by MSGLC categories and Type of School 140
Table 8.8: Breakdown of parent/caregiver perceptions of achievement levels and teacher attitudes in ICT (secondary only), by MSGLC categories and Type of School....................................141
Table 8.9: Breakdown of parent/caregiver perceptions of achievement levels and teacher attitudes in mathematics, by MSGLC categories and Type of School....................................143

LIST OF FIGURES

Figure 2.1: Schools reporting difficulty in retaining science teachers, expressed as a percentage of the total number of schools responding per ARIA category 15
Figure 2.2: Percentages of Year 3, 5 and 7 students in different MSGLC categories achieving the National Numeracy Benchmark in 2004 25
Figure 2.3: Mean scores of Australian students from different locations in the PISA 2003 tests of mathematical literacy, scientific literacy and problem solving 26
Figure 3.1: Profile plot of mean 'need' scores of science respondents for the Professional Interaction and Development components, compared by MSGLC categories (Table 5.3 for item names in full) 45
Figure 4.1: Percentage of primary and secondary respondents in different locations reporting an annual staff turnover greater than 20% 48
Figure 4.2: Reported difficulty of filling vacant primary teaching positions in different locations [only respondents reporting the situation as 'not difficult' and 'very difficult' are shown here] 51
Figure 4.3: Reported difficulty of filling vacant secondary teaching positions in different locations [only respondents reporting the situation as 'not difficult' and 'very difficult' are shown here] 52
Figure 4.4: Percentages of science, ICT and mathematics respondents in different locations reporting that it is 'very difficult' to fill teaching vacancies in their subject areas 52
Figure 4.5: Current teaching locations of respondents who lived in either a Metropolitan Area or a Rural Centre when undertaking their initial teacher education 55
Figure 4.6: Profile plot of means for the eleven initial decision items compared, by Sex of Respondent (Table 4.7 for item names in full) 59
Figure 4.7: Profile plot of means for the eleven initial decision items compared, by Age of Respondent (Table 4.7 for item names in full) 60
Figure 4.8: Profile plot of means for the eleven initial decision items, compared by School system. (Table 4.7 for item names in full) 61
Figure 4.9: Profile plot of means for the eleven continuance decision items, compared by Sex of Respondent (Table 4.9 for item names in full) 64
Figure 4.10: Profile plot of means for the eleven continuance decision items, compared by Age of Respondent (Table 4.7 for item names in full) 64
Figure 4.11: Profile plot of means for the ten decisions to move to a metropolitan school items, **c**ompared by Age of Respondent (Table 4.11 for item names in full) 67
Figure 4.12: Profile plot of means for the ten decisions to move to a metropolitan school items, **c**ompared by Type of School (Table 4.11 for item names in full) 67
Figure 4.13: Profile plot of means for the ten motivation to take up a rural or regional position items, compared by Age of respondent (Table 4.13 for item names in full) 69
Figure 4.14: Profile plot of teacher preparation items, compared by Age of Respondent [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] (Table 4.15 for item names in full) 73
Figure 4.15: Profile plot of primary teacher preparation items, compared by Location During Initial Teacher Education (Table 4.15 for item names in full) 73
Figure 4.16: Profile plot of secondary teacher preparation items, compared by Age of Respondent [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] (Table 4.17 for item names in full) 76
Figure 4.17: Profile plot of secondary teacher preparation items, compared by Location During Initial Teacher Education [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] (Table 4.17 for item names in full) 76

Figure 4.18: Profile plot of secondary teacher preparation items, compared by Survey Respondent Type (science, ICT and mathematics) [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] (Table 4.17 for item names in full) 77
Figure 4.19: Percentages of science, ICT and mathematics respondents indicating they are required to teach subjects for which they are not formally qualified 80
Figure 5.1: Profile plot of mean 'need' scores of primary respondents for the Professional Interaction & Development components, compared by MSGLC categories (Table 5.1 for item names in full) 84
Figure 5.2: Profile plot of mean 'need' scores of primary respondents for the Professional Interaction & Development components, compared by percentage of students from Indigenous backgrounds (Table 5.1 for item names in full)... 86
Figure 5.3: Profile plot of mean 'need' scores of science respondents for the Professional Interaction and Development components, compared by MSGLC categories (Table 5.3 for item names in full)... 89
Figure 5.4: Profile plot of mean 'need' scores of science respondents for the Professional Interaction & Development components, compared by percentage of students from Indigenous backgrounds (Table 5.3 for item names in full)... 90
Figure 5.5: Profile plot of mean 'need' scores of mathematics respondents for the Professional Interaction and Development components, compared by percentage of students from Indigenous backgrounds (Table 5.7 for full item names) 95
Figure 6.1: Profile plot of mean 'need' scores of primary respondents for the Material Resources and Support Personnel components, compared by percentage of students from Indigenous backgrounds (Table 6.1 for item names in full)................. 100
Figure 6.2: Profile plot of mean 'need' scores of science respondents for the Material Resources and Support Personnel components, compared by MSGLC categories..... 103
Figure 6.3: Profile plot of mean 'need' scores of science respondents for the Material Resources and Support Personnel components, compared by percentage of students from Indigenous backgrounds 104
Figure 6.4: Profile plot of mean 'need' scores of ICT respondents for the Material Resources and Support Personnel components, compared by MSGLC categories 108
Figure 6.5: Percentages of ICT respondents reporting that >20% of their time is spent managing equipment and assisting others 109
Figure 6.6: Profile plot of mean 'need' scores of mathematics teachers for the Material Resources and Support Personnel components, compared by percentage of students from Indigenous backgrounds 113
Figure 7.1: Profile plot of mean 'need' scores of primary respondents for the Student Learning Experience components, compared by MSGLC categories (Table 7.1 for item names in full) 117
Figure 7.2: Profile plot of mean 'need' scores of primary respondents for the Student Learning Experience components, compared by percentage of students from Indigenous backgrounds (Table 7.1 for item names in full) 118
Figure 7.3: Profile plot of mean 'need' scores of science respondents for the Student Learning Experiences components, compared by MSGLC categories (Table 7.3 for item names in full) 121
Figure 7.4: Profile plot of mean 'need' scores of science respondents for the Student Learning Experiences components, compared by percentage of students from Indigenous backgrounds (Table 7.3 for item names in full) 122
Figure 7.5: Profile plot of mean 'need' scores of ICT respondents for the Student Learning Experience components, compared by MSGLC categories (Table 7.5 for item names in full) 125
Figure 7.6: Profile plot of mean 'need' scores of mathematics respondents for the Student Learning Experience components, compared by percentage of students from Indigenous backgrounds (Table 7.7 for item names in full)....................................... 128

Figure 7.7: Percentages of secondary respondents in different subject areas indicating that composite senior courses in these subjects were taught in their schools 129
Figure 7.8: Percentages of secondary teachers in different MSGLC categories indicating that science, ICT or mathematics courses were taught in composite classes 130
Figure 8.1: Mean 'agreement' by respondents that their child's school is able to attract and keep qualified primary teachers, compared by MSGLC categories [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)] 136
Figure 8.2: Mean 'agreement' of parent/caregiver respondents with statements about science achievement in their children's schools, compared by MSGLC categories [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)] 140
Figure 8.3: Mean ratings by parent/caregiver respondents on perceptions of ICT achievement levels in their child's school, compared by MSGLC categories [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)] 142
Figure 8.4: Mean ratings by parent/caregiver respondents on perceptions of mathematics achievement levels in their child's school, compared by MSGLC categories [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)] 144

CHAPTER ONE

INTRODUCTION TO THE SiMERR NATIONAL SURVEY

1.1 BACKGROUND

In July 2004, the Deputy Prime Minister the Hon. John Anderson officially opened the National Centre of Science, ICT and Mathematics Education for Rural and Regional Australia, at the University of New England. The SiMERR National Centre was established through a grant from the Australian Government in response to concerns about the lower levels of achievement of rural and regional students in these subjects relative to their metropolitan peers.

One of the first priorities of the SiMERR National Centre was to identify the key issues affecting student outcomes in science, ICT and mathematics at primary and secondary levels. To accomplish this task, a team from SiMERR developed the National Survey which was designed to collect base-line data on the characteristics, motivations and needs of rural and regional teachers, along with the perspectives of teachers, parents/caregivers and students regarding the strengths and obstacles associated with science, ICT and mathematics education in their schools.

1.2 OUTLINE OF THE NATIONAL SURVEY

The National Survey was conducted in two phases. In Phase One, five separate questionnaires were distributed to primary teachers, secondary science, ICT and mathematics teachers, and parent/caregivers. The four teacher questionnaires sought data on factors the literature suggested could be obstacles to rural students' achievement in the three subject areas. These factors included school staffing, professional isolation, resourcing, and student learning opportunities. The Parent/Caregiver survey sought family perspectives on science, ICT and mathematics education, and the strengths and obstacles that characterise rural schools.

The surveys were distributed to rural and regional schools in May 2005. In order to provide comparative data, questionnaires were also sent to a large sample of metropolitan schools. Responses were received from 2940 teachers and 928 parents/caregivers.

A second, parallel, phase of the survey involved research groups in the eight state and territory 'hubs' of SiMERR Australia interviewing teachers, students and parent/caregivers in a total of 37 rural and remote schools. The interviews provided in-depth perspectives to complement the mainly quantitative nature of the first phase. The hub reports are presented in a companion volume, *Science, ICT and Mathematics Education in Rural and Regional Australia: State and Territory Case Studies*.

1.3 SIGNIFICANCE OF THE NATIONAL SURVEY

There have been a number of important studies on rural education undertaken over the last decade. In addition, several reports on related concerns in rural and regional Australia, such as health, social conditions, Indigenous issues and rural industries have also been released. Many of these were commissioned by federal, state and territory governments. In some respects, the overall findings of the SiMERR National Survey are consistent with these reports, indicating that many of the difficulties identified by earlier studies have not been addressed, or that measures taken in response to recommendations have either not been successful, or have not yet effected the required change. The National Survey team considers it important to draw attention to these reports, reviewed in Chapter Two, both to emphasise that many of the symptoms of fundamental problems in rural Australia have already been identified, and to provide a context for the specific findings of the SiMERR National Survey.

This report makes six substantial contributions to this body of literature. First, it focuses specifically on school science, ICT and mathematics education, rather than on education in general. Second, it compares the different circumstances and unmet needs of teachers in four geographic regions: Metropolitan Areas, Provincial Cities, Provincial Areas and Remote Areas, and quantifies these differences. Third, it compares the circumstances and unmet needs of teachers in schools with different Indigenous populations. Fourth, it provides greater distinction than previous studies between the needs of schools and teachers in each of these subject areas. Fifth, the analyses of teacher unmet needs have been controlled for the socio-economic background of school locations, resulting in findings that are more tightly associated with geographic location than with economic circumstances. This distinction has not been made in previous studies. Finally, the major reports on rural Australia discussed in Chapter Two (e.g., Alloway, Gilbert, Gilbert & Muspratt, 2004; Human Rights and Equal Opportunity Commission, 2000; Skilbeck & Connell, 2003; Vinson, 2002) were based upon focus interviews, public submissions or secondary analyses of available data. The National Survey, on the other hand, generated a sizable body of original quantitative and qualitative data.

1.4 DEFINITIONS OF RURAL AND REGIONAL

As Hugo (2000) observed, terms such as regional, rural and remote are often used in a vague and overlapping way. While this is acceptable in general discourse, research examining socio-geographic differences requires greater clarity of terms. Such research also needs to consider accessibility to services as well as location (Alloway et al., 2004; Hugo, 2000). However, the range of classification models available and the difficulties involved in applying the criteria often hamper such research. This problem is apparent in the review of literature in Chapter Two. For example, the recent Australian Council of Deans of Science publication, *Who's Teaching Science?* (Harris, Jensz & Baldwin, 2005) drew geographic comparisons using the five categories of the Accessibility and Remoteness Index of Australia (ARIA) developed by the Australian Bureau of Statistics. In contrast, a recent report on the Programme for International Student Assessment (PISA) (Thomson, Cresswell & De Bortoli, 2004) compared student performance across the three categories of the MCEETYA Schools Geographical Location Classification (MSGLC). Other studies have used postcodes, Local Government Areas, or simple metropolitan/non-metropolitan dichotomies. Ultimately, the different reporting models used by different state, territory and federal bodies make geographic comparisons difficult.

In an attempt to establish a standard classification, the Ministerial Committee on Employment, Education and Youth Affairs (MCEETYA) agreed in July 2001 to adopt the MCEETYA Schools Geographic Location Classification (MSGLC) developed by Jones (2000) for reporting nationally comparable schooling outcomes. The latest version of this classification (Jones, 2004) was used to identify schools in the SiMERR National Survey.

The eight categories of the MSGLC model (Table 1.1) consider both population and accessibility/remoteness. The first four categories are based on population, while the accessibility/remoteness of smaller locations (pop. < 25 000) is determined with reference to the Accessibility and Remoteness Index of Australia (ARIA) developed by the Australian Bureau of Statistics. Locations are given an accessibility/ remoteness value between 0 and 15, based on the physical road distance to the nearest town or service centre. The higher the value, the more remote and inaccessible the location. For reasons outlined in Chapter Three, the results of the SiMERR National Survey are reported with reference to four categories, collapsed from the eight MSGLC sub-categories. Table 1.2 identifies these categories, their criteria, and some of the towns and cities covered.

Having four categories allows for greater distinction between Provincial Cities and Provincial Areas than would be the case using the three MSGLC Zones, and permits comparisons with studies using the CD ARIA plus categories[2].

Table 1.1 Categories of the MCEETYA Schools Geographic Location Classification

Major Category	Sub-category	Criteria
1. Metropolitan Zone	1.1 State Capital City regions	State capitals (except Hobart, Darwin)
	1.2 Major urban Statistical Districts	Pop. ≥ 100 000
2. 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 Plus score ≤ 2.4
	2.2.2 Outer provincial areas	CD ARIA Plus score > 2.4 and ≤ 5.92
3. 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

Table 1.2 The four collapsed categories of the MCEETYA Schools Geographic Location Classification (MSGLC) used throughout the report

MSGLC Category	Code	Sub-category	Criteria	Examples
Metropolitan Area	1.1	State Capital City regions (except Darwin)	All cities pop. ≥ 100 000	Sydney, Melbourne, Brisbane, Adelaide, Perth, Canberra-Queanbeyan, Cairns, Gold Coast-Tweed, Geelong, Hobart, Newcastle, Townsville, Wollongong
	1.2	Major urban Statistical Districts		
Provincial City	2.1.1	Provincial City Statistical Districts + Darwin	Pop. 25 000 – 99 999	Ballarat, Bathurst-Orange, Burnie-Devonport, Bundaberg, Darwin, Launceston, Portland, Bunbury,
	2.1.2	Provincial City Statistical Districts		
Provincial Area	2.2.1	Inner provincial areas	Pop. < 25 000 and CD ARIA Plus score ≤ 5.92	Armidale, Busselton Mt. Gambier, Gympie Dimboola, Huonville
	2.2.2	Outer provincial areas		
Remote Area	3.1	Remote areas	CD ARIA Plus score > 5.92	Port Headland, Cowell, Lightning Ridge, Mataranka, Cloncurry, Cape Barren Island
	3.2	Very Remote areas		

[2] Various ARIA classifications have been developed by the ABS. The one used by the MSGLC is the Collection District (CD) ARIA Plus index.

1.5 STRUCTURE OF THE REPORT

The following chapter provides a synthesis of the literature that informed the focus and design of the National Survey. The chapter outlines some of the social and economic changes recently experienced by rural communities, and the effects of these changes on school education. It then draws on a range of studies to highlight the main issues facing education generally, and science, ICT and mathematics education in particular. These include the demand and supply of teachers in these subject areas, the circumstances faced by teachers and students in rural areas, and disparities in the achievement levels of rural and metropolitan students.

Chapter Three outlines the main elements involved in designing and implementing the National Survey, including determining the study population, developing the questionnaires and establishing the analytical methodology. The chapter provides profiles of the responding schools, teachers and parents/caregivers, and concludes with some guidance on how to interpret the figures and tables presented in later chapters.

Chapter Four reports the findings with regard to school staffing. In particular, the chapter describes respondent teachers' perceptions of staff turnover and recruitment in their schools, their motivations for teaching in rural or regional schools (if relevant), reflections on their own teacher education and preparation, and a summary of their teaching qualifications.

Chapter Five summarises the professional development needs of respondent teachers, including the degree to which they felt professionally connected or isolated, and whether the type and level of need varied with school characteristics, such as geographic location.

Chapter Six concerns teachers' responses to questions about the importance and availability of material resources and support personnel to help them teach science, ICT and mathematics. Again, responses were compared across a range of variables, including geographic location and Indigenous student population.

Chapter Seven reports respondent teachers' perceptions of the need for a range of learning experiences for their students. The chapter provides an outline of the opportunities available to students in different locations, particularly with regard to subject choice and specialist teachers.

Chapter Eight explores the perspectives of parents/caregivers on a range of issues relating to their children's experiences with science, ICT and mathematics education. These include educational aspirations for their children, perceptions of the abilities of their children's schools to attract and retain suitable teachers, and views on the quality of education available at these schools.

Chapter Nine provides a summary of the main findings with some discussion of their implications with reference to the literature. Each set of findings is accompanied by recommendations for action by relevant education authorities and other bodies.

Chapter Ten outlines a proposal for a National Rural School Education Strategy as the principal recommendation of the report. The chapter provides a rationale for the Strategy, an indication of how such an initiative might be established, and some suggestions as to its structure and primary aims. Given the scale of the concerns about rural and regional education in Australia revealed in Chapter Two and in the Report itself, Chapter Ten concludes that a collaborative National Strategy is the next logical step.

1.6 ACRONYMS

ABS	Australian Bureau of Statistics
ACDS	Australian Council of Deans of Science
ANCOVA	Analysis of Covariance
ARIA	Accessibility and Remoteness Index of Australia
CEO	Catholic Education Office
COAG	Council of Australian Governments
DEST	Department of Education, Science and Training (Federal)
DET	Department of Education and Training (State or Territory)
DOTARS	Department of Transport and Regional Services
HoD	Head of Department
HREOC	Human Rights and Equal Opportunity Commission
ICPA	Isolated Children's Parents Association
ICT	Information and Communication Technology
MANCOVA	Multivariate Analysis of Covariance
MCEETYA	Ministerial Council for Employment, Education, Training and Youth Affairs
MSGLC	MCEETYA Schools Geographic Location Classification
MWHI	Median Weekly Household Income
NESB	Non-English Speaking Background
SES Indicator	DEST Socio-economic Status Indicator for schools
SiMERR	National Centre of Science, Information and Communication Technology and Mathematics Education for Rural and Regional Australia
UNE	University of New England

CHAPTER TWO

THE CONTEXT OF RURAL AND REGIONAL EDUCATION IN SCIENCE, ICT AND MATHEMATICS

2.1 INTRODUCTION

> Schooling should be socially just, so that students' outcomes from schooling are free from the effects of … differences arising from students' socio-economic background or geographic location.
>
> (MCEETYA, 1999)

> By age 18, each young person residing in rural or remote Australia will receive the education required to develop their full potential in the social, economic, political and cultural life of the nation.
>
> (MCEETYA Task Force, 2001, p. 7)

These quotes lie at the heart of a firm belief in equality of educational opportunity for students living in all parts of Australia. The first is taken from Goal 3 of *The Adelaide Declaration on National Goals for Schooling in the Twenty-First Century*. The second, written in a similar vein, is a vision statement from the *National Framework for Rural and Remote Education*. As clearly enunciated in these guiding documents, the principle of equality of opportunity, regardless of economic and social changes, remains central as a stated position of Australian education.

Education in rural and regional Australia has been the subject of numerous studies concerned with a wide variety of issues and conducted from different perspectives. Rather than duplicating these studies, the SiMERR National Survey sought to build upon the foundation established by this research to identify and investigate in greater detail those rural and regional issues related specifically to science, ICT and mathematics education.

This chapter provides a context for the National Survey by identifying and discussing these issues. The first section, *Images of rural and regional Australia*, considers the changing social, economic and educational context of rural areas. The next three sections, *Professional and social issues for rural and regional teachers*, *Demand and supply of science, ICT and mathematics teachers*, and *Strategies to address recruitment and retention problems*, look more specifically at the major concerns of education providers and rural teachers.

The sections titled *Students living in rural and regional Australia* and *Indicators of rural student achievement in science and mathematics,* examine what is understood about rural students' experiences, aspirations, attitudes and learning outcomes. These sections are followed by *Rural and regional ICT education,* which looks at student achievement in ICT subjects as well as their access to and use of ICT. A *Summary of rural influences on educational outcomes* completes the literature review.

2.2 IMAGES OF RURAL AND REGIONAL AUSTRALIA

For most of last century rural Australia represented an idyll; Slessor's country towns peopled by Lawson's rugged heroes and heroines with their dry humour, strong loyalties and sense of fairness. While few Australians may have subscribed to this as a realistic image, we were in general content that there was enough substance to the myth, and if the heroes were thinner on the ground than we might like, at least the character of rural Australia, and in particular the passion for equity, were still strong.

Over the last twenty years that image has taken a battering in the public consciousness. When rural Australia is in the headlines today, it is because of bank closures and foreclosures, chronic drought and urban drift, poor telecommunications, and troubled health services. The fair go seems to have gone and equity is now discussed in an entirely different context altogether.

This image, like the idyll, is inaccurate. Much of rural Australia today is vibrant, dynamic, and in some cases, increasingly cosmopolitan. While there is a steady drift to larger centres, many rural areas are growing – with some even experiencing a boom as city folk look for a 'sea change' or 'tree change'.

Nevertheless, it is true that the overall complexion of rural Australia has changed. The country has developed a more open, less protected, national economy through reductions in trade barriers and assistance programs, deregulation of the financial system and labour market, and privatisation of government utilities and services (Squires, 2003). A consequence of this shift has been an acceleration of structural change in rural areas. Corporate rationalisation has indeed led to closures of banks and other infrastructure institutions in many small towns, in some cases to the point that schools have come to be seen as the main enduring institution and hence, a focal point for the community.

There has been a diminution of the traditional employment opportunities that attracted and retained adults in rural communities. Furthermore, job options for school leavers have changed in nature and scope. Census and other data reveal that income levels for rural communities are well below those in metropolitan cities, with Squires (2003, p. 27) reporting that average household incomes in about 80% of Australian rural towns and municipalities are at least 10% below the national average. In almost half of all rural areas, average household incomes are 20% or more below the national average.

There has also been a demographic change. Whereas about 54% of Australia's population in 1900 lived in rural areas, near the end of the 20th century this proportion had dropped to 21% (Squires, 2003, p. 26). Dellitt (1998) warns that unless more people are encouraged to conduct online businesses from rural locations, the decline in rural population is likely to continue. One consequence for rural communities of this demographic change can be what Squires (2003, p. 31) describes as 'the absence of a critical mass of people of a similar age, or life stage or gender or common interests.'

These changes have had consequences for school education in rural Australia. The current trend toward cost-efficiency and consolidation of resources means that the viability of some smaller rural schools is being questioned (Hammer, 2001). Restricted access to education, especially higher education, has been identified as a critical factor in 'the increasing social exclusion of many rural young people' (Alston & Kent, 2003, p. 15), resulting in their being 'shut out of the global marketplace and limited to local labour market opportunities'.

Nevertheless, there are growing indications that education in rural and remote areas of Australia has begun to receive more attention in recent years. The two quotes introducing this chapter are indicative of this trend. In addition, there appears to be a renewed recognition of the valuable economic and social contributions made by rural communities to the nation's output and wellbeing (MCEETYA Task Force, 2001, p. 4).

The decision by the federal government to provide establishment funding for the National Centre of Science, ICT and Mathematics Education for Rural and Regional Australia (SiMERR) at the University of New England in July 2004 is another indicator of government concern. In turn, the SiMERR National Centre has developed hubs at universities in each state and territory to create SiMERR Australia, a cohort of researchers and educators committed to identifying and addressing concerns in these subject areas. The vision of SiMERR Australia is to work with rural and regional communities to achieve improved educational outcomes for all students in the areas of science, ICT and mathematics, so that:

- Parents can send their children to rural or regional schools knowing they will experience equal opportunities for a quality education
- Students attending rural or regional schools can realise their academic potential in science, ICT and mathematics
- Teachers can work in rural or regional schools and be professionally connected and supported.

Clearly, a deeper understanding of how best to address the particular needs of rural teachers, their students and their communities will allow for a more effective and efficient response from governments and other relevant support and service agencies. The results of the SiMERR National Survey provide a critical way forward. The survey, guided by the earlier research reported here, provides the necessary empirical basis for state, territory and national governments to make policy and funding decisions.

2.3 PROFESSIONAL AND SOCIAL ISSUES FOR RURAL AND REGIONAL TEACHERS

2.3.1 Advantages of teaching in rural schools

In his review of public education in NSW, Vinson (2002) acknowledged the many positive features of rural schools. Indeed, a number of researchers have identified the advantages of teaching in a rural environment. Boylan, Sinclair, Smith, Squires, Edwards, Jacob, O'Malley and Nolan (1993, p. 112) found that teachers perceived these benefits to include quieter, safer lifestyles with less crime and other problems that affect big cities. The teachers also felt that rural centres offered smaller, more caring communities, healthier lifestyles, and an abundance of clean, open spaces. Country communities were also considered to be good places to raise children.

More recently, Arnold (2001, p. 34) concluded that rural schools are often a focal point of the rural community. They are commonly seen as a community resource and an economic strength. Arnold also found that smaller class sizes allow for more individual attention, the staff members are often younger and more accepting of educational innovation, and student-teacher relationships are generally very positive.

In addition, the Isolated Children's Parents' Association (ICPA, 1999, p. 16) pointed out that the experience of teaching in an isolated area could help a teacher become more adaptable, confident and independent. However, the ICPA acknowledged that the value of this positive outcome may be diminished if professional experiences are not recognised and rewarded at system level, for example, through transfer and promotion criteria, for professional advancement.

Sher (1991, cited in Yarrow, Ballantyne, Hansford, Herschell & Millwater, 1998, pp. 7-8) warned that some barriers to attraction and retention in rural and remote areas are the result of ‘myths’ about life there. To counterbalance this he suggested that ‘rural education has the potential to be a wonderful laboratory for educational innovation and improvement.’ The implication is that teachers may experience a sense of achievement, recognition and control over their own professional lives that will itself be an incentive to teach in such schools.

2.3.2 Disadvantages of teaching in rural schools

High among the disadvantages for teachers working in rural and regional schools is the feeling of isolation. Boylan et al. (1993, p. 112) identified the chief disadvantages faced by many teachers on their appointments to rural areas. These included:

- a dearth of cultural activities
- the ‘tyranny of distance’, of having to travel long distances
- the lack of employment opportunities for their spouses and their own children
- the more limited availability of health facilities (e.g., specialists) and sporting facilities.

The Isolated Children’s Parents’ Association maintained that ‘attracting and retaining qualified teachers to many isolated rural and remote areas is an increasing problem once their own children reach secondary level’ (ICPA, 1999, p. 15). They cite the observation of one farming family from the Eyre Peninsula in South Australia that ‘principals always make sure that they are transferred from here prior to their children commencing secondary education’ (p. 31). Understandably, teachers’ appreciation of the value of education means that they want good quality access to opportunities for their children. That they look for this elsewhere reflects their beliefs about the quality of education available at their current posting.

There are conflicting beliefs about the characteristics of rural and remote students. It has been claimed that the advantages of teaching in rural and remote schools are that students are less difficult to manage and that student-teacher relations are more positive than in city schools (e.g., Arnold, 2001). On the other hand, the ICPA (1999, p. 17) has expressed concern that discipline problems are common in many remote schools, even to the extent that parents fear at times for the safety of their children.

These contrasting points of view suggest that solutions to the challenges of attracting and retaining teachers will need to address the specific challenges associated with some individual communities as well as the broader concerns that affect all or most rural and remote schools. The ICPA also conceded that some small communities can be ‘extremely insular’ (ICPA, 1999, p. 11) and that this could lessen the motivation and aspirations of children living in them, adding an extra dimension of challenge for teachers in such communities.

Whether these findings, mainly from 1990s research, remain relevant today is worthy of further investigation. Also important is the issue of their significance to teachers making decisions about appointments in rural and remote areas, and those deciding to relocate to larger centres.

Professional isolation and morale of teachers

As indicated above, a critical theme running through much of the literature on rural education is that teachers and principals commonly experience professional isolation. Herrington and Herrington (2001, p.1) pointed out that geographic and professional isolation associated with rural areas occurs across all service professions, with 'teachers, doctors, dentists, nurses … equally at greatest risk of leaving their profession in those first critical years in country placements'. The authors believe the consequences of isolation go even deeper. They see the attraction and retention of human service professionals and para-professionals in rural and regional Australia as a significant problem affecting the very sustainability and social cohesion of rural communities.

Social and professional isolation can be exacerbated when young teachers placed in rural and remote schools are living away from home for the first time. Squires (2003) listed the physical aspects of isolation as access to services, difficulty in travel, and demographic changes (especially a lack of like-minded people), along with such psychological aspects as feelings of disempowerment (or low self-efficacy) and differences in values, attitudes and aspirations. It is these features that may help explain why Cresswell and Underwood (2004, p. 8) commented in their analysis of the PISA 2000 survey that 'principals from schools in outer regional areas reported the lowest levels of staff morale'.

In her study of rural teachers' morale and efficacy, Young (1998) found that teacher morale varied within and between schools, indicating the importance of taking into consideration both the individual and the collective staff morale of a school. She also concluded that teachers' morale appeared to be a 'useful indicator' of an effective school. Squires (2003, p. 35) highlighted the importance to staff morale of school-community relations, arguing: 'if the school perceives its community to be depressed and unresponsive, or its prospects to be poor, or its attitudes to be negative, the reactions of school personnel are likely to be less enthusiastic and committed.'

The MCEETYA Task Force (2001, p. 13) acknowledged that 'the fundamental capacity of a rural or remote community to build a learning environment will vary significantly throughout Australia'. This means the challenges are greater in some communities than others, so rural and remote schools ought not be seen as a single, uniform entity. What is clear from the report is the affirmation that schools can play a vital role in educational capacity building, particularly in remote Indigenous communities.

Since frequent teacher turnover has a deleterious effect on a school's 'institutional memory' (e.g., of successful practices, of community dynamics) it seems essential that retention be investigated fully and successfully. Boylan and McSwan (1998) reported that two key issues identified by teachers considering remaining in rural and remote schools were opportunities to engage in professional development activities and the availability of curriculum support personnel. For example, Sharplin's study (Roberts, 2005, p. 49) found that lack of contact with other teachers in their subject area was a major concern of first-year teachers.

A lack of sufficient relief staff in many rural and remote communities is cited (e.g., ICPA, 1999, p. 17) as contributing to teachers' discontent and professional isolation, as it means that they are unable to avail themselves of opportunities to attend professional development days and other forms of face-to-face sharing and knowledge enhancement. This becomes particularly unfortunate, and potentially very stressful, for teachers in one-, two- or three-teacher schools. These teachers often miss out on the chance to share practices and ideas with colleagues concerning across-school perspectives and administrative responsibilities that can help address concerns related to 'curriculum overload' that many teachers appear to feel.

While the provision of online professional development and networking opportunities should help to address these concerns, Roberts (2005, p. 50) warned that reliance on information technology alone might *increase* teachers' sense of professional isolation. This arises as it may further reduce teachers' already limited face-to-face contact with colleagues – unless 'network meetings, tutorial support and conferences' complement these on-line activities.

In his NSW inquiry, Vinson (2002, p. 107) found compelling evidence 'of the special difficulties and associated costs faced by country teachers in accessing professional development opportunities.' He recommended that rural teachers receive a significantly higher per capita professional development allocation than their city-based counterparts in recognition of the view that, while online communication will help to diminish professional isolation, many teachers, like many of their students, wish this to complement rather than replace face-to-face contact. One objective of the SiMERR National Survey was to determine whether teachers in other states and territories also experience these 'special difficulties', and if so, how they were being addressed.

Several researchers (e.g., Millwater, 1996; Yarrow et al., 1998) have extended this notion of personal contact. They recommended a collaborative approach to the content and processes associated with the practicum component of initial teacher education undertaken in rural and remote schools. They based their suggestion on the grounds that it will encourage

> … reflective and interactive teaching practices (and) … will involve teacher-mentors and student-interns working together to develop and improve relationships with students and the wider community.
>
> (Yarrow et al., 1998, p. 10)

The implication is that teacher education faculties within universities can contribute to school renewal and the minimising of rural teachers' professional isolation. At the same time university staff can benefit from tapping into the insights and experiences of practising teachers in rural and remote areas. Such practices may be enhanced by the development of better links between schools, and between schools and their rural communities.

In the report of their research project on social capital in rural communities Kilpatrick, Johns, Mulford, Falk and Prescott (2002, p. xii) recommended that 'both government and independent schools in rural areas should be encouraged and supported to develop further linkages with each other, with rural and other industry, and with community groups.'

Because of its current accelerating growth in both accessibility and capacity, and its potential for new forms of interaction, ICT will inevitably be part, and possibly a major part, of the solution to teachers' feelings of professional isolation. The extent and nature of this need to be the focus of current and ongoing research in Australia and elsewhere. Nevertheless, Herrington and Herrington (2001) have outlined some of the features of professional development websites that may reduce the sense of isolation.

However, the Human Rights and Equal Opportunity Commission's (HREOC, 2000) finding that teachers in rural and remote areas often had no formal training in ICT is a cause for concern, if still the case. This is an issue that needs to be clarified. The lack of familiarity with the technology may be the reason why online conferencing has been reported to be underused in Australia (Dellitt, 1998). Mentoring has been mooted (e.g., Yarrow et al., 1999) as a strategy that could help to overcome some of the problems faced by beginning teachers. Determining the optimal mix of online and face-to-face forms of mentoring is an issue for further investigation, as is the question of what kind(s) of 'expert' can assume the mentor role most effectively.

Professional isolation is often cited as the major concern of teachers in rural and remote areas, and an important factor in their reluctance to remain long-term in rural schools (Roberts, 2005). A detailed understanding of what this means to teachers, and science, ICT and mathematics teachers in particular, may be the key to the overarching problem of attracting teachers to rural schools.

2.4 DEMAND AND SUPPLY OF SCIENCE, ICT AND MATHEMATICS TEACHERS

> Most states and Territories reported difficulties in filling two types of vacancies: those located in rural and remote areas (and in some locations within metropolitan areas as well) and for certain specialisations – with mathematics, science and ICT vacancies specified as "hard to fill in all states and territories".
>
> (MCEETYA, 2003, p. 20)

This quote highlights the scope of the problem faced by rural schools in trying to fill teaching vacancies in science, ICT and mathematics. While the statistics are not currently available for 2005, it is generally believed the situation is now worse than it was in 2003 as the large cohort of teachers trained in the late 1960s and early 1970s approach retirement age.

This section takes up this issue by considering three aspects related to demand and supply. These are the national context, attraction and retention of teachers, and international trends.

2.4.1 The national context

The national situation concerning demand and supply of teachers in these subject areas is difficult to quantify. There is plenty of anecdotal evidence about shortages in certain subjects in certain areas of Australia. However, there is difficulty in gaining up-to-date data about staffing in all three subjects from all states and territories. A further problem is that official figures do not always reflect the actual staffing situations in particular schools. The situation is made even more confusing by reports of teachers being expected to teach outside the area in which they were trained. Nevertheless, some studies in Australia have managed to collect data on the issue.

The Committee for the Review of Teaching and Teacher Education (2003a, p. 80) reported that the 2003 National and State Skill Shortage Lists (generated by the Department of Employment and Workplace Relations) identified national shortages in the second half of 2002 in the secondary subject areas of manual arts, mathematics, physics/chemistry and general science. More specifically, the report identified specific national shortages in rural and remote areas.

In their recent survey of secondary science teaching in Australia, Harris, Jensz and Baldwin (2005) found that 30% of sample schools reported difficulty in filling vacancies for chemistry teachers, while 40% reported difficulty recruiting suitably qualified physics teachers. Catholic schools were most affected by the shortage of suitably qualified senior-school chemistry and physics teachers.

Harris et al. (2005) also found a high level of disillusionment among science teachers about remaining in the profession, and discovered that a large proportion of respondents teaching Years 7 and 8 students in Australian schools do not have any university science in their professional qualifications. Whether these findings vary according to geographic location was not explored by Harris et al. (2005). However, given the lack of properly qualified teachers, and the short supply of science teachers in rural areas, there is a suspicion that unqualified teachers are more common in rural areas. Clarification on this issue is an objective of the National Survey.

The situation with mathematics teachers seems even more fraught, with a recent survey by the Australian Secondary Principals' Association (*Review of Teaching and Teacher Education*, 2002, Submission No. 138, cited in Skilbeck & Connell, 2003, p. 33) revealing that 67% of Australian schools in the sample had experienced difficulty in finding sufficiently trained mathematics teachers. Furthermore, they found that '56% of sample schools (and 92% of remote sample schools) indicated they anticipated some loss of curriculum offerings due to teacher shortage during 2003' (Skilbeck & Connell, 2003, p.33).

One consequence of requiring teachers to teach science and mathematics, despite their lack of suitable expertise and training, is the lower likelihood that they will be seen as enthusiastic role models. Further, such teachers may be ill-equipped to give advice on careers in science and mathematics (Federation of Australian Scientific and Technological Societies, 2002). The net effect on students can be a negative image of science and mathematics that may become entrenched.

Three emerging trends appear to be affecting the availability of teachers of science, mathematics and ICT particularly in rural areas, suggesting that the current difficulties could become worse. These are the aging teacher workforce in Australia, the gender trends and related subject specialisations of teachers being trained, and the urbanisation of education with fewer teachers, especially beginning teachers, having experience in rural schools.

Aging teacher workforce

The age structure of the Australian teaching profession is another source of concern in that a sizeable proportion of its members, already aged over 50, may retire in the next five-to-ten years. Two particularly relevant aspects of this looming exodus are that it:

> … is particularly the case for males, and males supply a significant proportion of teachers in certain teaching specialisations, notably maths, science and ICT. Further, census data indicate the national teaching workforce has a bimodal age structure – there are large numbers of teachers aged under 35, and significant numbers aged over 45. However, there are limited numbers in the 35-45 age range, which will cause a major gap in the 'experience' of the teaching workforce as older teachers retire.
>
> (MCEETYA, 2003, pp. 4-5)

In the report of their survey of secondary science teaching in Australia, Harris et al. (2005, p. ix) also expressed concern about this trend among science teachers. They noted: 'the age profile for (science) teachers shows a bulge of 'baby boomers' in the 45–54 year age bracket, that is particularly prominent for males.' The science teachers in their sample had, on average, been teaching for 15 years, though the mean of 17 years' experience for males was five years higher than that for females. While those teaching in 'highly accessible' and 'accessible' areas had an average period of service in line with the national average, 'teachers from less accessible locations had taught for only 11 years on average' (Harris et al., 2005, p. 6).

Gender and subject specialisation

Gender differences in preferences of teaching specialisation have become an emerging factor to consider. The proportion of female secondary teachers in Australian schools is increasing, in line with overseas trends. New female teachers are specialising more in the secondary subject areas, and the percentages of female teachers in secondary schools is approximately equal to that of males and appears to be rising. This situation is very different in the primary sector where the ratio of female teachers to males is about four to one.

The important point for secondary schools is that the incoming female teachers tend to specialise in the humanities and languages rather than difficult-to-fill subject areas. While new male secondary teachers favour science, mathematics and ICT, 'the numbers of males undertaking teaching qualifications has declined in recent years' (MCEETYA, 2003, p. 5)

An urbanised workforce

A national census-style survey of teachers in Australian schools (Department of Education, Science and Training, 2001) found that the majority of teachers spend most of their careers teaching in metropolitan and city schools. Moreover, the study reported that only 10.5% had ever taught in an isolated community, with the majority of these teachers spending less than five years in these communities. Of greatest concern, however, was the finding that 'teachers aged 21 to 30 years were least likely to have taught in these schools' (DEST, 2001, p. 7).

This last finding highlights a possible tendency for new teachers to be called upon to fill the vacancies in difficult-to-staff metropolitan areas. Once the lifeblood of rural and regional schools, it is possible that the most capable and better qualified of these new teachers may never find their way into rural schools. This emerging situation needs to be monitored carefully.

2.4.2 Attracting and retaining teachers for rural schools

Attracting qualified teachers is a significant challenge facing rural areas; retaining them is even more critical. While these two issues are clearly linked, it appears that the incentives and disincentives associated with teacher attraction differ in some ways from those linked with teacher retention.

Major barriers (Lunn, 1997, cited in Yarrow et al., 1998, p. 6) in the *attraction* of teachers to rural and remote areas were found to include:

- a negative perception of teaching as an attractive and viable career
- the improved employment prospects in urban schools in time of teacher shortages, especially for subject specific and specialist teachers
- a predominance of students from urban-suburban environments in teacher preparation courses
- a decline in the numbers of students from rural and remote areas entering teacher preparation courses

- the personal and professional considerations of experienced teachers, particularly couples, residing in metropolitan or large provincial centres that dislocation to a rural or remote areas incurs
- a lack of personal and professional incentives to accept a teaching position in rural and remote areas.

By way of comparison, major barriers (Lunn, 1997, cited in Yarrow et al., 1998, p. 6) to the *retention* of teachers in rural and remote areas were identified as:

- the desire or need to return 'home'
- lack of professional advancement
- dissatisfaction with teaching and/or living in rural and remote areas
- lack of appropriate incentives to retain teaching personnel in rural and remote locations
- the selection of teaching personnel for appointment to rural and remote areas.

In the case of secondary science, the survey conducted by Harris et al. (2005) confirmed that many of these issues have still not been adequately addressed. The authors reported that more than 50% of the 'remote' and 'very remote' schools surveyed reported difficulty in retaining staff. They noted that isolation and geographic disadvantage were most commonly cited as the reason for lack of retention. Figure 2.1, reproduced from Harris et al. (2005, pp. 31–32), shows that, in contrast, only 17% of those from 'highly accessible' schools reported difficulty in retaining science teachers.

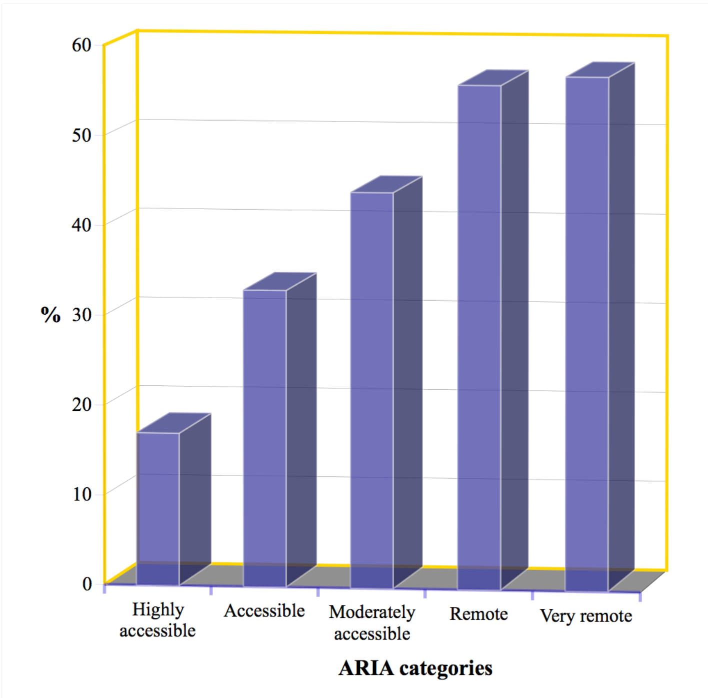

Figure 2.1 Schools reporting difficulty in retaining science teachers, expressed as a percentage of the total number of schools responding per ARIA category (adapted from Harris et al. 2005, pp. 31–32)

When considering career plans Harris et al. (2005, p. 35) noted several important findings. In particular, they found that science teachers in 'very remote' areas were almost twice as likely as those from 'highly accessible' areas to be planning to leave the profession by 2009. Those in 'remote' and 'moderately accessible' regions expressed the highest levels of uncertainty about remaining in teaching. However, the numbers of respondents in the remote categories were low and the differences not statistically significant, leaving this an issue that warrants fuller investigation.

At the time of writing, similar data for mathematics and ICT teachers were not available. Hence, an objective of the National Survey was to generate data about geographic differences in staffing in science, ICT and mathematics at the primary and secondary levels.

2.4.3 International comparisons

The shortages in science, ICT and mathematics teachers identified by the Committee for the Review of Teaching and Teacher Education (2003b), among others, have prompted education authorities to look at ways of rapidly increasing supply to meet demand. In the past, shortfalls in qualified teachers have been met through overseas recruitment, but this appears to be more difficult in the current world situation.

It seems that other comparable countries are in a very similar situation concerning the demand and supply of teachers of science, ICT and mathematics. Indeed, our supply problems could be exacerbated if other countries seek to attract Australian teachers as part of their own solution to teacher shortages in areas such as science and mathematics. For example, secondary teachers of mathematics, science, and ICT ‘continue to be in great demand’ in New Zealand, with vacancies ‘more likely to occur in rural and minor-urban areas’ (MCEETYA, 2003, p. 33). A policy of overseas recruitment of teachers to meet demand in these areas was stated as a ‘likely option’ in an official New Zealand report (Ministry of Education, 2002).

In the USA the Secretary of Education outlined ‘the critical need for teachers in curriculum areas such as mathematics, science ...’ (MCEETYA, 2003, p. 32). This quote foreshadows a worsening US problem as a result of heightened emphasis on science and technology education, increasing student enrolments and rising teacher retirements (Committee on Science, Engineering and Public Policy, 2005).

A study of teacher demand and supply in British Columbia (Grimmett & Echols, 2001) found shortages of physics, chemistry and biology teachers in all areas, but particularly in rural schools. These findings supported those revealed earlier in the Survey of Canadian School Boards on Demand/Supply Issues, which reported that among the 19 subject areas surveyed, the most critical shortages were in science specialisations (Canadian Teachers Federation, 2000, p. 2).

In their OECD country background report on the United Kingdom, Ross and Hutchings (2003) noted evidence of teacher shortages in mathematics, science and technology, and in particular expressed concerns about shortages of chemistry and physics teachers (2003, p. 34).

Clearly, the literature suggests that finding qualified professionals to teach mathematics and science in many countries is becoming more difficult. The problem appears worse for rural schools. It is compounded in situations where administrators are willing to consider recruiting individuals without appropriate qualifications or skills. Ideally, rural teachers are expected to fit in with the school, take a leadership role in the community, and stay in the job for the long-term. They should be certified to teach more than one subject or grade level, capable of teaching students with a wide range of abilities in the same classroom, prepared to supervise extracurricular activities, and able to adjust to the community (Collins, 1999). These expectations are demanding and it is doubtful they can be fulfilled using unqualified, inexperienced teachers.

2.5 STRATEGIES TO ADDRESS RECRUITMENT AND RETENTION PROBLEMS

This section examines the strategies to address recruitment and retention suggested in the literature. Because of the complexities involved, research conclusions can sometimes appear contradictory. This section is divided into three parts, the first of which concerns a number of incentives to encourage recruitment and retention of teachers. The second part considers the role of teacher education for rural placement, and the third outlines specific strategies for recruiting science/mathematics teachers.

2.5.1 Incentives to encourage recruitment and retention of teachers

All of the key studies in this area have recommended that some system of incentives should be put in place in order to successfully recruit and retain teachers in rural areas. For example, the Human Rights and Equal Opportunity Commission inquiry (2000) recommended a package of incentives that would redress financial and personal disadvantage in order to attract and retain experienced professional staff for an optimum period of five years.

Incentives recommended by the Australian Education Union (1999, p. 4) include the introduction of a remote teaching service award covering the 'real costs of living in these communities', while the Education Alliance (2004, p. 6) supported a similar approach by suggesting that governments 'develop higher salary structures in rural systems'.

Most studies acknowledge that financial packages only address part of the problem. In view of the apparent importance of teachers' perceptions of school-community relations, it also seems that more could be done to make newly appointed teachers feel welcomed into the community of which they are to become a member. Some newly appointed teachers have commented on the lack of any information packages about, and welcoming events in, the community they have joined (Kenyon, Sercombe, Black & Lhuede, 2001, p. 40). In fact, the issue of how well teachers are prepared for living and teaching in rural and remote areas is central to the attraction and retention debate, and is discussed in some detail later in this chapter.

As a balance to calls for incentives, Boylan (2003, p. 5) offered a warning that some staff recruitment incentives, such as a guaranteed transfer to a preferred location, 'can lead to increasing turnover rather than increasing staffing stability'. Boylan (2003, p. 5) also cited Watson and Hatton's (1995) conclusions that 'incentives are not very effective in improving the quality of teaching', especially where the deficit approach is a response to some urgent need 'and often implies short term expediency'. The key point here is that effective planning requires a long-term emphasis and one that addresses the *qualitative* implications of staffing decisions, not just the quantitative criterion of filling all vacancies.

Finally, as well as considering the nature of incentives to encourage teachers to work in rural areas, there should be attempts to minimise disincentives. An unintended consequence of the move from seniority-based to merit-based promotion within education systems seems to be that teachers perceive the new approach as disadvantaging those who take up rural appointments. The reason for this lies in the perception that subsequent returns to metropolitan teaching positions may not be readily available, let alone assured (Roberts, 2005).

If the vision that Vinson (2002) and others described as the 'community strengthening and capacity building roles of country schools' is to be realised it seems imperative that teachers, principals and school executives in rural and remote schools be chosen on the basis of their capacity (knowledge, skills and desire) to assume such broadened leadership responsibilities.

2.5.2 Teacher education and rural experience

> (Teacher Education) is mostly carried out in large, metropolitan institutions and draws heavily on an international culture of intellectual endeavour, research and experience, even in the ordering of the practical component of training.
>
> (Skilbeck & Connell, 2003, p. 20)

Skilbeck and Connell pinpoint a fundamental issue concerning teacher education in Australia today, namely, it has a predominantly metropolitan character. Support for this view may be found in a recent survey by the Rural Education Forum Australia (Halsey, 2005, p. 4) which reported that no Australian university involved in teacher education requires its students to undertake pre-service teaching experience in a rural school.

The lack of systematic and effective preparation of teachers in Australia to teach in rural and remote schools has been reiterated over the past two decades (e.g., Gibson, 1994a; Yarrow et al., 1998). In their earlier review of the literature on teaching in rural and remote schools, Yarrow et al. (1998, p. 5) noted that *all* significant studies advocated some sort of specialised training.

Cooper and Hatton (2003) pointed out that rural people working in many professions often have to be more multi-skilled than their urban counterparts. For teachers, this may mean being able to teach across the primary/secondary divide, or in subject areas beyond their zone of expertise. Cooper and Hatton argued for an initial degree that focuses on all grades of schooling as one way of preparing teachers more adequately for the challenges and opportunities associated with teaching in rural and remote communities.

One joint initiative of the Queensland University of Technology and ICPA resulted in a program of student-teacher practicum placements across rural and remote parts of that state. This has been implemented so that the student-teachers (the majority of whom are from Brisbane) may gain first-hand experience of teaching in small schools and of living in rural and remote communities. An encouraging outcome of this venture has been that many of the participants have subsequently 'applied for and accepted appointment in rural and remote communities' (ICPA, 1999, p. 14).

However, Boylan's (2003) survey in 2002 of the 11 major teacher education institutions in New South Wales found that only two universities included a rural education subject in their concurrent initial teacher education program (compulsory in one case but as an elective in the other). Furthermore, only two universities offered such a subject (as an elective in both cases) in their end-on secondary program.

Gibson and King (1998, cited in Boylan, 2003) conducted a national survey of 27 universities to document the level of pre-service preparation provided for prospective rural teachers. From this work and an earlier study (Gibson, 1994b) the following deficiencies in their preparation for rural teaching were identified:

- pedagogy of multi-age classes and multi-age group strategies
- strategies for managing lower grade students in multi-grade classes
- rural classroom organisation and small school administrative responsibilities
- accessing appropriate and sufficient resources
- strategies for engaging in successful community interaction

- developing an understanding of community dynamics that influence the teaching-learning environment
- strategies for dealing with value clashes
- isolation
- developing supportive communication and interaction networks with colleagues, consultants, support groups or friends
- teaching experiences in rural schools and their communities.

(Boylan, 2003)

In a similar vein, Boylan (2003, pp. 2-3) cites Yarrow, Herschell and Millwater's (1999) conclusion that rural-oriented preparatory programs for teachers needed to include: strategies for teaching in multi-age classrooms; developing an understanding of and a sensitivity to the cultural differences, values and mores of country towns; appreciating and using the nature and extent of community involvement in school life; and participating in rural practicum experiences. Further, the need to prepare teachers for the challenge of teaching multi-age and multi-level classes was a common inclusion in such analyses (e.g., Higgins, 1993).

A recurring recommendation (e.g., Roberts, 2005) is that universities involved in teacher education should collaborate with state and territory education departments to develop and implement specialised preparation programs for rural teaching. One instance of such collaboration has been the 'Beyond the Line' program introduced by the University of New England in New South Wales (Boylan, 2003).

If part of the solution is to attract into teaching more people who have grown up in rural and remote communities, then attention needs to be given to how best to achieve this. One pertinent observation here is the HREOC inquiry's finding (cited by Roberts, 2005, p. 19) that:

> Training in the community by distance mode, with short residential on-campus programs, is the preferred option for many rural and remote trainees. It is cost-effective and avoids family and community disruption. Other benefits include a commitment to working in the local community on the part of the trainee which means enhanced stability of staffing in rural and remote schools and the opportunity for local children to be taught by community members.

2.5.3.Strategies for recruiting science, ICT and mathematics teachers

It is clear that a number of strategies have been suggested for attracting and retaining teachers in general to rural and remote areas. However, few studies at the national level have addressed the specific problem of recruiting science, ICT and mathematics teachers.

Skilbeck and Connell (2003, p. 31) identified three programs at the state level. Western Australia developed a scheme to pay university fees of science graduates entering teaching. The Northern Territory offered student bursaries for priority subject areas such as special education, ICT, science and mathematics. New South Wales offered retraining programs for accredited teachers for targeted specialties. There has been no evaluation of these programs to date.

At the national level, the DEST Quality Teacher Programme, which commenced in 2000, was designed to support the updating and improvement of the knowledge and skills of teachers re-entering the workforce, and casual teachers in the subject areas of mathematics, science and ICT in schools (MCEETYA, 2003, p. 25). In addition, in 2002 the Australian Government made available 2,000 new fully-funded places under its 'Backing Australia's Ability' initiative. Of these, 280 new places (increasing to nearly 770 places after four years), or 14% of those available, were allocated to innovative teacher education programs specialising in the teaching of mathematics, science and information technology (Skilbeck & Connell, 2003, pp. 41–42).

The Federation of Australian Scientific and Technological Societies (2002) recommended that HECS liabilities for teachers should be at the lowest rate irrespective of discipline, i.e., differentials that act as another disincentive for prospective teachers to undertake science and mathematics degrees should be avoided. This seems particularly pertinent for students from rural and remote areas since the cost involved has been cited as a factor in their lower rate of university attendance (e.g., James et al., 1999).

In conclusion, concerns about teacher recruitment and retention in the fields of science, mathematics, and ICT are not (with the possible exception of teaching ICT) a recent phenomenon. These claims have been part of a general concern, expressed over several decades, about staffing difficulties and turnover in rural schools. Nevertheless, this ongoing concern has yet to produce definitive, detailed solutions, despite some pertinent and helpful research endeavours. While noting that several previous reports and other investigations have made many similar recommendations about how to attract and retain teachers in rural and remote areas, and how to improve the life chances of their students, Roberts (2005, p. 58) still found that 'there were significant gaps in the research and existing government reports which need to be addressed'.

2.6 STUDENTS LIVING IN RURAL AND REGIONAL AUSTRALIA

2.6.1 Student perspectives and aspirations

While not wishing to downplay the difficulties associated with schooling in some rural areas, it is important to avoid presenting a deficit view of life in rural Australia. Research focusing on rural and regional education issues highlight the many positive experiences of students and their teachers. For example, Alloway et al. (2004, pp. 124–125) commented favourably on the degree of 'street savvy' and resulting confidence displayed by many of the rural students who participated in their study. It is also important to recognise that the research reported here does not describe all students in all rural areas.

Nevertheless, young people in rural and remote areas are particularly vulnerable in the face of economic restructing. Consequential demographic and community changes have been identified in several sources (Ainley & McKenzie, 1999; Kenyon, et al. 2001; Spierings, 2001). Alloway et al. (2004, p. 2) noted that this vulnerability is compounded by the educational disadvantage experienced by young people in some areas of regional Australia in terms of access to schools, suitable curricula, and higher education and training programs.

There are conflicting messages in the research on rural students' aspirations. On the one hand, a study of the higher education choices of Australian students in Years 10–12 (James et al., 1999) found that, compared with urban students, rural and remote students are:

- less likely to consider that a tertiary education offers any benefits
- less likely to believe that their parents want them to go to university
- more likely to view tertiary qualifications as irrelevant to their employment aspirations

- more likely to believe that their families cannot support them going to university
- more likely to consider that the cost is beyond their resources.

On the other hand, Alloway et al. (2004, p. 263) concluded from their more recent focus-group interviews that rural students differed little from their metropolitan peers in their aspirations and expectations for their futures. In contrast to the previous study, rural and regional students seemed to have recognised ‘the need in newly emerging knowledge-based economies and information societies for further education and training’.

There has been a growing trend for young people educated in rural communities to be under-represented in post-compulsory education (Lamb, Dwyer & Wyn, 2000, p. viii). Further, young people with rural backgrounds are:

> over-represented in what Kilpatrick and Abbott-Chapman (2002) call ‘the most disadvantaged labour market group’ – those who have not participated in post-school training and who have been unemployed for more than 25 percent of the time since leaving school.
>
> (Alloway et al., 2004, p. 30)

This situation is exacerbated in many rural and remote areas by the lack of local access to secondary schooling (especially in the senior years) and to post-school education and training.

The study by James et al. (1999, p. 84) on 7000 rural students’ higher education aspirations and access found that a larger proportion of rural students with low-to-medium access to universities intended to enrol in general science, health science and agricultural science courses, while urban students were more inclined to take courses in law, engineering, surveying, computing, and business (see Table 2.1).

Table 2.1 Intended field of university study, by student location (James et al., 1999)

	Rural			Urban
Intended field of study	**Low Access**	**Medium Access**	**High Access**	**High Access**
Agricultural science	8.3	7.0	5.1	1.4
Architecture/Building/Planning	3.5	2.2	2.7	4.2
Arts/Humanities/Social science	19.0	20.6	25.2	19.6
Business/Administration/Economics	15.3	12.7	15.1	17.9
Education	10.6	14.9	11.2	9.8
Engineering/Surveying/Computing	11.6	9.8	10.7	14.9
Health sciences	15.6	19.0	15.0	14.9
Law/Legal Studies	3.5	3.5	4.9	6.7
Veterinary science	2.8	2.2	2.2	3.0
Science	9.6	8.2	8.0	7.5
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Low access: more than 300 kilometres from a university; Medium access: 151-300 kilometres from a university; High access/rural: less than 150 kilometres from a university, and home postcode classified as rural; High access/urban: less than 150 kilometres to a university and home postcode classified as urban.

One implication of this finding for the present study is that students from rural areas undertaking university study are proportionally more likely than their urban counterparts to become involved in many science-related careers and thereby contribute to scientific endeavours.

2.6.2 Student diversity

Students in rural and regional areas have similar needs and concerns to their city cousins. Consequently, they require similar services and support systems. This is particularly the case with regard to student diversity in learning. This can take the form of access to specialised programs in literacy and numeracy as well as support for students with learning difficulties, programs for those who are gifted or talented in certain subject areas, or special programs and activities for Indigenous students.

The Human Rights and Equal Opportunity Commission (1999) noted the importance for many remote community children to have access to early literacy programs. Alloway et al. (2004) supported this view on the basis of research evidence that revealed the significance of literacy competence for all forms of educational success, including school completion, higher education entry and likely employability. Hence,

> … the lack of access to early childhood education can be identified as a potential disadvantage for rural children, and as a factor likely to affect young people's aspirations and expectations.
>
> (Alloway et al., 2004, p. 31)

Because of their size, many rural schools do not have ready access to the expertise needed if children's specific learning difficulties or disabilities are to be diagnosed early and accurately (ICPA, 1999, p. 21). This scarcity of expertise for diagnosis is mirrored in the limited access to treatment when a disability is apparent. The ICPA reports that rural and remote students identified as requiring speech therapists, occupational therapists or physiotherapists do not have local access to these services on a regular basis. In remote areas, it is often the case that there is no access at all.

Likewise, the identification of gifted children is often left to chance. In general, specific expertise is not available to confirm or challenge teachers' initial subjective judgements through the use of IQ tests or other standardised measures of academic potential. Research in rural NSW (Chaffey, Bailey & Vine, 2003) showed that academically gifted Indigenous children are highly likely to become 'invisible underachievers', and misperceived by teachers as 'average students', unless very specific objective methods are used to reveal their true potential. Indeed, Chaffey's research demonstrated that *most* Indigenous students may be underachieving markedly, regardless of their level of academic potential.

In contrast, a survey of rural and remote schools in the United States (Colangelo, Assouline, Baldus & New, 2002) reported that students in smaller schools indicated a greater sense of belonging. Teachers in smaller schools reported that it was much easier to work together to create individualised instructional plans for students with special abilities and interests. They felt they were less hampered by rigid bureaucracy and large enrolments and had more time to spend on students as individuals.

On the other hand, difficulties identified by Colangelo et al. (2002) included lack of, or much more limited access to community resources, including museums, libraries and mentors. Moreover, the relative scarcity of gifted students in a small population can result in their experiencing social isolation and loneliness. The curriculum options for these students, especially in the form of advanced courses, are also more limited because of smaller student cohorts in schools.

Likewise, teachers in rural areas may find it difficult to access professional development to help them teach gifted students. This can increase feelings of isolation in teachers who are trying to develop new ideas and skills. The recent production in Australia of a professional development package (Gross, MacLeod, Bailey, Chaffey, Merrick & Targett, 2005) on teaching gifted and talented students provides one example of how ICT may be used to lessen professional isolation.

In their research on the attitudes of Indigenous students in Western Australia to schooling, Richer, Godfrey, Partington, Harslett and Harrison (1998) found their students generally had a positive attitude to their schools and their education, but were much less positive about their teachers. Nearly 60% disagreed with the statement 'I like the teacher', 37% disagreed with the statement 'my teacher cares what happens to me', and 34% disagreed that their teachers encouraged them to continue their education. In addition, about one in five agreed that 'most teachers pick on me at school, while 12% thought that 'the teachers gang up on me'.

The low participation rate of Indigenous Australian students in post-compulsory schooling, and in higher education and training, is well documented (Kenyon et al., 2001; Yunupingu, 1995). Reasons suggested for this include Euro-centric curricula, language difficulties, and an absence of Indigenous role models (Kenyon et al., 2001). Feelings of racism and prejudice were also found to be factors inhibiting Indigenous students' aspirations and expectations for their futures, including their access to further education and training, and to employment (Kenyon et al., 2001). Lester's (2000) research in NSW described the strong influence of racism, and racist perceptions and attitudes, on the educational and employment aspirations of Indigenous young people.

One of the findings emerging from analysis of the PISA 2003 results was that Indigenous students were over-represented in the lower categories of achievement (Thomson, Cresswell & De Bortoli, 2004). As one step toward addressing this issue, the Vinson Inquiry in New South Wales recommended that trainee teachers who have a commitment to Aboriginal education be identified and nurtured, with a view to their being placed in schools with high numbers of Indigenous students (Roberts, 2005, p. 21).

However, a more common recommendation (e.g., HREOC, 2000, pp. 78-81) is that all teachers be educated – through initial teacher education and also through professional development once in the service – to understand, respect and adjust their teaching to accommodate Indigenous culture, history, languages, aspirations and learning styles. The extent to which teachers currently feel comfortable with such expectations and confident about their ability to act upon them, given the resources and support currently available, requires exploration.

2.6.3 Parent perspectives

It is useful to look at these background issues through the eyes of the parents. Secondary schooling is particularly challenging for many parents. Its demands often exceed the capacity of supervising parents to provide appropriate support. In the cases where children are engaged in home-based distance education this problem is often exacerbated. For those students who do attend a rural school many find their subject choices restricted because of the school's small size or the lack of teacher expertise in specific subject areas.

Even where it is possible for parents to send children to larger centres for education there are implications for the rural schools they leave. Preston (1999) argued that 'middle class flight' (e.g., sending rural students to boarding schools) lessens the attractiveness of rural and remote schools. Hence, 'the importance of improving the quality of schooling so that the local school is a reasonable choice, rather than assisting those who want to choose schooling elsewhere to leave the district' (p. 8).

Vinson (2002, p. 104) noted that financial disparities were a source of rural inequality and that this adversely affected:

> Parents, teachers and students in the Inquiry's country consultations spoke as one about the additional expenses they incurred, compared with their city counterparts, in fulfilling basic educational requirements.

The alternative for parents is having children board away from home in order to attend larger urban secondary schools. This option remains costly despite government recognition of the need to provide supplementary financial support (e.g., through the Assistance for Isolated Children's Scheme). With recurring droughts undermining rural sustainability this option becomes impossible for many, and a difficult burden for most parents residing in rural and remote parts of Australia.

International influences, such as the rising cost of fuel, can also affect distance education indirectly, as in cases where a generator must be run for extra hours to accommodate radio- and computer-based access to school. Learning through traditional forms of distance education, such as correspondence, can be difficult for students who are not fluent readers, and for those whose supervising parents have had very limited schooling themselves (Preston, 1999).

The HREOC (1999) report concluded that distance education was adequate for the primary years of schooling but not for the secondary years. Whether innovative forms of online interaction and presentation of learning material can fully address this aspect of teaching remains to be determined.

2.7 INDICATORS OF RURAL STUDENT ACHIEVEMENT IN SCIENCE AND MATHEMATICS

This section examines two important issues. The first is the relative underachievement of rural students in science and mathematics compared to their capital city peers. Data are becoming available that allow a quantifiable interpretation of the issue. The second concerns the factors research suggests might contribute to the disparity in academic achievement, and how these factors helped guide the framework of the National Survey.

2.7.1 Geographic variations in achievement

The significant variations in the academic achievement of students in different parts of Australia may not be a recent phenomenon. Nevertheless, evidence of this variation has gradually emerged in recent decades (e.g., Cresswell & Underwood, 2004; HREOC, 1999; Jones, 2002;). Of particular relevance to the National Survey are the results of the National Numeracy Benchmarks (MCEETYA, 2006) and the international tests associated with the Programme for International Assessment (PISA).

The National Numeracy Benchmarks are agreed minimum acceptable standards for numeracy at particular year levels. Figure 2.2 shows the percentages of students in Years 3, 5 and 7 in different parts of Australia achieving these minimum standards in 2004.

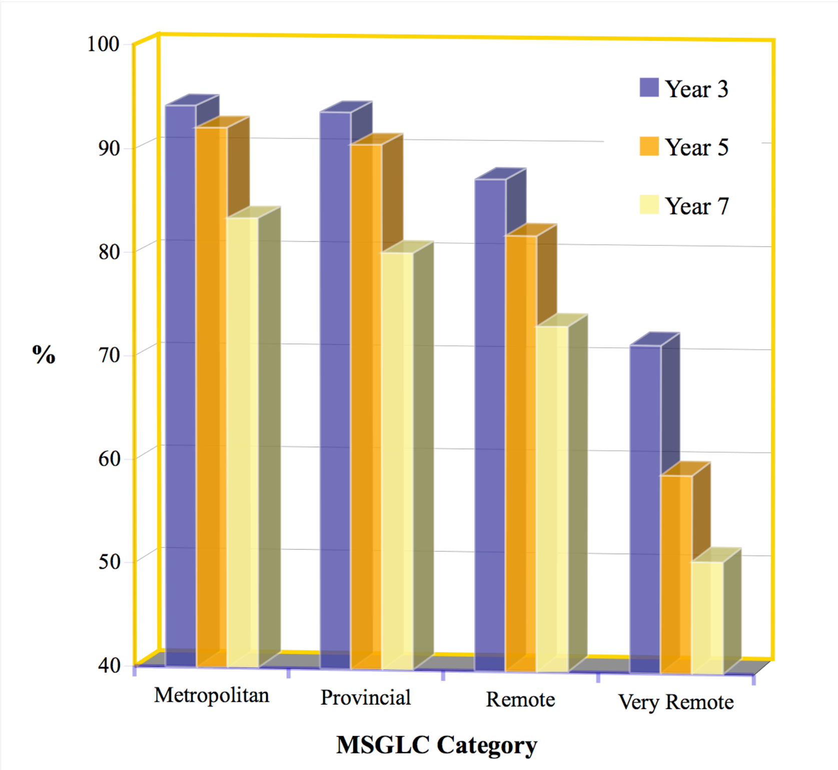

Figure 2.2 Percentages of Year 3, 5 and 7 students in different MSGLC categories achieving the National Numeracy Benchmark in 2004 (adapted from MCEETYA, 2006)

The figure displays a pattern whereby the percentages of Year 3, 5 and 7 students achieving the benchmark decline with remoteness/accessibility of school location[3]. To some degree the relatively lower proportions of remote students achieving the benchmark may be influenced by the significantly lower percentage of Indigenous students achieving the benchmark (MCEETYA, 2006), though information about the extent of any interactive influence is not yet available.

PISA conducts regular surveys of the mathematical and scientific literacy of 15-year-old students in a range of countries. The 2003 survey involved approximately 276, 000 students from 41 countries, including over 12,000 in Australia (Thomson et al., 2004). In general, Australian students performed very well in mathematical literacy, scientific literacy and problem solving, achieving results that placed them in the top five countries in each area. However, a closer analysis revealed that the performance of Australian students varied significantly with their geographical location.

School location was categorised according to the MCEETYA Schools Geographic Location Classification (MSGLC), the same classification system used in the SiMERR National Survey[4]. Thomson et al. (2004) reported the PISA results in terms of the broadest three categories: Metropolitan, Provincial and Remote Classification.

[3] MCEETYA notes that the small number of Very Remote students tested means that measurement uncertainty is relatively high for comparisons involving this group (MCEETYA, 2006).
[4] See Chapter One for explanation

Figure 2.3 shows that in mathematical and scientific literacy, students in metropolitan schools outperformed those in provincial schools, who in turn had a higher mean achievement than students in remote areas. According to Thomson et al. (2004), all of the differences between regions are statistically significant. By comparison with the OECD mean score (500), the performance of students in metropolitan locations was on average about one quarter of a standard deviation higher, while performance of those in remote areas was below the OECD average.

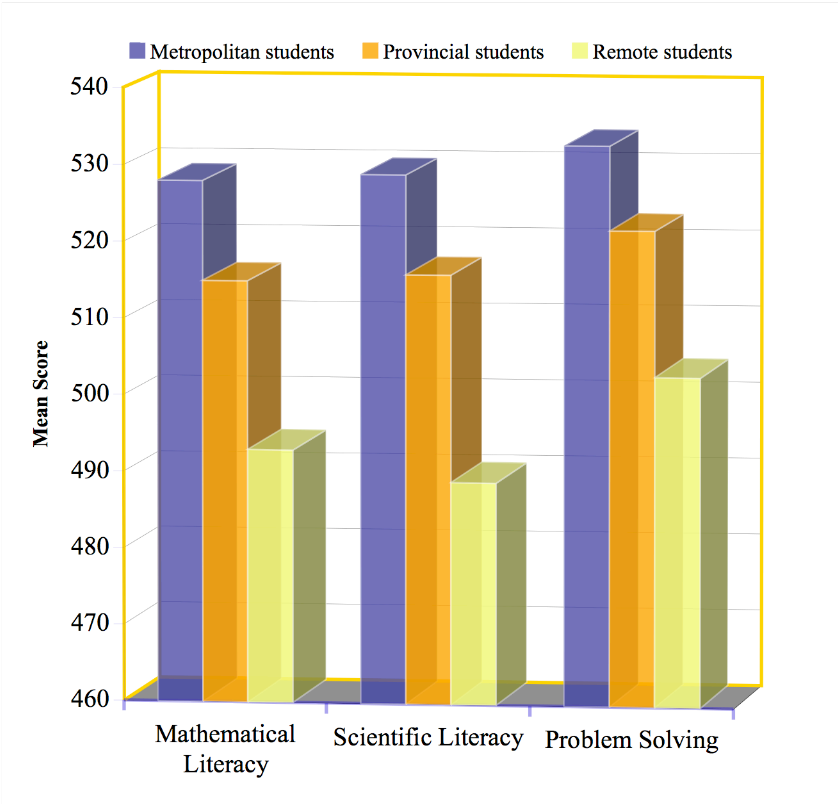

Figure 2.3 Mean scores of Australian students from different locations in the PISA 2003 tests of mathematical literacy, scientific literacy and problem solving (adapted from Thomson, Cresswell & De Bortoli, 2004)

The authors also noted that Indigenous students were over-represented at the lower levels of performance in mathematical and scientific literacy, and under-represented at higher levels.

This pattern is consistent with that reported in PISA 2000. According to Cresswell and Underwood (2004), one explanation for the regional differences in scientific literacy suggested by school principals was the availability of science resources. The implications were that the availability of such resources declined with distance from a major city and that this adversely affects student academic performance. This is an important issue to be explored in the National Survey.

PISA 2003 also tested problem-solving skills of Australian students, and Figure 2.3 reveals the same pattern of regional variation. Thomson et al. (2004) commented that this was an interesting finding since problem solving would not be expected to be as dependent on resources as mathematical literacy might be.

2.7.2 Consequences of poor teacher retention for student outcomes

Alloway et al. (2004, p. 160) reported that when expressing opinions about the quality of schooling in rural and remote communities, students and teachers most often focused on issues relating to the availability of specialist teachers, the range of subjects from which students could choose, the high turn-over of teachers and, invariably, the quality of subject offerings.

Alloway et al. (2004) found that Year 10 students in remote areas were concerned about the quality of teaching they experienced, and how this affected their learning. For example, students in one remote Western Australian school commented that they 'get the worst teachers up here'. These students were also aware that their teachers were often teaching in subject areas for which they were not qualified (Alloway et al., 2004, p. 160). The authors added that students' concern about the lack of sufficient specialist teachers was linked to their anxiety about doing well at school. This was most evident in grades where there were competitive examinations that might determine their further education or work opportunities.

The conclusions of Alloway et al. (2004) are consistent with the view expressed by Elliott (2002, p. 6) in her submission to the Committee for the Review of Teaching and Teacher Education. Elliot was concerned that many schools in hard-to-staff areas cannot get mathematics, science, technology or ICT teachers. Some schools employ teachers who 'would not be acceptable in more affluent areas because of their poor training, poor spoken English skills, and poor classroom management skills'.

Smaller class sizes and multi-level classes in many regional and remote areas can also work against the employment of specialist mathematics, science and technology teachers in those areas (Isolated Children's Parents' Association, submission no. 48, cited in Committee for the Review of Teaching and Teacher Education, 2003, p. 68).

These conclusions are generally based on qualitative data from sample sites (14, in the case of Alloway et al, 2004), or anecdotal evidence. One aim of the SiMERR National Survey is to quantify the availability of specialist science, ICT and mathematics teachers in different parts of Australia, and determine the extent to which teachers in different areas are required to teach outside their areas of expertise.

2.8 RURAL AND REGIONAL ICT EDUCATION

Much of the previous discussion has concerned science and mathematics education. There is little existing literature on the challenges associated with teaching ICT to students in rural and remote areas. Previous findings that are pertinent tend to relate to access, infrastructure and technical support issues, but are often anecdotal. Learning about ICT and learning with ICT are both crucial concerns if community regeneration and the full potential of rural students are to be realised.

2.8.1 ICT resourcing and support

In their study of resourcing of Australian primary schools, Angus, Olney, Ainley, Caldwell, Burke, Selleck and Spinks (2004) found numerous complaints that ICT support is seriously under-resourced. For example, schools generally do not have staff with appropriate expertise when networks or servers fail – this affected teaching programs adversely. Furthermore, these necessary support services 'are not always available locally, especially in the case of rural schools', and hence 'delays of several weeks during term time are common and longer periods are not uncommon' (Angus et al., 2004, p. 33).

The nature and adequacy of access remains an issue in Australia. For example, Vinson (2002) reported a widely expressed concern in rural NSW that the Internet does not work efficiently in many rural regions. While acknowledging that attempts were being made to address this problem, Vinson noted that prolonged delays in accessing web sites frustrated the work (and temperament) of students and school staff. Similar concerns were voiced in the Human Rights and Equal Opportunity Commission's (2000) report.

Because of its current politicisation in Australia, it seems likely that ICT access will be a major focus of government attention in the immediate future. The MCEETYA Task Force (2001, p. 5) highlighted 'improvement in user affordability (as) the major challenge that must be met in order to fully capitalise upon the revolution in online learning that is taking place'.

However, the extent to which everyday resource issues – such as the availability, speed and reliability of Internet access and ICT servicing and technical support, and the adequacy of science laboratories and materials – are currently problematic for teachers in rural and remote schools has not been examined in detail. This warrants a fuller investigation. Only five years ago the Human Rights and Equal Opportunity Commission (2000, p. 3) cited cases where IT infrastructure was inadequate and where 'repairs can take an entire term to effect'.

The 2001 Census data revealed that less than 10% of Indigenous Australians had access to the Internet at home, compared with 30% of non-Indigenous Australians, and that this low figure 'declined with distance from the major urban centres' (Daly, 2005, p. 1). The use of community facilities to promote access has been recommended, particularly for remote areas, one implication being that more community online access centres need to be established, along with training in their use.

Cresswell and Underwood (2004) reported that the learning of students in remote areas was hindered by a shortage of educational resources. Unfortunately, they did not provide details of which resources this involved although their comments did not seem to apply to computer access: 'students in Remote/Very Remote areas responded that there was never an occasion when they had no access to a computer at school' (p. 6). Resourcing problems, actual or perceived, have the potential to act as disincentives and hence to affect teachers' willingness to remain in rural schools, so it is important to investigate this aspect of education in rural and remote areas.

2.8.2 ICT for distance learning

ICT is a globalising force, as well as an enabling one (Alloway et al., 2004). However, the Human Rights and Equal Opportunity inquiry concluded that distance education 'is not suitable for all students and cannot be relied on to ensure effective educational access for every isolated student' (HREOC, 2000, p. 43), on the grounds of differences in students' learning styles and expressed preferences. Roblyer's (1999) research supported this view. It found that for some students, control over pace and timing of learning was more important while for others interaction with other students and the teacher was seen as paramount.

Yet, it was asserted at a public meeting in Bourke, NSW, that isolated students are well suited to take advantage of information technology 'because of their independence and responsibility' (HREOC, 2000, p. 92). This is a claim that invites empirical investigation, not only because of the opportunities it may create, but also to resolve the contradictory views it exposes.

There is a finding that students who have high self-efficacy for self-regulated learning tend to attain higher levels of achievement (Zimmerman & Martinez-Ponz, 1992). Hicks (2002) found support for his hypothesis that there is an improvement in academic achievement for rural school students who learn through distance education. ICT education seems one domain that should not suffer unduly from being taught largely online to rural students, though this remains to be demonstrated.

2.9 A FRAMEWORK FOR THE SIMERR NATIONAL SURVEY

A number of important themes have emerged from this review of the rural education literature. The most prominent include staffing difficulties, particularly in science, ICT and mathematics, pre-service preparation for rural teaching, professional isolation, school resourcing, student disadvantage and underachievement, student and parent aspirations, and perceptions of the quality of rural education.

Nevertheless, there are gaps and inconsistencies in the literature. In some cases there is conflicting evidence on these issues (e.g., Arnold, 2001). In others, the conclusions relate only to particular states or territories (e.g., Vinson, 2002) or apply to education generally, rather than science, ICT and mathematics education specifically. Moreover, the data that informed these conclusions were in many cases from the 1990s. The need for up-to-date, nationwide data on these themes provided both the motivation and framework for the SiMERR National Survey.

Finally, it is worth reflecting on a statement made by the chair of the Committee for the Review of Teaching and Teacher Education, Kwong Lee Dow (2003b, p. 8):

> Australia's future lies in its potential as a knowledge-based economy and society–one built on the knowledge, intellectual capabilities and creativity of its people. To achieve this potential, it will be necessary to: raise the scientific, mathematical and technological literacy and the innovative capacity of students; strengthen the education system that provides the platform from which world class scientists and innovators emerge; support the development of a new generation of excellent teachers of science, technology and mathematics teaching.

As the federal, state, and territory governments move to take up these challenges, it is critical that the particular needs of rural and regional areas are considered, and that the principle of equality of opportunity for students and teachers remains central as a stated tenet of Australian education.

CHAPTER THREE

DESIGN AND IMPLEMENTATION

3.1 INTRODUCTION

The National Survey was designed to collect an extensive body of base-line data and perspectives on science, ICT and mathematics education from key stakeholders across Australia. The design incorporated several data collection strategies, including paper and web-based questionnaires and focus group interviews. The quantitative and qualitative data generated through this multiple mode approach were triangulated to improve the overall trustworthiness of the findings.

The survey proceeded in two phases. Phase One, with which this volume is concerned, involved the collection of data via five survey questionnaires sent to primary teachers, secondary science teachers, secondary ICT teachers, secondary mathematics teachers, and parents/caregivers of school age children. In Phase Two, focus group interviews were conducted with teachers, parents/caregivers and students in each state and territory. Details of the design of this phase are set out in the companion volume, *Science, ICT and Mathematics Education in Rural and Regional Australia: State and Territory Case Studies*.

3.2 IDENTIFYING THE STUDY POPULATION

A unique database of schools was constructed for the National Survey by merging the MCEETYA Schools Database with a second database containing additional demographic and contact information. Schools in the resulting database were classified according to the eight categories of the MCEETYA Schools Geographical Location Classification (MSGLC).

In line with the inclusive approach of the National Survey, invitations to participate were sent to all non-metropolitan schools in Australia. In order to provide data for comparison, invitations were also extended to a representative group of metropolitan schools identified through a process of stratified random sampling. These consisted of 10% of all primary and 20% of all secondary schools in metropolitan areas (MSGLC categories 1.1 & 1.2), selected randomly in proportion to their representation within states and territories and within educational sectors. The over-sampling of metropolitan secondary schools was necessary to avoid analytical problems which might arise from a lower than expected response rate, since there are far fewer secondary than primary schools.

For logistical and analytical reasons, combined schools ($N = 565$) catering for both primary and secondary level students were represented twice on the database, coded once as a primary school and again as a secondary school. This ensured that teachers received copies of all surveys. Table 3.1 provides a general description of the 5445[5] invited schools on the National Survey database.

[5] The National Survey began with a database of 5669 schools. Seventy-two of these were removed when correspondence was returned indicating that the schools had closed or parcels were incorrectly addressed. In addition, 152 special schools for physically and intellectually challenged students originally invited to participate were later removed from the database as their very low response rate (<4%) suggested that the teachers considered the focus of the survey to be of less direct relevance to their situation than might be the case in schools with a more conventional curriculum. There is also some question about the validity of including data from special schools with that from more conventional schools, given their different needs and contexts.

Table 3.1 Characteristics of schools invited to participate in the National Survey

		Number of schools	% of all invited schools
School Type	Primary	3447	63%
	Combined [a]	1130	21%
	Secondary	868	16%
School System	Government	4031	74%
	Catholic Systemic	772	14%
	Independent	642	12%
State/Territory	ACT	26	0.05%
	NSW	1590	29%
	NT	229	4%
	QLD	1157	21%
	SA	481	9%
	TAS	230	4%
	VIC	1145	21%
	WA	587	11%
MSGLC Category [b]	Metropolitan Area	703	13%
	Provincial City	925	17%
	Provincial Area	2932	54%
	Remote Area	885	16%
	Total	5445	100%

[a] Each of the 565 combined schools was included twice. See text for explanation.
[b] Only the four categories used for analysis are shown here.

It was not possible to establish with any accuracy the total numbers of teachers involved in science, ICT or mathematics education within these schools. A large proportion of secondary school teachers teach a combination of science, mathematics or ICT, making it very difficult to obtain reliable estimations of target populations. To give some indication of the margin for error in such an estimation, independent calculations of the numbers of science teachers per school conducted by the Australian Council of Educational Research (ACER), and the Australian Council of Deans of Science (ACDS) differed by as much as 50% (Harris et al. 2005).

Even if one or other of these calculations had been used as a base population, it would have been very difficult to accurately estimate the proportion of this population represented by the study schools, due to the different selection strategies applied to metropolitan and non-metropolitan schools. Likewise, it was not possible to establish the size of the parents/caregiver population associated with these schools, given the various possible parenting combinations and the fact that many pupils are siblings.

3.3 DATA COLLECTION INSTRUMENTS

3.3.1 Questionnaire design

Five survey questionnaires were constructed to collect data from the key respondent groups: primary teachers, secondary science, ICT and mathematics teachers, and parents/caregivers. The teacher surveys had many items in common, allowing comparisons to be made within and between survey types. The majority of items invited teachers to indicate responses using a multiple-choice format or a Likert-like rating scale. In addition, there were 13 opportunities on each survey for teachers to expand on their responses or contribute reflections (see Appendix 3.1).

Each survey consisted of four sections designed to collect demographic data on responding teachers and their schools, as well as views on a range of issues identified in the literature as possibly affecting on outcomes in science, ICT and mathematics in rural and regional schools. A brief overview of the generic survey format is shown below.

Section A. Teacher Profile

a) Biographical data
b) Professional background, qualifications and experience
c) Views on teacher education and preparedness
d) Motivation for moving to and remaining at a school in a provincial or remote area (if applicable)
e) Motivation for leaving a position at a school in a provincial or remote area (if applicable).

Section B. School Profile (completed in collaboration with school administration)

a) Perceptions of teacher turnover and difficulty of filling positions in science, ICT or mathematics
b) Range of courses in these subject areas available at the school
c) Approximate class sizes
d) Percentage of Indigenous students in the school
e) Views on the influence of school context on teaching and learning.

Section C. Department or Faculty Profile

a) Importance and availability of a range of material resources
b) Importance and availability of a range of ICT resources
c) Importance and availability of a range of support personnel
d) Opportunities for Professional Development
e) Importance and availability of a range of student learning experiences.

Section D. Your Reflections (Open response)

a) The strengths of the school in terms of helping students achieve in science, ICT and mathematics
b) The obstacles to student learning in these subject areas
c) Useful practices and programs for improving student learning in these subject areas
d) Recommendations to school systems.

The Parent/Caregiver Survey (Appendix 3.2) was only three pages and of a more general nature. Its three sections are outlined below.

Section A. About you and your child

a) Biographical details of parent/caregiver and child.

Section B. Teaching and Learning science, ICT and mathematics

a) Views on relationships between school, teachers, parents/caregivers and community
b) Perceptions of teaching quality
c) Perceptions of availability of resources and learning support.

Section C. Your Ideas and Concerns

a) The strengths of the school in terms of helping students achieving in science, ICT and mathematics
b) The obstacles to student learning in these subject areas
c) Useful practices and programs for improving student learning in these subject areas
d) Recommendations to school systems.

The extensive format of the teacher surveys was necessary in order to explore a range of factors that may affect student learning outcomes across school types, geographical regions and subject areas. However, it was also anticipated that the length of the teacher questionnaires (ten pages) and the time required to complete them could adversely affect response rates among busy teachers (Porter 2004). Nevertheless, the literature indicates that issues in rural education are complex and interconnected, and in order to produce as comprehensive a map as possible from a single survey, it was decided that data richness should take priority over response rate.

3.3.2 Trialing and refining the survey instruments

The survey instruments underwent an extensive review process, including review by the National Survey Advisory Committee, and consultation with experts in statistical analysis.
The instruments were also reviewed by members of the state and territory hubs of SiMERR Australia to ensure that terminologies, references to curricula and other contextual details in the surveys would be relevant and comprehensible to teachers and parents/caregivers in different states and territories. Both the Advisory Committee and the hub teams were also asked to comment on the format and accessibility of the Web surveys. The surveys were also piloted by groups of practising primary and secondary teachers and non-teaching parents.

3.3.3 Web survey design issues

The National Survey questionnaires were also made available on the SiMERR web site in order to reduce mailing costs and data entry time, and to enable real time monitoring of response rates (Dillman 2000). On the other hand, there was some doubt about the quality of Internet access among the target populations, and concern about whether these populations would be predisposed to completing a Web survey (Lang et al. 2000; Mertler 2003). Consequently, Phase One employed a dual mode approach, providing the surveys in electronic and paper form. This approach can improve both the representativeness of the sample (Yun & Trumbo 2000) and response rates (Schneider et al. 2005). Research shows that responses to questionnaires are not significantly affected by response mode (Mertler 2003; Smither, Walker & Yap 2004).

3.4 RESEARCH INTEGRITY

The scope and complexity of the National Survey presented substantial ethical issues with regard to gaining the consent of education authorities and participants. Permission to conduct Phase One was required from the University of New England Research Ethics Committee, and 29 educational jurisdictions. These included all state and territory departments of education, and various Catholic education authorities. Permission was also required from all school principals.

In order to inform participants about the purpose of the survey, confidentiality of responses and security of data, an Information Sheet for Participants accompanied each survey form. For the Web survey, respondents were directed to links providing this information.

Each school was allocated a unique survey code and web-logon code. The codes ensured that only the research team could identify individual schools. They also ensured security of electronic responses, since surveys were only accessible via an authentication page requiring matching codes. Nevertheless, it was anticipated that some parents/caregivers may become aware of the National Survey through the media or organizations other than schools, and might not have access to the codes. The electronic version of the Parent/Caregiver Survey therefore allowed respondents to access the survey using the name of their child's school and the postcode of the school.

3.5 RESPONSE RATES

3.5.1 Strategies to encourage responses

Response rates to mail surveys, and to education surveys in particular, have been declining over the last decade or so (Porter 2004). Because of the importance of the National Survey, and the extensive format of the teacher surveys, strategies were put in place to maximise response rates. On the basis of recommendations from the literature (Dillman 2000; Porter 2004) the following strategies were incorporated:

- the use of multiple modes of participation (paper and web)
- multiple contacts with potential respondents
- extensive media coverage of the National Survey
- advertisement of the National Survey through professional teacher and school leadership organizations, and through parent bodies such as the Australian Parents Council, the Australian Council of State School Organisations, and the Isolated Children's Parents Association
- the provision of posters and postcards as staffroom reminders
- an emphasis on the relevance and uniqueness of the National Survey
- assurances of confidentiality
- assurances of access to project findings
- reference to sponsorship by University of New England and the Australian Government.

In particular, the use of multiple contacts was an important feature of this strategy. Table 3.2 outlines the timetable for contact. Additional correspondence was sent to principals in various states and territories regarding arrangements to accommodate the differing holiday periods or other circumstances.

3.5.2 Profile of responding schools

Survey parcels were sent to the principals in the last two weeks of May 2005. Those consenting to participate were asked to distribute the questionnaires to teachers involved in science, ICT or mathematics education, and to invite parents/caregivers through the school newsletter or parent organisation to complete a survey questionnaire.

Useable responses were received from 3868 teachers and parents/caregivers in 1408 schools. The school response rate varied considerably with MSGLC category, type and size of school. Response rates of less than 10% were found among very small independent schools (<40 students) and remote Indigenous community schools, while a response rate of 61% was achieved from large (>700 students) provincial government secondary schools. Table 3.3 illustrates the response rates among primary and secondary schools from different sectors and locations.

Table 3.2 Timetable of contact with schools

Date / 2005	Details
May 18	Principals contacted by email to introduce the National Survey and advise that survey parcel will soon be sent to schools.
May 24-27	*Survey launch. All invitations and survey parcels dispatched to schools*
June 20	Follow-up letter sent to all schools by email, thanking those who had responded and reminding principals about the July 8 deadline for returns. Letters posted to schools without email addresses.
July 8	*Initial deadline*
July 12	Letters mailed to non-responding schools extending the deadline to August 19 and encouraging participation.
August 19	*Final deadline*

Table 3.3 Response rates of invited schools by Type, System, State/Territory and MSGLC category

		Invited	Responded	Response rate
School Types	Primary	3447	766	22%
	Combined [a]	1130	271	24%
	Secondary	868	371	43%
School System	Government	4031	1037	26%
	Catholic Systemic	772	202	26%
	Independent	642	169	26%
States and Territories	ACT	26	10	38%
	NSW	1590	428	27%
	NT	229	45	20%
	QLD	1157	277	24%
	SA	481	188	39%
	TAS	230	59	26%
	VIC	1145	231	20%
	WA	587	170	29%
MSGLC Categories [b]	Metropolitan Area	703	206	29%
	Provincial City	925	283	31%
	Provincial Area	2932	740	25%
	Remote Area	885	179	20%
	Total	**5445**	**1408**	**26%**

[a] Each of the 565 combined schools was counted twice. See text for explanation.
[b] Only the four categories used for analysis are shown here.

Some of the variation in response rates may be attributable to differences in the number of teachers per school. For example, Metropolitan and Provincial City schools are, in general, larger than Provincial Area or Remote Area schools and therefore have a larger number of teachers available to complete the survey. Small, rural one-teacher primary schools, for example, had very low response rates. The lower than expected representation of Victorian schools is consistent with comments from a number of Victorian government school principals that teachers were already involved in at least one large state government survey and were reluctant to commit to another. The low response rate from the Northern Territory is consistent with the low response rate among the many small Indigenous community schools.

Other variations are more difficult to explain. The higher than expected response rate from South Australian schools might be related to the higher level of media coverage generated about the National Survey in that state, though the high response rate from ACT schools is difficult to understand, considering that there are only two non-metropolitan schools in the ACT.

The response rates from different education systems and MSGLC categories have implications for the interpretation of findings. Although the overall response rates from schools in each system were similar (26%), system representation within each of the MSGLC categories is not proportional. For example, about 86% of respondents in Remote Areas were from Government schools, with less that 2% from Independent schools. Thus, there is an interaction effect in that data from Remote Area schools pertain mainly to characteristics of government schools. On the other hand, only about 50% of respondents from Metropolitan Area schools worked in government schools, so data from this MSGLC category relates to all three systems. While the system representation within MSGLC categories in the study is similar to that within the general population, the fact that these representations do vary substantially should be considered when attempting to generalise from the findings.

Similarly, interpretations of the findings need to consider that analyses ignored state and territory boundaries[6], and therefore state and territory-based educational characteristics. General findings relating to MSGLC categories therefore do not necessarily apply to all states and territories.

3.5.3 Profile of responding teachers

Table 3.4 provides an overall breakdown of responding teachers by survey type. In all 2940 useable responses were received from teachers. Overall, and perhaps not surprisingly in view of population distributions, roughly 68% of respondents came from three states: NSW, Queensland and Victoria. Respondent numbers were quite small in the ACT, chiefly from Catholic Systemic schools. Northern Territory respondents were also somewhat sparse and predominantly from Government schools.

The table shows that responses were received from 1576 primary teachers and 1364 secondary teachers. Of the latter, 580 were science teachers, 237 were ICT teachers and 547 were mathematics teachers. Overall, about 58% of respondents were from Provincial and Remote Areas, and about 69% taught in Government schools.

[6] A condition of the consent from two state government authorities was that no comparisons across states and territories be reported in the findings.

Table 3.4 Breakdown of teacher survey respondents by State/Territory, School System and MSGLC Categories of School

			Survey Respondent Type				
			Secondary Science	Secondary Mathematics	Secondary ICT	Primary	*Overall*
State/Territory	NSW	Count	161	151	62	414	788
		% of Row	20.4%	19.2%	7.9%	52.5%	100.0%
		% of Column	27.8%	27.6%	26.2%	26.3%	26.8%
	QLD	Count	123	137	65	272	597
		% of Row	20.6%	22.9%	10.9%	45.6%	100.0%
		% of Column	21.2%	25.0%	27.4%	17.3%	20.3%
	VIC	Count	99	92	35	339	565
		% of Row	17.5%	16.3%	6.2%	60.0%	100.0%
		% of Column	17.1%	16.8%	14.8%	21.5%	19.2%
	SA	Count	87	75	37	206	405
		% of Row	21.5%	18.5%	9.1%	50.9%	100.0%
		% of Column	15.0%	13.7%	15.6%	13.1%	13.8%
	WA	Count	50	46	20	214	330
		% of Row	15.2%	13.9%	6.1%	64.8%	100.0%
		% of Column	8.6%	8.4%	8.4%	13.6%	11.2%
	TAS	Count	25	16	7	83	131
		% of Row	19.1%	12.2%	5.3%	63.4%	100.0%
		% of Column	4.3%	2.9%	3.0%	5.3%	4.5%
	NT	Count	21	20	7	43	91
		% of Row	23.1%	22.0%	7.7%	47.3%	100.0%
		% of Column	3.6%	3.7%	3.0%	2.7%	3.1%
	ACT	Count	14	10	4	5	33
		% of Row	42.4%	30.3%	12.1%	15.2%	100.0%
		% of Column	2.4%	1.8%	1.7%	.3%	1.1%
School System	Government	Count	365	367	149	1138	2019
		% of Row	18.1%	18.2%	7.4%	56.4%	100.0%
		% of Column	62.9%	67.1%	62.9%	72.2%	68.7%
	Catholic Systemic	Count	107	87	45	319	558
		% of Row	19.2%	15.6%	8.1%	57.2%	100.0%
		% of Column	18.4%	15.9%	19.0%	20.2%	19.0%
	Independent	Count	108	93	43	119	363
		% of Row	29.8%	25.6%	11.8%	32.8%	100.0%
		% of Column	18.6%	17.0%	18.1%	7.6%	12.3%
MSGLC Category of School	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%
Overall	Count		580	547	237	1576	2940
	% of Row		19.7%	18.6%	8.1%	53.6%	100.0%
	% of Column		100.0%	100.0%	100.0%	100.0%	100.0%

Table 3.5 provides a description of teacher respondents by sex, age, position, qualifications and teaching experience at their current school. About 60% of respondents were female, reflecting the high proportion of female teachers in primary schools. The majority of respondents were 41 years of age or older; only about 18% were less than 30 years of age. Approximately 64% of respondents were classroom teachers, 18% were Subject Coordinators or Heads of Department (these were secondary respondents only) and about 19% were Senior School Management

(Principals or Deputy/Assistant Principals). In the Teacher and Senior School Management categories, the greater percentages of respondents were female and vice-versa for Subject Coordinators/Heads of Department.

Over 85% of respondents held either a Bachelor degree (plus an undergraduate or postgraduate diploma) or some type of postgraduate teaching qualification, with females dominating the percentages in each case. Respondents having qualifications at a level less than a B.Ed. were most frequently older than 41 years of age. Over 80% of respondents had 12 years or less experience teaching at their current school.

Table 3.5 Breakdown of Sex and Age of Respondent, by individual teacher-related variables

			Sex of Respondent			Age of Respondent				
			Male	Female	Overall	< = 30 yrs	31 - 40 yrs	41-50 yrs	> 50 yrs	Overall
Position of Respondent	Senior school management	Count	235	305	540	39	99	214	187	539
		% within Row	43.5%	56.5%	100.0%	7.2%	18.4%	39.7%	34.7%	100.0%
		% within Col	19.9%	17.6%	18.5%	7.4%	16.3%	22.6%	22.6%	18.5%
	Subject coord/HoD	Count	306	207	513	39	115	181	179	514
		% within Row	59.6%	40.4%	100.0%	7.6%	22.4%	35.2%	34.8%	100.0%
		% within Col	25.9%	12.0%	17.6%	7.4%	18.9%	19.1%	21.6%	17.7%
	Classroom Teacher	Count	640	1220	1860	447	395	553	461	1856
		% within Row	34.4%	65.6%	100.0%	24.1%	21.3%	29.8%	24.8%	100.0%
		% within Col	54.2%	70.4%	63.9%	85.1%	64.9%	58.3%	55.7%	63.8%
Highest academic qualification	< B.Ed.	Count	112	305	417	6	48	170	192	416
		% within Row	26.9%	73.1%	100.0%	1.4%	11.5%	40.9%	46.2%	100.0%
		% within Col	9.5%	17.7%	14.4%	1.1%	7.9%	18.0%	23.3%	14.4%
	B.Ed.	Count	300	654	954	322	238	261	133	954
		% within Row	31.4%	68.6%	100.0%	33.8%	24.9%	27.4%	13.9%	100.0%
		% within Col	25.6%	37.9%	32.9%	61.6%	39.3%	27.6%	16.2%	32.9%
	Bach + UG or PG Dip	Count	499	483	982	136	222	315	308	981
		% within Row	50.8%	49.2%	100.0%	13.9%	22.6%	32.1%	31.4%	100.0%
		% within Col	42.5%	28.0%	33.9%	26.0%	36.6%	33.4%	37.4%	33.9%
	PG degree + other	Count	263	284	547	59	98	198	190	545
		% within Row	48.1%	51.9%	100.0%	10.8%	18.0%	36.3%	34.9%	100.0%
		% within Col	22.4%	16.5%	18.9%	11.3%	16.2%	21.0%	23.1%	18.8%
Years teaching at this school	0 - 3 years	Count	440	713	1153	396	268	301	188	1153
		% within Row	38.2%	61.8%	100.0%	34.3%	23.2%	26.1%	16.3%	100.0%
		% within Col	37.4%	41.3%	39.7%	76.0%	43.9%	32.0%	22.7%	39.8%
	4 - 12 years	Count	464	738	1202	124	321	428	324	1197
		% within Row	38.6%	61.4%	100.0%	10.4%	26.8%	35.8%	27.1%	100.0%
		% within Col	39.4%	42.7%	41.4%	23.8%	52.6%	45.4%	39.2%	41.3%
	13 - 25 years	Count	220	241	461		21	201	238	460
		% within Row	47.7%	52.3%	100.0%		4.6%	43.7%	51.7%	100.0%
		% within Col	18.7%	13.9%	15.9%		3.4%	21.3%	28.8%	15.9%
	> 25 years	Count	54	36	90	1 [a]		12	77	90
		% within Row	60.0%	40.0%	100.0%	1.1%		13.3%	85.6%	100.0%
		% within Col	4.6%	2.1%	3.1%	.2%		1.3%	9.3%	3.1%
Overall	Count		1187	1746	2933	528	612	954	833	2927
	% within Row		40.5%	59.5%	100.0%	18.0%	20.9%	32.6%	28.5%	100.0%
	% within Col		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

[a] This respondent obviously gave an incorrect response to either age, or years of experience.

3.5.4 Response from parents/caregivers

Table 3.6 provides a description of the 928 respondents to the Parent/Caregiver survey. About 75% of respondents were female, with 66% reporting with relation to primary schools and 72% reporting on Government schools. Table 3.7 provides an overview of response rates by state/territory and School System.

Table 3.6 Overview of parent/caregiver respondent characteristics

		% respondents
Sex	Female	**75%**
	Male	**25%**
School type	Primary	**55%**
	Combined	**18%**
	Secondary	**27%**
MSGLC category	Metropolitan Area	**17%**
	Provincial City	**20%**
	Provincial Area	**53%**
	Remote Area	**10%**

Table 3.7 Breakdown for the parents/caregivers sample, by State/Territory and School System

			School System			
			Government	Catholic Systemic	Independent	*Overall*
State or territory	NSW	Count	**218**	**45**	**31**	**294**
		% within State	74.1%	15.3%	10.5%	100.0%
		% within School System	32.7%	34.9%	23.5%	31.7%
	QLD	Count	**152**	**27**	**24**	**203**
		% within State	74.9%	13.3%	11.8%	100.0%
		% within School System	22.8%	20.9%	18.2%	21.9%
	VIC	Count	**103**	**17**	**33**	**153**
		% within State	67.3%	11.1%	21.6%	100.0%
		% within School System	15.4%	13.2%	25.0%	16.5%
	SA	Count	**87**	**11**	**28**	**126**
		% within State	69.0%	8.7%	22.2%	100.0%
		% within School System	13.0%	8.5%	21.2%	13.6%
	WA	Count	**72**	**22**	**11**	**105**
		% within State	68.6%	21.0%	10.5%	100.0%
		% within School System	10.8%	17.1%	8.3%	11.3%
	TAS	Count	**10**	**3**	**4**	**17**
		% within State	58.8%	17.6%	23.5%	100.0%
		% within School System	1.5%	2.3%	3.0%	1.8%
	NT	Count	**24**	**2**	**1**	**27**
		% within State	88.9%	7.4%	3.7%	100.0%
		% within School System	3.6%	1.6%	.8%	2.9%
	ACT	Count	**1**	**2**		**3**
		% within State	33.3%	66.7%		100.0%
		% within School System	.1%	1.6%		.3%
Overall		Count	**667**	**129**	**132**	**928**
		% within State	71.9%	13.9%	14.2%	100.0%
		% within School System	100.0%	100.0%	100.0%	100.0%

3.6 VARIABLES AND DATA PREPARATION

In the design of the National Survey, decisions were made on the number of categories allocated to each variable. For example, based upon the MSGLC code, invited schools were differentiated by eight categories. However, analysis of responses revealed a number of variable categories that needed to be collapsed because they contained too few respondents, or an unnecessarily large number of categories which could unnecessarily complicate analysis and interpretation. Table 3.8 lists the various collapsed categories used for analysis and reporting. In specific databases other variables may be collapsed as required and this will be indicated at the appropriate point in the report.

Table 3.8 Variable Categories

Variable	No. Categories	Category labels
School System affiliation	3	Government school Catholic Systemic school Independent school
MSGLC Categories	4	Metropolitan Area *(also Capital city + Major Urban city)* Provincial City Provincial Area Remote Area
Type of School	3	Primary only Combined Secondary only
Age of Respondent	4	≤ 30 years 31-40 years 41-50 years > 50 years
Position of Respondent	3	Senior school management Subject coordinator/Head of Department Teacher
Employment basis of respondent	3	F/T permanent P/T permanent Temp/Contract/Casual
Highest academic qualification	4	< B.Ed. *(lower than a Bachelor of Education)* B.Ed. *(Bachelor of Education)* Bach + UG or PG *Dip (Bachelor degree of any type, + an undergraduate of Postgraduate Diploma of Education)* PG degree + other *(postgraduate degree or higher)*
Years teaching subject, and Years teaching at this school	4	0 – 3 years 4 – 12 years 13 – 25 years > 25 years
Location of school for High School study, and Location where lived during initial teacher education	4	Metropolitan centre *(pop. >100 000)* Provincial centre *(pop. 50 -99 999)* Regional centre *(pop. 25 000- 49 999)* Rural centre *(pop. < 25 000)*
Percentage of teachers who leave the school each year	3	0 – 10% 11 – 20% > 20%
Size of junior science class	3	≤ 15 students 16 – 25 students > 25 students
Percentage of Indigenous students at school	4	0% 1 – 20% 21 – 40% > 40%

Many of the variable categories listed in Table 3.8, such as 'Position of Respondent', were used only in descriptive analyses to provide profiles of responding schools, teachers and parents. This was also the case for state/territory location of school, and school system affiliation. As the National Survey was primarily concerned with geographical variations in the data, the key variable used in comparative analyses was MSGLC Category of School. A second variable, Percentage of Indigenous Students, allowed comparisons that could identify differences in the circumstances and needs of schools with different proportions of Indigenous students.

Other independent variables used in comparative analyses included Type of School, Respondent Type, Sex, Age of Respondent, and Location While Undertaking Initial Teacher Education.

3.7 DATA ANALYSIS

A range of analytical tools was used to interpret the data. Decisions about the most appropriate procedure for a particular analysis were guided by the research questions and dependent upon the characteristics of data sets.

3.7.1 Decision criteria for statistical testing

The numerous questions on the surveys and the large number of respondents, coupled with the many anticipated statistical comparisons and tests, demanded that some attention be given to the proper level of significance to be applied during analysis. To help prevent spurious claims of significance, the conventionally accepted .05 level of significance was reset to the much stricter level of *.001*. This new criterion has been employed in all statistical tests reported for all surveys. Statistical tests achieving a level of significance of .01 are identified as suggestive and worthy of further exploration. One immediate implication of this decision is that many significant associations at the .05 level may exist within the data, but have not been identified in this report.

3.7.2 Frequency tables and cross-tabulations

For many of the categorical variables of interest in the surveys, patterns and trends were summarised using either a simple frequency table or a cross-tabulation table. In all cross-tabulation tables, cell counts were reported along with both the count's percentage in the row category and the count's percentage in the column category. In some cases, the patterns in a cross-tabulation table were evaluated for statistical significance using the standard chi-square contingency table test. When a significant chi-square test was observed, the statistical test along with the Cramer' V measure of effect size was also reported as a footnote. Further, individual cell counts in the cross-tabulation table were evaluated for their contribution to the significant chi-squared relationship using adjusted standardised residuals (such contribution was always interpreted relative to what would be expected if the two categorical variables were not statistically associated).

3.7.3 Combining importance and availability ratings for items

The primary and secondary teacher questionnaires provided respondents with a large number of teaching and learning-related items, which they were asked to rate in terms of both importance (using a scale ranging from 1 – Not at all Important to 5 – Extremely Important) and availability (using a scale ranging from 1 – Never Available to 4 – Always Available). Rather than analysing importance ratings and availability ratings separately (leading to a huge number of comparisons), the analytical approach adopted was to combine the importance and availability ratings in such a way as to yield scores where higher values indicated a greater deficit or 'need' for increasing the availability of the item. This was accomplished through a simple transformation for each item: a 'need' score was computed by multiplying the Importance (I) rating for an item by the quantity of 5 minus the Availability (A) rating for the item ['Need' = I x (5 – A)]. This transformation had the net effect of reverse-scoring availability ratings so that larger numbers indicated less availability and, when multiplied by the importance rating, meant that items of high importance but low availability had the highest 'need' score. By way of justifying such a transformation, it is important to note that there is ample basis in the literature for this type of multiplicative transformation to combine sources of rating information (e.g., expectancy-valance motivation theory, see, for example, Kanfer, 1994;

and subjective expected utility theory and decision tree analysis, see, for example, Goodwin and Wright, 2004). Furthermore, by combining the two sets of ratings for each item in such a meaningful way, the number of statistical comparisons which needed to be made was cut immediately by half.

3.7.4 Principal components analysis

Each survey contained several sets of items addressing common themes. If individual items had been evaluated for group differences, the number of potential statistical comparisons and tests would have been enormous, accompanied by a virtual guarantee that at least one falsely significant finding would have been identified. Thus, in addition to employing a stricter decision criterion for evaluating each statistical test, a secondary strategy was employed to reduce the number of statistical tests conducted. For each thematically-related set of survey items (those rated using Likert-type scales), a principal components analysis was conducted to identify coherent subsets of items that measured a common sub-theme. For each principal components analysis, a scree plot, coupled with the 'eigenvalue greater than 1.0' rule, was used to determine the proper number of components to interpret. All components were rotated using the promax rotation procedure in order to produce the most interpretable component structures, while allowing for the possibility of correlated components. Each component was labelled in a way that summarised the general theme running through the items comprising it. Once the appropriate number of components had been identified in each analysis, respondents were given a score on each component by averaging their ratings on each of the items that defined the component. Subsequent statistical tests then focused on the component scores. The results of all principal components analyses for each survey instrument appear in an Appendix to the relevant Part of this report. For the principal components analyses of relevant items in the teacher surveys, the 'need' scores were analysed, yielding components whose defining items exhibited similar patterns of 'need'.

3.7.5 Multivariate analysis of covariance (MANCOVA)

Once relevant principal components had been identified for a particular domain of Likert-type items, multivariate analyses of covariance (MANCOVAs) were conducted to compare the component scores across various classifications of respondents. The covariates employed for all such multivariate group-comparison analyses were: Total FTE for the school, Median Weekly Household Income[7] and the SES Index[8]. In this way, all comparisons were made *after* controlling for the effects of school size and socioeconomic status of the school's location.
The justification for this is that these variables may in some cases have a confounding effect on the results of analyses using MSGLC categories, given that socioeconomic factors and school size may be covariates with geographic location. In order to ensure that any significant differences found in such analyses were a function of location rather than socioeconomic background or school size, these variables were controlled.

MANCOVAs, in conjunction with the stricter level of significance criterion of .001 and the use of principal component scores as dependent variables, were employed in an attempt to maintain some control over the increased risk of making false claims of significance when simultaneous tests on many variables were conducted. It is important to appreciate that only those MANCOVAs revealing a significant multivariate test were further pursued by evaluating individual (univariate) tests on each component separately – an analytical flow consistent with the logic set out by Tabachnick and Fidell (2001). For each significant multivariate effect, the partial eta-squared (η^2) measure of effect size is reported to give a feeling for the magnitude of

[7] Median Weekly Household Income from Australian Bureau of Statistics Census 2001 figures
[8] DEST Socioeconomic Status Indicator for schools

the overall set of differences as a proportion of variance explained by the categories being compared.

Since MANCOVA analyses tended to produce voluminous sets of numbers, what is reported in ensuring chapters are tables of component mean scores (adjusted for the influence of all covariates) and standard errors (indicating the precision of the estimate of the adjusted mean) and, where a significant difference is identified, colour codes highlight which of the components showed significant differences. To further explore significant differences, a profile plot of covariate-adjusted means for the original items comprising each component (ordered by component) is presented. These profile plots make it relatively easy to identify exactly where specific differences reside, with respect to original item content. It must be emphasised that this MANCOVA approach formally tested for differences using only the component scores; the profile plots of original item scores are provided only to facilitate a post hoc understanding of what seemed to be contributing to the observed differences.

3.7.6 Qualitative analysis

Many sections of the surveys invited comments or reflections and teachers and parents made good use of these opportunities, generating thousands of items of qualitative data. Constant comparative analysis (Glaser & Strauss, 1967; Maykut & Morehouse, 1994) was used to develop numerical codes for the responses to each question. This process involved the interpretation of meaning, inductive development of response categories and allocation of subsequent responses to categories through comparisons. Frequency analysis of response codes identified the most commonly expressed opinions, and the characteristics of schools and teachers allowed comparisons across these variables. Where appropriate, representative comments are used in the report to complement or illustrate findings.

3.8 HOW TO INTERPRET TABLES AND FIGURES IN THIS REPORT

Cross-tabulation (contingency) tables

As noted above, cross-tabulations were used in some cases to look for associations between variables. Contingency tables summarise the data and use colour to identify significant patterns. For example, Table 3.9 below summarises the perceptions of respondents in different locations about the annual staff turnover in their schools. Responses to this question have been collapsed into three categories: 0-10%, 11-20%, and >20% of staff leaving the school each year. The cell count is the number of respondents from a particular location indicating a particular turnover rate. Below the count are the percentage contributions of each count to the row and column totals. For example, Table 3.9 shows that 377 respondents from Metropolitan Areas reported a low (0-10% p.a.) turnover in their schools. This represented 21.4% of all respondents who reported this turnover rate, and 73.1% of all Metropolitan Area respondents to this question.

Chi-square significance tests indicated that a significantly greater than expected number of respondents in Metropolitan Areas and Provincial Cities reported an annual staff turnover between 0-10% (pink cells). In contrast, significantly fewer than expected respondents from Remote Areas reported this situation (green cells). On the other hand, significantly fewer respondents from Metropolitan Areas and Provincial Cities reported a high turnover rate (>20% p.a.), while this rate was reported by a significantly higher number of respondents in Remote Area schools. The term 'expected' refers to what would be expected if there was no statistical association between staff turnover rate and location of school. The significance level is .001, indicating that there is at most one chance in a thousand that this association has been identified incorrectly. The colour pattern in the table therefore illustrates an extremely strong likelihood of association between annual staff turnover rate and location of school.

Table 3.9 Reported rates of staff turnover in schools in different MSGLC categories [a]

			MSGLC categories				
			Metropolitan Area	Provincial City	Provincial Area	Remote Area	*Overall*
Reported percentage of teachers leaving the school each year	0 - 10%	Count	377	424	886	76	1763
		% of Row	21.4%	24.0%	50.3%	4.3%	100.0%
		% of Column	73.1%	71.6%	65.9%	30.5%	65.2%
	11 - 20%	Count	103	126	298	67	594
		% of Row	17.3%	21.2%	50.2%	11.3%	100.0%
		% of Column	20.0%	21.3%	22.2%	26.9%	22.0%
	> 20%	Count	36	42	161	106	345
		% of Row	10.4%	12.2%	46.7%	30.7%	100.0%
		% of Column	7.0%	7.1%	12.0%	42.6%	12.8%
							2702

[a] Shaded cells indicate categories making a significant (p < .001) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

Principal components tables

Table 3.10 is an example of the tables used in the report to display significant associations between principal components and other variables. The three principal components (each a group of Professional Development items having a similar theme) are listed across the top of the table, and the comparison variable, in this case MSGLC category of school, on the left hand side. Each cell contains the mean 'need' score and standard error on that component for science respondents in each location. The gold colour in the cell titled 'MSGLC categories' indicates that overall, there were significant differences (p < .001) on the scores on these components by respondents in different locations.

Table 3.10 Mean ratings by science respondents on Professional Interaction and Development item components, broken down by MSGLC categories [a]

			Professional Development Component			
			General Personal Professional Development	Development for Teaching to Targeted Groups	Professional Relationships Development	Valid N
MSGLC categories	Metropolitan Area	Mean	8.88	8.32	8.41	
		s.e. (Mean)	.29	.36	.29	131
	Provincial City	Mean	10.65	9.85	9.08	
		s.e. (Mean)	.30	.38	.30	110
	Provincial Area	Mean	10.12	9.68	9.23	
		s.e. (Mean)	.20	.25	.20	248
	Remote Area	Mean	10.35	11.69	10.10	
		s.e. (Mean)	.51	.63	.51	36

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences (p < .001) on a component; light blue shading indicates suggestive differences (p < .01) on a component.

Closer analysis reveals that this significant overall difference was due to suggestive differences at the .01 level (blue) in the need for General Personal Professional Development of respondents from different locations, and significant differences (gold) in the need for development for Teaching to Targeted Groups. Looking at the mean scores under this heading, it is clear that science respondents in Metropolitan Areas reported a lower need (mean need score 8.32) for this type of professional development than did those in other locations. Science respondents from Remote Areas reported the highest score (11.69) and therefore the greatest unmet need for this type of professional development.

Profile plot figures

The principal components tables do not provide detailed information about ratings on particular questionnaire items. In order to identify which items within the components contributed most to significant or suggestive differences, colour coded profile plots accompany each table. These figures have a number of dimensions, worth introducing here. The example below, Figure 3.1, shows the profile plot that accompanies Table 3.10.

Shortened names for the individual items are found on the 'x' axis, and the 'mean need' rating scale on the 'y' axis. The higher the rating, the greater the unmet need for that professional development opportunity (the scale is ordinal). It is clear from Figure 3.1 that the highest unmet need for science respondents in Remote Areas (purple) was for professional development opportunities to help them teach gifted and talented students. The highest unmet need among Provincial City science respondents (green) was for relief from face-to-face teaching for programming. The coloured lines do not suggest a trend, as these are discrete items. The lines are simply a visual aid to minimise confusion when differentiating between variables.

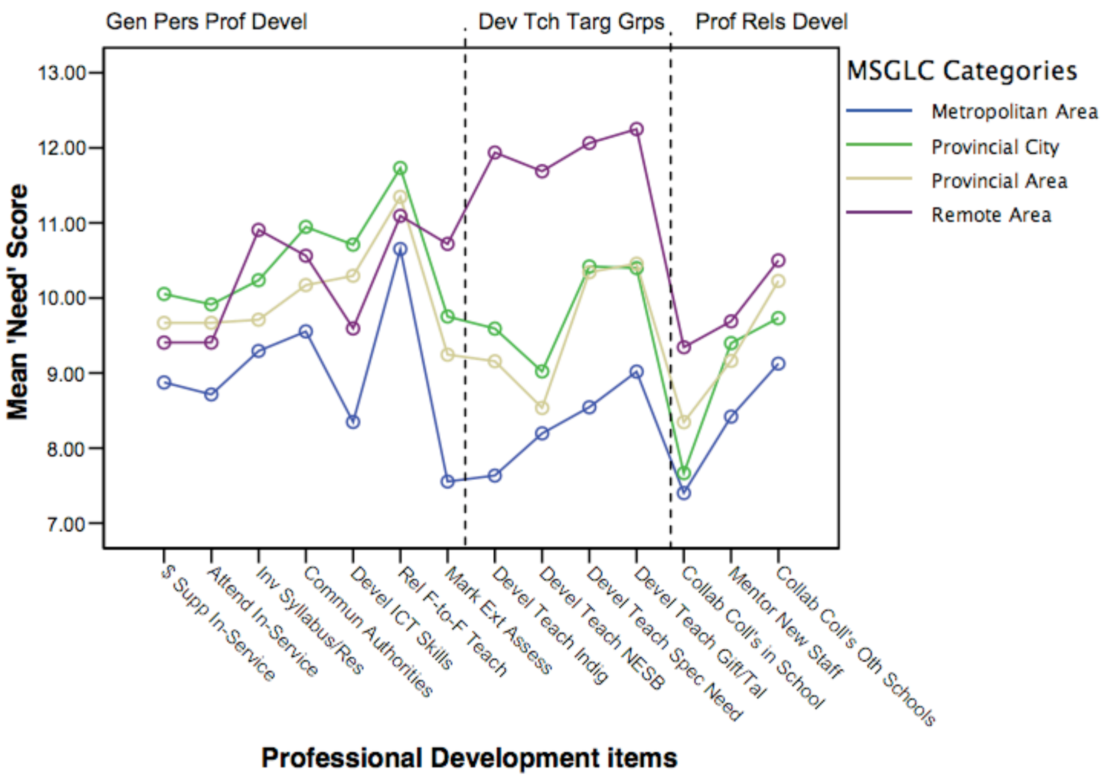

Figure 3.1 Profile plot of mean 'need' scores of science respondents for the Professional Interaction and Development components, compared by MSGLC categories (Table 5.3 for item names in full)

The items in Figure 3.1 are divided into three sets, separated by dotted lines. The sets contain items identified by the principal components analysis as relating to a common sub-theme. It is possible, therefore, to see from the tables and profile plots which components were significantly associated with particular variables, which items within these components contributed most to this association, and how mean ratings on these items differed across a variable.

CHAPTER FOUR

STAFFING ISSUES IN SCIENCE, ICT AND MATHEMATICS

4.1 INTRODUCTION

This chapter reports on staffing in the responding schools and the issues relating to the attraction and retention of suitably qualified teachers of science, ICT and mathematics. The report focuses on findings in four areas:

- Teachers' perceptions of staffing profiles
- Motivations for teaching in rural or regional schools
- Teacher's reflections on their teacher education and preparation
- Teaching qualifications.

The findings emerged from analyses of responses to questions common to the four teacher surveys (primary, secondary science, secondary mathematics and secondary ICT). They represent the views of 2940 respondents, of whom 1576 (54%) were primary teachers and 1364 were (46%) secondary teachers. The secondary respondents included 580 science teachers, 237 ICT teachers and 547 mathematics teachers. Approximately 64% of respondents were classroom teachers, 18% were Subject Coordinators or Heads of Department (these were secondary respondents only) and about 19% were Senior School Management (Principals or Deputy/Assistant Principals). Where tables or other comparisons based on these samples do not add up to the totals reported here, it is because of missing responses to particular items.

4.2 SCHOOL STAFFING PROFILES

Teachers were asked for their perceptions of annual staff turnover rates in their schools and the difficulty of filling vacant positions. Whereas primary teachers were asked to rate the difficulty of filling general teaching vacancies at their schools, the secondary teachers were asked to rate the difficulty of filling vacancies in their subject areas at their schools. To increase the reliability of estimates, teachers were advised to consult with school administration if unsure about their responses to this section of the survey. Responses to these questions were summarised using cross-tabulations, and patterns in the tables evaluated for statistical significance using the standard chi-square contingency table test.

4.2.1 Teachers' perceptions of staff turnover rates

Table 4.1 shows that nearly 35% of all respondents estimated a turnover rate at their school exceeding 10% each year, while about 13% estimated a rate exceeding 20%. Cross-tabulations revealed a number of significant differences across MCEETYA Schools Geographical Location Classification (MSGLC) category and Type of School.

Variation with geographic region

There was a significant association between the reported percentage of teachers leaving the school each year and the MSGLC category of school[9]. This was primarily due to significantly more respondents than expected from Metropolitan Areas and Provincial Cities, and significantly fewer respondents than expected from Remote Areas, reporting teacher turnover

[9] $\chi^2(6) = 260.83$; $p < .001$; Cramer's V = .22

rates between 0% and 10%. Conversely, significantly fewer respondents than expected from Metropolitan Areas and Provincial Cities and significantly more respondents than expected from Remote Areas reported teacher turnover rates greater than 20% per year. Figure 4.1 shows that only about 7% of respondents in Metropolitan Area and Provincial City schools reported high turnover rates (>20% per annum), compared with 12% of Provincial Area respondents and about 43% of Remote Area respondents.

Table 4.1 Rates of staff turnover and difficulty of filling vacant positions in schools in different MSGLC categories. [a]

			MSGLC categories				
			Metropolitan Area	Provincial City	Provincial Area	Remote Area	*Overall*
Reported percentage of teachers leaving the school each year	0 - 10%	Count	**377**	**424**	**886**	**76**	**1763**
		% of Row	21.4%	24.0%	50.3%	4.3%	100.0%
		% of Column	73.1%	71.6%	65.9%	30.5%	65.2%
	11 - 20%	Count	**103**	**126**	**298**	**67**	**594**
		% of Row	17.3%	21.2%	50.2%	11.3%	100.0%
		% of Column	20.0%	21.3%	22.2%	26.9%	22.0%
	> 20%	Count	**36**	**42**	**161**	**106**	**345**
		% of Row	10.4%	12.2%	46.7%	30.7%	100.0%
		% of Column	7.0%	7.1%	12.0%	42.6%	12.8%
							2702
How difficult is it to fill vacant positions?	Not difficult	Count	**250**	**290**	**524**	**42**	**1106**
		% of Row	22.6%	26.2%	47.4%	3.8%	100.0%
		% of Column	47.3%	47.6%	38.7%	16.7%	40.4%
	Somewhat difficult	Count	**135**	**155**	**345**	**61**	**696**
		% of Row	19.4%	22.3%	49.6%	8.8%	100.0%
		% of Column	25.6%	25.5%	25.5%	24.3%	25.4%
	Moderately difficult	Count	**98**	**103**	**293**	**78**	**572**
		% of Row	17.1%	18.0%	51.2%	13.6%	100.0%
		% of Column	18.6%	16.9%	21.7%	31.1%	20.9%
	Very difficult	Count	**45**	**61**	**191**	**70**	**367**
		% of Row	12.3%	16.6%	52.0%	19.1%	100.0%
		% of Column	8.5%	10.0%	14.1%	27.9%	13.4%
							2741

[a] Shaded cells indicate categories making a significant ($p < .001$) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

Variation with Type of School

Table 4.2 shows that the reported percentage of teachers leaving the school each year was significantly associated with the Type of School[10]. This was due to significantly more than expected primary respondents reporting a low teacher turnover rate (0% -10%), with fewer reporting moderate turnover rates (11% -20%). Significantly more than expected secondary school respondents reported moderate annual turnover rates (11% - 20), while significantly more than expected combined school respondents reported a high turnover rate (greater than 20%). In view of the previous finding, and the higher representation of combined schools in Remote Areas compared with secondary schools, it is reasonable to suppose that this pattern is related to geographic location.

[10] $\chi^2(4) = 105.13$; $p < .001$; Cramer's V = .14

Figure 4.1 Percentage of primary and secondary respondents in different locations reporting an annual staff turnover greater than 20% (*N*=2702*)*

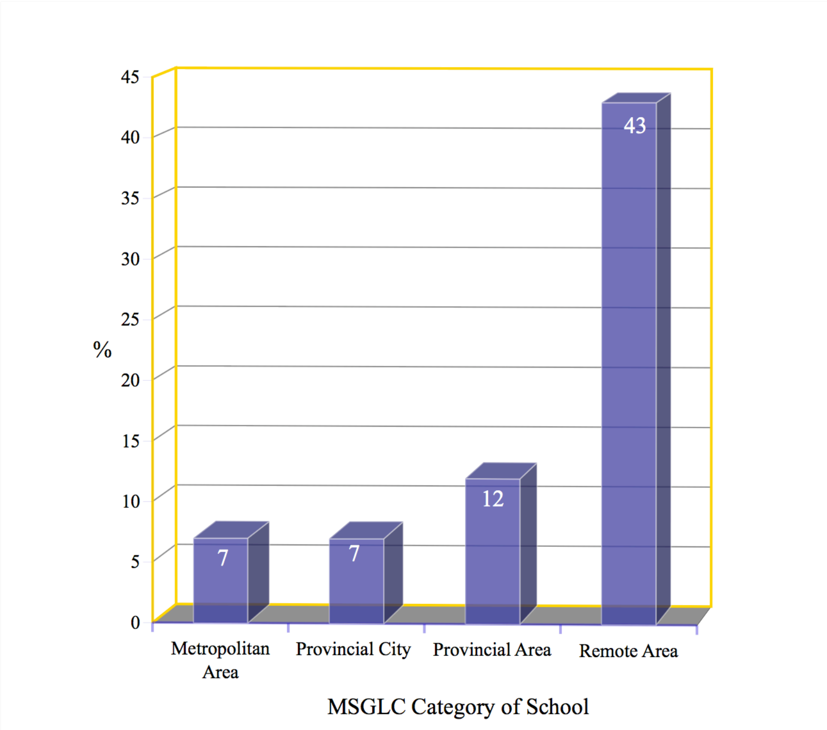

Table 4.2 Reported percentage of teachers leaving the school each year, by Type of School [a]

			Type of School			
			Primary	**Secondary**	**Combined**	*Overall*
Reported percentage of teachers leaving the school each year	**0 - 10%**	**Count**	**919**	**580**	**264**	**1763**
		% of Row	52.1%	32.9%	15.0%	100.0%
		% of Column	71.9%	61.7%	54.5%	65.2%
	11 - 20%	**Count**	**185**	**277**	**132**	**594**
		% of Row	31.1%	46.6%	22.2%	100.0%
		% of Column	14.5%	29.5%	27.3%	22.0%
	> 20%	**Count**	**174**	**83**	**88**	**345**
		% of Row	50.4%	24.1%	25.5%	100.0%
		% of Column	13.6%	8.8%	18.2%	12.8%
			1278	**940**	**484**	**2702**

[a] Shaded cells indicate categories making a significant (p < .001) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

4.2.2 Teachers' perceptions of difficulty in filling vacant teaching positions

Table 4.1 shows that overall, more than 34% of respondents indicated that filling a vacant teaching position in their school was moderately to very difficult, while about 40% of respondents considered that it was not difficult. Cross-tabulations revealed a number of significant differences across MSGLC category and Type of Respondent. Comparisons across School Systems revealed no clear differences in the reported difficulty of filling vacant teaching positions.

Variation with geographic region

There was a significant association between MSGLC category of school and the difficulty of filling a vacant position[11]. Table 4.1 shows that this association was primarily attributable to significantly more respondents than expected from Metropolitan Areas and Provincial Cities indicating that it was not difficult to fill vacant positions, and significantly more respondents than expected from Remote Areas indicating that it was moderately or very difficult to fill vacant positions. Fewer than expected Remote Area respondents felt that filling vacant positions in their school was not difficult. In contrast, fewer than expected Metropolitan City respondents felt that it was very difficult to fill vacant positions in their school.

Variation with type of respondent

Overall, there was a significant association between Survey Respondent Type and reported difficulty of filling a vacant position in the school[12]. Table 4.3 shows that this association was partly attributable to significantly more primary respondents than expected indicating that it was not difficult to fill vacant positions, and significantly more than expected science, ICT and mathematics respondents considered it either moderately or very difficult to fill vacancies in their discipline areas at their schools.

Table 4.3 Reported difficulty of filling vacant primary teaching positions and secondary science, ICT and mathematics teaching positions [a]

			Survey Respondent Type				
			Secondary Science	Secondary Maths	Secondary ICT	Primary	*Overall*
How difficult is it to fill vacant positions?	Not difficult	Count	139	76	34	857	1106
		% of Row	12.6%	6.9%	3.1%	77.5%	100.0%
		% of Column	26.0%	14.9%	15.7%	57.9%	40.4%
	Somewhat difficult	Count	162	143	74	317	696
		% of Row	23.3%	20.5%	10.6%	45.5%	100.0%
		% of Column	30.3%	28.1%	34.1%	21.4%	25.4%
	Moderately difficult	Count	149	145	61	217	572
		% of Row	26.0%	25.3%	10.7%	37.9%	100.0%
		% of Column	27.9%	28.5%	28.1%	14.7%	20.9%
	Very difficult	Count	85	145	48	89	367
		% of Row	23.2%	39.5%	13.1%	24.3%	100.0%
		% of Column	15.9%	28.5%	22.1%	6.0%	13.4%
		Totals	535	509	217	1480	2741

[a] Shaded cells indicate categories making a significant ($p < .001$) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

Responses to this question were also analysed across MSGLC category for each Survey Respondent Type. There were no significant associations between the variables for ICT respondents. For primary respondents, the difficulty of filling vacant teaching positions and MSGLC category of school were significantly associated[13]. Table 4.4 shows that this association was mainly attributable to significantly more respondents than expected from Metropolitan and Provincial Cities indicating that it was not difficult to fill vacant primary positions, and significantly more respondents than expected from Remote Areas indicating that it was moderately or very difficult to fill vacant positions.

[11] $\chi^2(9) = 123.40$; $p < .001$; Cramer's V = .12
[12] $\chi^2(9) = 497.93$; $p < .001$; Cramer's V = .25
[13] $\chi^2(9) = 183.68$; $p < .001$; Cramer's V = .20

The difficulty of filling a vacant secondary science position was significantly associated with MSGLC category of school[14]. Table 4.4 shows that this association was mainly attributable to significantly more than expected respondents from Metropolitan Areas indicating that it was not difficult to fill vacant science positions, and significantly more than expected respondents from Remote Areas indicating that it was very difficult to fill vacant positions.

Table 4.4 Reported difficulty of filling vacant primary and secondary science, ICT and mathematics teaching positions in different MSGLC categories[a]

			MSGLC Categories				
			Metropolitan Area	Provincial City	Provincial Area	Remote Area	Overall
How difficult is it to fill vacant primary teaching positions?	Not difficult	Count	157	243	425	32	857
		% within Row	18.3%	28.4%	49.6%	3.7%	100.0%
		% within Column	73.4%	72.1%	55.3%	20.0%	57.9%
	Somewhat difficult	Count	39	65	166	47	317
		% within Row	12.3%	20.5%	52.4%	14.8%	100.0%
		% within Column	18.2%	19.3%	21.6%	29.4%	21.4%
	Moderately difficult	Count	12	26	126	53	217
		% within Row	5.5%	12.0%	58.1%	24.4%	100.0%
		% within Column	5.6%	7.7%	16.4%	33.1%	14.7%
	Very difficult	Count	6	3	52	28	89
		% within Row	6.7%	3.4%	58.4%	31.5%	100.0%
		% within Column	2.8%	.9%	6.8%	17.5%	6.0%
How difficult is it to fill vacant science teaching positions?	Not difficult	Count	49	26	56	8	139
		% within Row	35.3%	18.7%	40.3%	5.8%	100.0%
		% within Column	37.4%	23.2%	22.2%	20.0%	26.0%
	Somewhat difficult	Count	40	34	82	6	162
		% within Row	24.7%	21.0%	50.6%	3.7%	100.0%
		% within Column	30.5%	30.4%	32.5%	15.0%	30.3%
	Moderately difficult	Count	32	30	75	12	149
		% within Row	21.5%	20.1%	50.3%	8.1%	100.0%
		% within Column	24.4%	26.8%	29.8%	30.0%	27.9%
	Very difficult	Count	10	22	39	14	85
		% within Row	11.8%	25.9%	45.9%	16.5%	100.0%
		% within Column	7.6%	19.6%	15.5%	35.0%	15.9%
How difficult is it to fill vacant ICT teaching positions?	Not difficult	Count	11	7	15		34
		% within Row	32.4%	20.6%	44.1%	2.9%	100.0%
		% within Column	20.4%	16.7%	14.9%	5.0%	15.7%
	Somewhat difficult	Count	16	12	41	5	74
		% within Row	21.6%	16.2%	55.4%	6.8%	100.0%
		% within Column	29.6%	28.6%	40.6%	25.0%	34.1%
	Moderately difficult	Count	16	16	23	6	61
		% within Row	26.2%	26.2%	37.7%	9.8%	100.0%
		% within Column	29.6%	38.1%	22.8%	30.0%	28.1%
	Very difficult	Count	11	7	22	8	48
		% within Row	22.9%	14.6%	45.8%	16.7%	100.0%
		% within Column	20.4%	16.7%	21.8%	40.0%	22.1%
How difficult is it to fill vacant mathematics teaching positions?	Not difficult	Count	33	14	28	1	76
		% within Row	43.4%	18.4%	36.8%	1.3%	100.0%
		% within Column	25.6%	11.9%	12.1%	3.2%	14.9%
	Somewhat difficult	Count	40	44	56	3	143
		% within Row	28.0%	30.8%	39.2%	2.1%	100.0%
		% within Column	31.0%	37.3%	24.2%	9.7%	28.1%
	Moderately difficult	Count	38	31	69	7	145
		% within Row	26.2%	21.4%	47.6%	4.8%	100.0%
		% within Column	29.5%	26.3%	29.9%	22.6%	28.5%
	Very difficult	Count	18	29	78	20	145
		% within Row	12.4%	20.0%	53.8%	13.8%	100.0%
		% within Column	14.0%	24.6%	33.8%	64.5%	28.5%

[a] Shaded cells indicate categories making a significant ($p < .001$) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

[14] $\chi^2(9) = 29.17$; $p < .001$; Cramer's V = .14

The difficulty of filling a vacant secondary mathematics position was significantly associated with MSGLC category of school[15]. Table 4.4 shows that this association was mainly attributable to significantly more respondents than expected from Metropolitan Areas indicating that it was not difficult to fill vacant mathematics positions, and significantly more respondents than expected from Remote Areas indicating that it was very difficult to fill vacant positions. A sizeable percentage of respondents from Provincial Areas also reported it to be very difficult to fill vacant mathematics positions.

Patterns in the data can be seen more clearly in Figures 4.2, 4.3 and 4.4. Figure 4.2 compares the proportions of primary respondents in different MSGLC categories reporting it is 'not difficult' to fill vacancies in their schools with those reporting it is 'very difficult'. Figure 4.3 shows the same levels of difficulty reported by secondary respondents (combined) in different locations. Both figures show the greater degree of difficulty in filling positions in Provincial and Remote Areas. However, it is clear that, overall, secondary respondents considered it more difficult to fill vacant positions in their subject areas than did primary respondents, and that the relative difficulty of filling secondary science, ICT and mathematics positions in non-metropolitan areas is more acute.

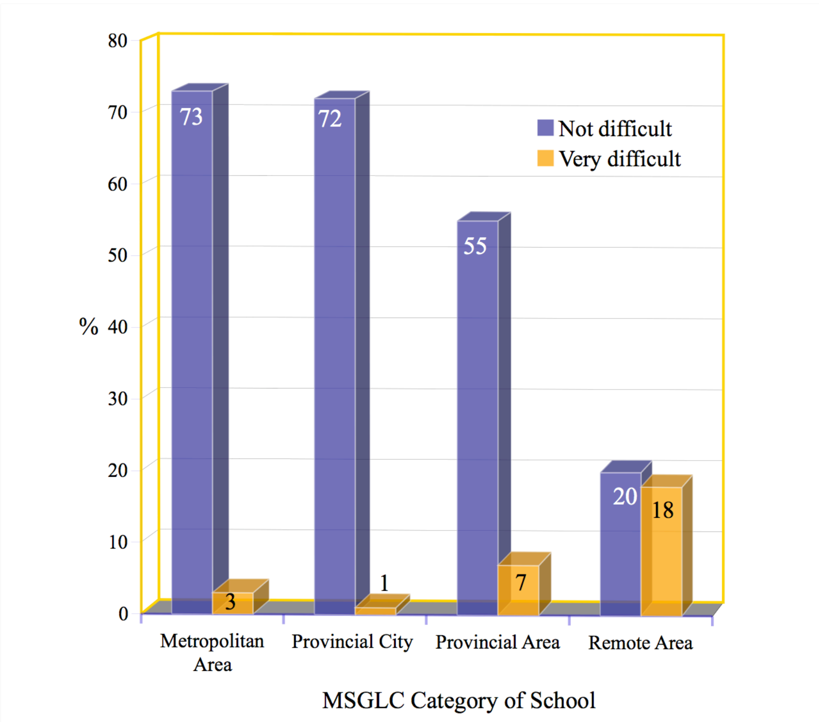

Figure 4.2 Reported difficulty of filling vacant primary teaching positions in different locations [only respondents reporting the situation as 'not difficult' and 'very difficult' are shown here] ***(N=1480)***

Figure 4.3 compares the proportions of science, ICT and mathematics teachers in different locations reporting that it is 'very difficult' to fill vacancies in their subject areas. While the overall tendency for greater difficulty in Provincial and Remote Area schools is apparent, the figure shows this patterns to be strongest among mathematics respondents.

15 $\chi^2(9) = 50.88$; $p < .001$; Cramer's V = .18

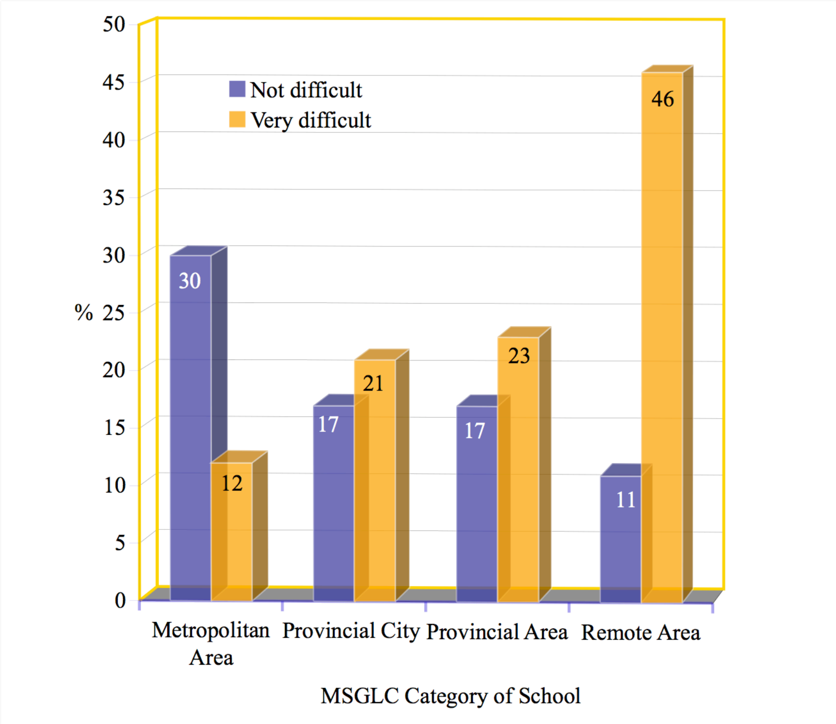

Figure 4.3 Reported difficulty of filling vacant secondary teaching positions in different locations [only respondents reporting the situation as 'not difficult' and 'very difficult' are shown here] ***(N (science, ICT and mathematics combined)=1261)***

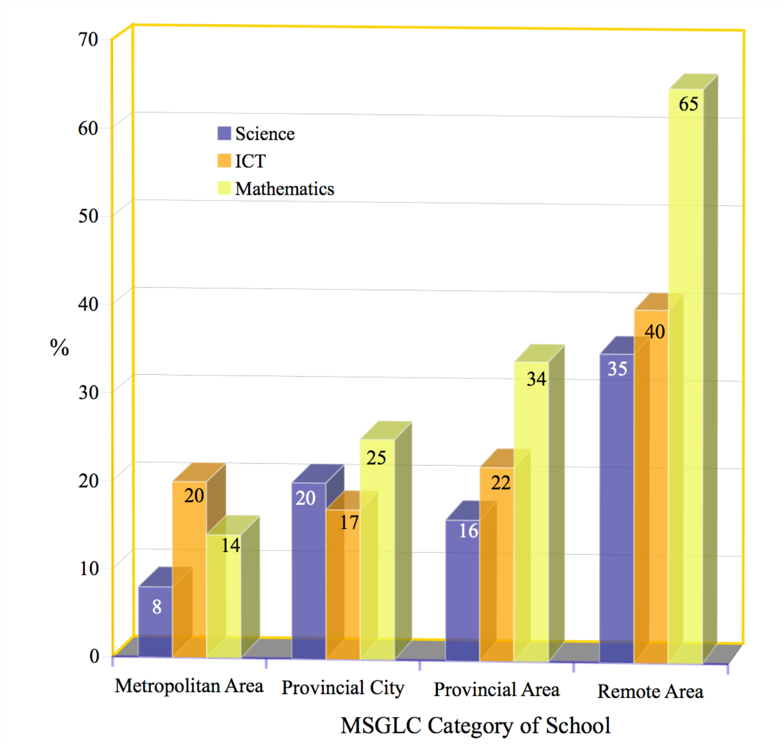

Figure 4.4 Percentages of science, ICT and mathematics respondents in different locations reporting that it is 'very difficult' to fill teaching vacancies in their subject areas (*N*=1261)

4.2.3 Summary of findings and implications

1. Overall, about 13% of respondents reported a high annual staff turnover (>20% p.a.) in their schools.
2. Reported rates varied significantly with location. Almost twice as many respondents from Provincial Area schools, and about six times as many from Remote Area schools, reported a high staff turnover rate (>20% p.a.) compared with their colleagues in Metropolitan and Provincial City schools.
3. The evidence indicates that it is significantly more difficult to fill vacant secondary science, ICT and mathematics positions than to fill vacant primary positions. Furthermore, the findings show that vacant primary and secondary positions are substantially more difficult to fill in Provincial and Remote Areas of Australia. Again, this problem appears more acute for secondary teachers.
4. The findings suggest that primary teachers in Provincial Areas are more than twice as likely, and those in Remote Areas up to six times more likely, than those in Metropolitan areas to be working at a school in which it is very difficult to fill vacant teaching positions.
5. Results indicate that secondary science, ICT and mathematics teachers in Provincial Areas are about twice as likely, and those in Remote Areas about four times as likely as those in Metropolitan Areas to be working at a school in which it is very difficult to fill vacant teaching positions in those subjects. Teachers in Provincial City schools are also more likely than those in Metropolitan Area schools to consider it very difficult to fill teacher vacancies in these subjects.
6. Among secondary teachers, the evidence suggests that it is more difficult to fill vacant mathematics positions in Provincial and Remote Areas, than to fill science and ICT vacancies in these locations.
7. The difficulty in filling vacant ICT positions appears to vary less with geographical location. However, ICT teachers seem to be in shorter supply in Metropolitan Areas than are science or mathematics teachers.

4.3 DESTINATION SCHOOLS OF CITY AND COUNTRY EDUCATED TEACHERS

Primary and secondary teachers were asked to indicate where they had lived while undertaking their high school education. Responses to this item served as a rough indicator of where they spent their formative years. Teachers were also asked where they had lived while completing their initial teacher education. Responses to these items were compared to the locations of their current schools. About 46% of respondents completed their high school studies in Regional (defined as having a population between 25 000-50 000[16]) or Rural Centres (defined as having a population fewer than 25 000) and 43% in Metropolitan Areas (population >100 000). However, the majority (about 62%) of respondents undertook their initial teacher education while in a Metropolitan Area; only about 23% did their initial teacher education in a Regional or Rural Centre. Female respondents tended to be somewhat more likely to have done their initial teacher education outside a Metropolitan Area.

Table 4.5 summarises the relationships between the site of respondents' high school education, the MSGLC category of their current school, and the Survey Respondent Type. The location where respondents did most of their high school study was significantly associated with the

[16] This simpler, population based, classification was necessary as teachers were being asked to identify their locations during these periods without reference to the CD ARIA Plus indices. The classification 'Regional Centre' corresponds to the MSGLC sub-category Provincial City 2.1.2, while 'Rural Centre' corresponds to Provincial Areas and Remote Areas (see Table 1.1).

location of their current school[17]. Here, significantly more respondents than expected who now teach in Provincial Cities did most of their high school study in either a Regional or a Rural Centre. Likewise, significantly more respondents than expected who now teach in Provincial Areas did most of their high school study in a Rural Centre. Significantly more respondents now teaching in Metropolitan Areas did their high school study in a Metropolitan Area.

Table 4.5 Breakdown of current MSGLC categories of respondents, by locations where they undertook high school study [a]

			Location of school in which you did most of your High School study				
			Metro. Area	**Provincial City**	**Regional centre**	**Rural centre**	*Overall*
MSGLC categories of current school	**Metropolitan Area**	**Count**	**388**	**46**	**45**	**86**	**565**
		% of Row	68.7%	8.1%	8.0%	15.2%	100.0%
		% of Column	31.2%	14.0%	12.8%	8.9%	19.5%
	Provincial City	**Count**	**202**	**130**	**125**	**187**	**644**
		% of Row	31.4%	20.2%	19.4%	29.0%	100.0%
		% of Column	16.3%	39.6%	35.6%	19.3%	22.3%
	Provincial Area	**Count**	**534**	**118**	**150**	**611**	**1413**
		% of Row	37.8%	8.4%	10.6%	43.2%	100.0%
		% of Column	43.0%	36.0%	42.7%	63.1%	48.9%
	Remote Area	**Count**	**119**	**34**	**31**	**85**	**269**
		% of Row	44.2%	12.6%	11.5%	31.6%	100.0%
		% of Column	9.6%	10.4%	8.8%	8.8%	9.3%
		Totals	**1243** (43%)	**328** (11%)	**351** (12%)	**969** (34%)	**2891**

[a] Shaded cells indicate categories making a significant ($p < .001$) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

Table 4.6 compares the MSGLC categories of respondents' current schools and the location where they lived while doing their initial teacher education. These variables were also significantly associated[18]. Here, significantly more respondents than expected now teaching in a Metropolitan Area lived in a Metropolitan Area while doing their initial teacher education. In addition, significantly more respondents than expected who now teach in a Provincial City also lived in a Provincial City while doing their initial teacher education.

Significantly more respondents than expected who now work in Provincial Areas lived in a Rural Centre while doing their initial teacher education and significantly fewer than expected lived in a Metropolitan Area while doing their initial teacher education. Conversely, significantly fewer respondents than expected who now work in a Metropolitan Area lived in a Provincial City, Regional Centre or Rural Centre while doing their initial teacher education. Again, Remote Area respondents did not contribute significantly to this relationship. Figure 4.5 shows that 73% of respondents who lived in rural centres when completing their teacher education are currently working in Provincial Area or Remote Area schools. Only 5% of respondents who lived in rural centres during their teacher education are now working in metropolitan schools.

[17] $\chi^2(9) = 316.31$; $p < .001$; Cramer's V = .19
[18] $\chi^2(9) = 170.51$; $p < .001$; Cramer's V = .14

Table 4.6 Breakdown of current MSGLC categories of respondents, by locations where they lived while completing their initial teacher education [a]

			Location of Area where you lived while doing initial teacher education				
			Metro. Area	**Provincial City**	**Regional centre**	**Rural centre**	*Overall*
MSGLC categories	**Metropolitan Area**	**Count**	**461**	**50**	**39**	**17**	**567**
		% of Row	81.3%	8.8%	6.9%	3.0%	100.0%
		% of Column	25.8%	11.0%	11.2%	5.5%	19.6%
	Provincial City	**Count**	**332**	**150**	**96**	**65**	**643**
		% of Row	51.6%	23.3%	14.9%	10.1%	100.0%
		% of Column	18.6%	33.0%	27.5%	21.1%	22.2%
	Provincial Area	**Count**	**807**	**215**	**186**	**208**	**1416**
		% of Row	57.0%	15.2%	13.1%	14.7%	100.0%
		% of Column	45.2%	47.4%	53.3%	67.5%	48.9%
	Remote Area	**Count**	**184**	**39**	**28**	**18**	**269**
		% of Row	68.4%	14.5%	10.4%	6.7%	100.0%
		% of Column	10.3%	8.6%	8.0%	5.8%	9.3%
		Total	**1784** (62%)	**454**(15%)	**349**(12%)	**308**(11%)	**2895**
Survey Respondent Type	**Secondary Science**	**Count**	**404**	**67**	**43**	**62**	**576**
		% of Row	70.1%	11.6%	7.5%	10.8%	100.0%
		% of Column	22.6%	14.8%	12.3%	20.1%	19.9%
	Secondary Maths	**Count**	**388**	**56**	**45**	**53**	**542**
		% of Row	71.6%	10.3%	8.3%	9.8%	100.0%
		% of Column	21.7%	12.3%	12.9%	17.2%	18.7%
	Secondary ICT	**Count**	**178**	**23**	**20**	**13**	**234**
		% of Row	76.1%	9.8%	8.5%	5.6%	100.0%
		% of Column	10.0%	5.1%	5.7%	4.2%	8.1%
	Primary	**Count**	**814**	**308**	**241**	**180**	**1543**
		% of Row	52.8%	20.0%	15.6%	11.7%	100.0%
		% of Column	45.6%	67.8%	69.1%	58.4%	53.3%

[a] Shaded cells indicate categories making a significant (p < .001) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

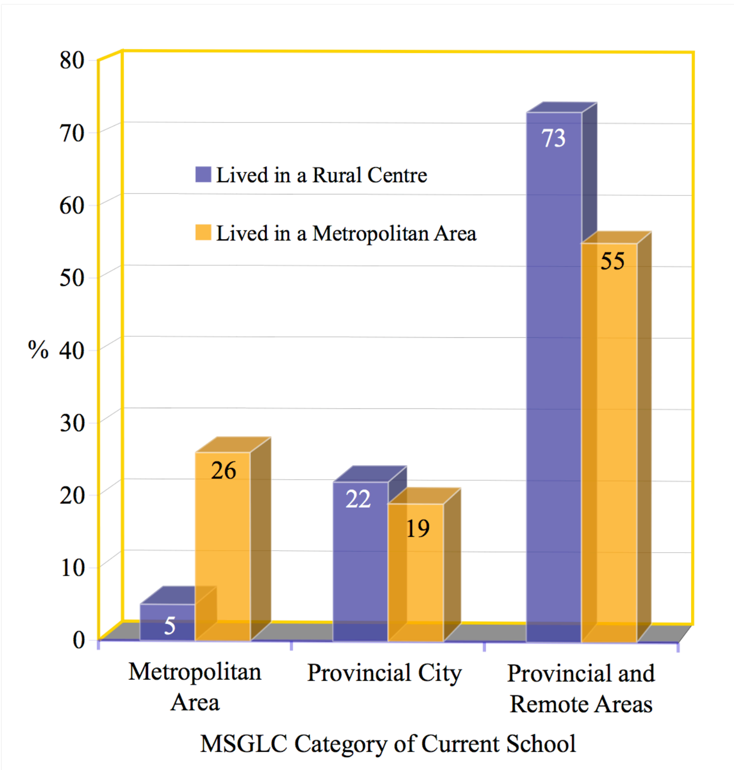

Figure 4.5 Current teaching locations of respondents who lived in either a Metropolitan Area or a Rural Centre when undertaking their initial teacher education *(N*=2895*)*

Respondent type and destination school

Respondent Type and location of area where respondents lived while doing their initial teacher education were also significantly associated[19]. Table 4.6 shows that significantly more secondary science, ICT and mathematics respondents than expected lived in a Metropolitan Centre while doing their initial teacher education. Significantly more primary respondents than expected lived in either a Provincial City or Regional Centre while doing their initial teacher education, though significantly fewer lived in Metropolitan Centres. Significantly fewer than expected secondary science respondents lived in Regional Centres and significantly fewer than expected secondary mathematics respondents lived in Provincial Cities.

School Type and destination school

The Type of School in which respondents were currently teaching was significantly associated[20] with the location where they lived while doing their initial teacher education. Table 4.6 shows that significantly more secondary school respondents than expected lived in a Metropolitan Centre while doing their initial teacher education and significantly more primary school respondents than expected lived in either a Provincial City or Provincial Area while doing their initial teacher education. Significantly fewer secondary school respondents than expected lived in either a Provincial City or Regional Centre while doing their initial teacher education. Significantly fewer primary school respondents than expected lived in a Metropolitan Centre while doing their initial teacher education and significantly fewer combined school respondents than expected lived in a Provincial City while doing their initial teacher education.

Summary of findings and implications

1. The findings revealed a tendency for teachers who attended high school in a rural or regional centre to move to a larger centre when undertaking their teacher training. This is not surprising, as nearly all universities and teachers' colleges are, or were, located in large centres, with most in the capital cities. In some states there are no such institutions outside Metropolitan Areas.
2. The findings exposed a tendency for teachers to gain employment in locations similar to that in which they lived while undertaking pre-service education. The study found that 73% of respondents who lived in rural centres when completing their teacher education are currently working in Provincial Area or Remote Area schools. Only 5% of respondents who lived in rural centres during their teacher education are now working in Metropolitan schools.
3. On the other hand, the findings did not provide any evidence that teachers who lived in Rural Centres while attending high school or completing teacher education gain employment in Remote Areas. Rather, there appears to be a pattern of drift to larger centres.
4. The findings revealed that a greater-than-expected proportion (over 70%) of science, ICT and mathematics teachers lived in metropolitan centres during their teacher education. In view of finding 2, above, it is likely, therefore, that beginning teachers in these subject areas will tend to seek employment in Metropolitan rather than Provincial or Remote Area schools.

[19] $\chi^2(9) = 124.81$; $p < .001$; Cramer's V = .12

[20] $\chi^2(6) = 117.90$; $p < .001$; Cramer's V = .14

4.4 MOTIVATIONS FOR TEACHING IN RURAL AND REGIONAL SCHOOLS

The four teacher surveys offered a range of items suggesting possible motivating factors that may have influenced decisions about their choice of school. Teachers were asked to rate each items on a scale according to its influence on their decisions to:

- initially teach in a rural or regional school[21]
- continue to teach in a rural or regional school
- leave a rural or regional school for a metropolitan school.

In addition, those respondents who had not taught in a rural or regional school were asked about possible factors that might motivate them to take up a position in such a school in the future. To further explore rural/regional teaching motivation responses, a number of MANCOVAs were conducted to compare the degree of motivator influence on decision making, as perceived by various categories of respondents. One set of MANCOVA analyses was conducted for each of the four decisions. For each set of motivating factors, six MANCOVA analyses were conducted, each focusing on a single independent variable or comparison variable: Sex of Respondent; Age of Respondent; School System; MSGLC Category of School; Survey Respondent Type; and Type of School.

Teachers were also given the opportunity to expand on their responses by adding qualitative comments about their decisions. Where appropriate, representative comments are included to illustrate findings.

4.4.1 Initial decision to teach in a rural or regional school.

Table 4.7 summarises, at the level of the entire combined teacher sample, the average responses to the items dealing with how influential different factors were in respondents' initial decision to teach in a rural or regional school. The most influential motivating factors overall were job availability and educational authority placement. The least influential factors were the availability of a rural or remote allowance, rent subsidy (though many of the respondents would not have qualified for these incentives), and affordable housing and promotion opportunities.

Table 4.7 Overall average ratings, standard deviations and valid N for the initial decision items (items are listed in descending order of mean rating)

How influential were the following on your initial decision to teach in a rural or regional school?	Mean	s.d.	Valid N
Job availability	**2.41**	1.23	2388
Education authority placement	**2.26**	1.30	2416
Previously lived in the same or similar location	**1.99**	1.17	2408
Lifestyle change	**1.84**	1.07	2395
Family connections in the location	**1.78**	1.15	2410
Spouse's/Partner's employment situation	**1.70**	1.15	2402
Bond/contract with educational provider	**1.61**	1.10	2381
Promotion	**1.43**	.89	2372
Affordable housing	**1.38**	.75	2390
Rent subsidy	**1.21**	.59	2392
Rural or remote area allowance	**1.14**	.48	2389

[21] As it was unlikely that teachers would know the MSGLC categories of their past or present school locations, an approximate definition for 'rural and regional' based on local population <50 000 was provided as a guide.

The contexts of respondents' motivation were illustrated by their additional comments, of which the following were typical:

> I was a bonded student. That is, I received free education and in exchange agreed to teach in any location. Bring it back! (Science teacher, Provincial Area, SA)
>
> I was imported from the U.K. in 1975, and went where I was sent. (ICT teacher, Provincial City, NSW)
>
> It was a compulsory requirement from the department for all teachers to have country teaching experiences. (Mathematics teacher, Metropolitan Area, SA)

A principal components analysis of the initial decision items (Appendix 4.1) produced three substantive components: Financial and Advancement Incentives, Family Links, Job/Career Requirements. Scores on these three components were analysed using a series of MANCOVAs in order to make specific group comparisons. Table 4.8 presents the mean ratings and their associated standard errors on the three components across the categories of these four comparison variables: Sex, Age, School System, and Survey Respondent Type.

Table 4.8 Mean ratings on teacher motivation components regarding respondent's initial decision to teach in a rural or regional school, broken down by Sex, Age of Respondent and School System [ratings on 1 (Not Influential) to 4 (Extremely Influential) scale] [a]

			Initial Decision Components			
			Financial & advancement Incentives	Family links	Job/Career requirements	Valid N
Sex of respondent	Male	Mean	1.37	1.60	2.31	
		s.e.(Mean)	.02	.03	.02	966
	Female	Mean	1.24	1.98	2.40	
		s.e.(Mean)	.01	.02	.02	1375
Age of respondent	≤ 30 years	Mean	1.38	1.85	2.32	
		s.e.(Mean)	.02	.04	.03	412
	31 - 40 years	Mean	1.31	1.82	2.29	
		s.e.(Mean)	.02	.04	.03	491
	41 - 50 years	Mean	1.24	1.89	2.38	
		s.e.(Mean)	.02	.03	.03	762
	> 50 years	Mean	1.27	1.73	2.42	
		s.e.(Mean)	.02	.03	.03	669
School System	Government	Mean	1.30	1.78	2.41	
		s.e.(Mean)	.01	.02	.02	1691
	Catholic Systemic	Mean	1.25	1.93	2.25	
		s.e.(Mean)	.02	.04	.04	392
	Independent	Mean	1.26	1.91	2.23	
		s.e.(Mean)	.03	.05	.04	258
Survey Respondent Type	Secondary Science	Mean	1.33	1.79	2.27	
		s.e.(Mean)	.02	.04	.04	431
	Secondary Mathematics	Mean	1.27	1.69	2.34	
		s.e.(Mean)	.03	.04	.04	423
	Secondary ICT	Mean	1.33	1.72	2.37	
		s.e.(Mean)	.04	.07	.05	182
	Primary	Mean	1.28	1.89	2.40	
		s.e.(Mean)	.01	.03	.02	1305

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with sex

The multivariate test for Sex of Respondent differences was significant[22]. Follow-up tests revealed that the primary reasons for this significant multivariate difference were significant univariate differences on the Financial and Advancement Incentives and Family Links components, and a suggestive difference on the Job/Career Requirements component. Male respondents rated the Financial and Advancement Incentives component as significantly more influential on their initial decision than female respondents, whereas female respondents rated the Family Links as significantly more influential and Job/Career Requirements as suggestively more influential than male respondents. This pattern was consistent with teachers' comments:

> I have taught in rural areas all my life. Most positions have been taken up due to proximity to my husband's work. (Primary teacher, Provincial Area, Vic)
>
> I married a farmer and thus chose to apply for this school. (Mathematics teacher, Provincial Area, WA)

Figure 4.6 displays a profile plot of the original initial decision item means (ordered by component – labelled across the top of the graph) by Sex of Respondent[23]. Figure 4.6 shows that the chief reason that Financial and Advancement Incentives differed was because male respondents felt that promotion was a more influential motivating factor. Within the Family Links component, male respondents rated all items, but especially spouse's/partner's employment situation, as substantially less influential on their initial decision compared to their female colleagues. Lifestyle change was more influential for male respondents and job availability was more influential for female respondents.

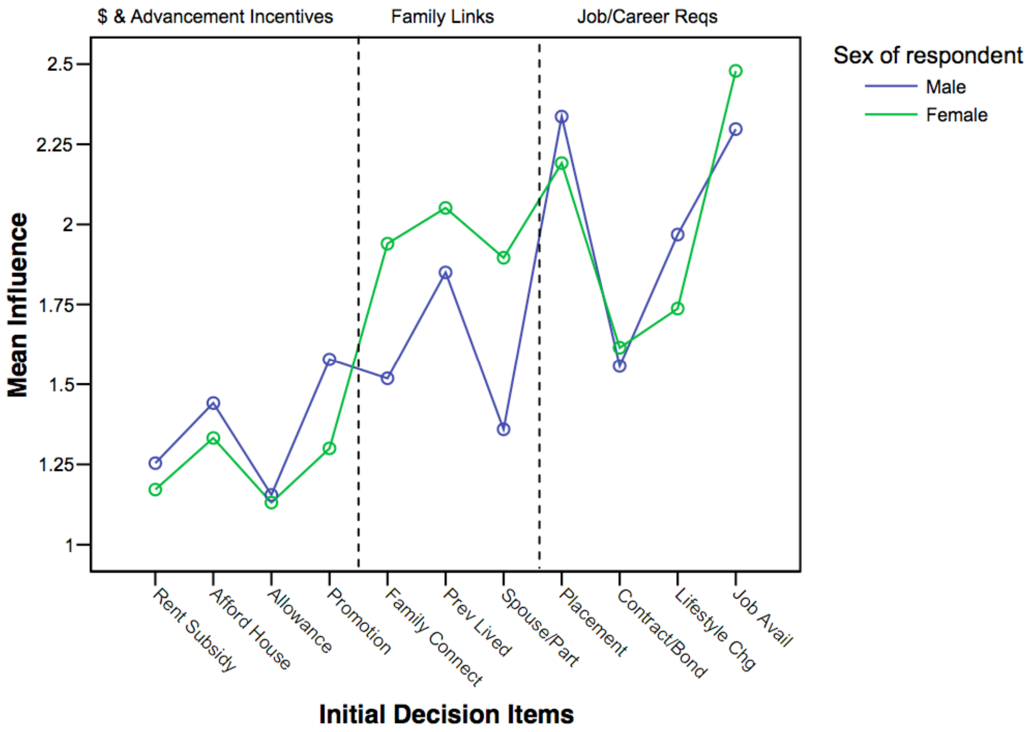

Figure 4.6 Profile plot of means for the eleven initial decision items compared, by Sex of Respondent (Table 4.7 for item names in full)

[22] Wilks' lambda = .933, $F(3, 23347) = 56.08$, $p < .001$, partial $\eta^2 = .07$

[23] In this figure, the unreversed lifestyle change item has been used so that it is clear which group found the item more influential.

Variation with age of respondent

The multivariate test for Age of Respondent differences across the three initial decision components was significant[24]. Follow-up tests revealed that the main reasons for this significant multivariate difference were a significant univariate difference on the Financial and Advancement Incentives component and suggestive differences on the remaining two components. The youngest two cohorts of respondents rated the Financial and Advancement Incentives component as substantially more influential on their initial decision than their older colleagues. Furthermore, Family Links were least influential on the oldest cohort of respondents but Job/Career Requirements became progressively more influential as age increased. Figure 4.7 shows the profile plot of the original initial decision item means by Age of Respondent. The youngest respondents clearly felt that the financial incentives (rent subsidy, allowance and affordable housing) in the component were more influential on their initial decision than it was for their older colleagues. Having previously lived in the same or similar area was also most influential for the youngest cohort. Having a contract or bond with an educational provider was substantially more influential for members of the oldest cohort of respondents; conversely, job availability was least influential for this cohort.

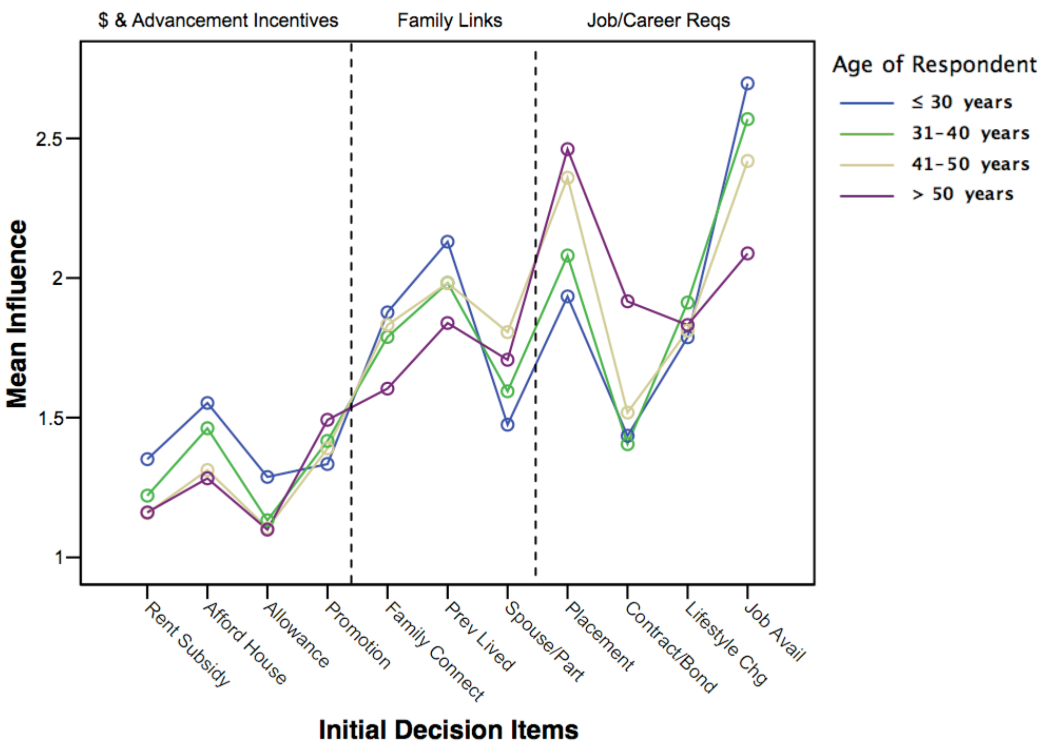

Figure 4.7 Profile plot of means for the eleven initial decision items, compared by Age of Respondent (Table 4.7 for item names in full)

Variation with school system

The multivariate test for school system differences across the three initial decision components was also significant[25]. Follow-up tests revealed that the primary reasons for this significant multivariate difference were a significant univariate difference on the Job/Career Requirements component and a suggestive difference on the Family Links component. Respondents from Government schools rated the Job/Career Requirements component as substantially more

[24] Wilks' lambda = .981, $F(9, 5658.59) = 5.00$, $p < .001$, partial $\eta^2 = .01$
[25] Wilks' lambda = .981, $F(6, 4666) = 7.35$, $p < .001$, partial $\eta^2 = .01$

influential on their initial decision than their colleagues from the other school systems. Respondents from Catholic Systemic and Independent schools rated Family Links as more influential than did colleagues from Government schools. Figure 4.8 shows the profile plot of the original initial decision item means by School System. Respondents from Government schools rated educational authority placement as substantially more influential on their initial decision than it was for respondents from either Catholic Systemic or Independent schools. Conversely, respondents from Catholic Systemic and Independent schools rated both having previously lived in the same or similar area and having family connections in the location as more influential on their initial decision than did colleagues from Government schools.

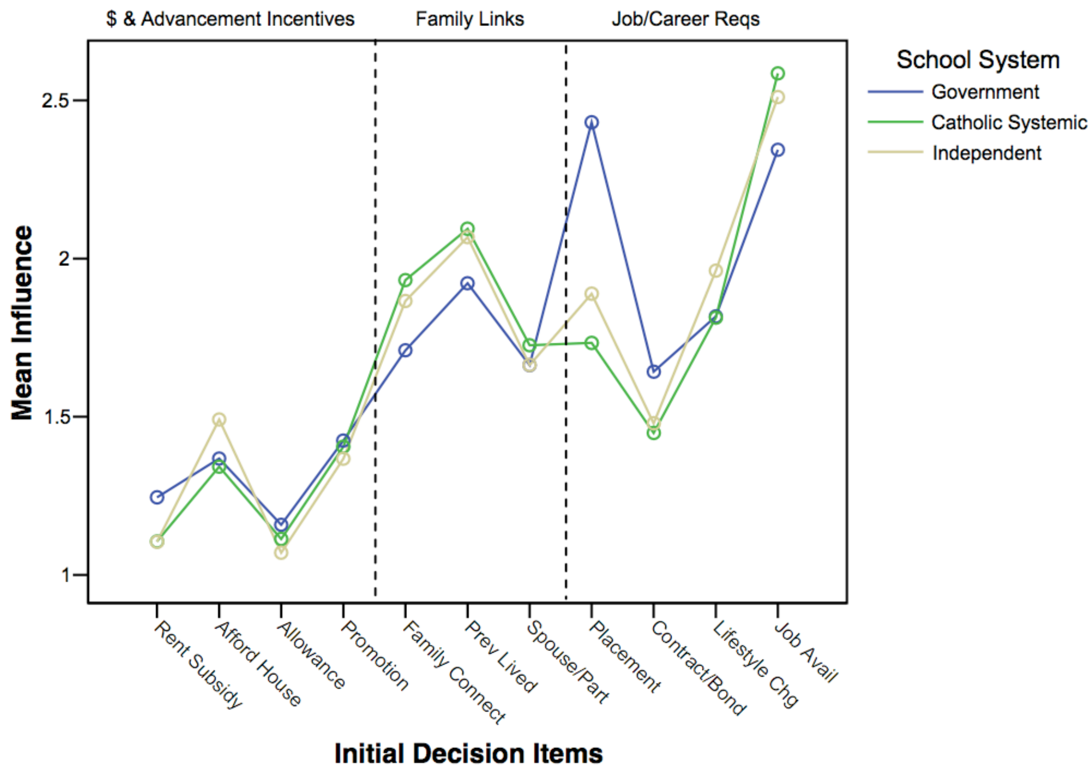

Figure 4.8 Profile plot of means for the eleven initial decision items, compared by School system (Table 4.7 for item names in full)

4.4.2 Decisions to continue teaching in a rural or regional school

Table 4.9 summarises, at the level of the entire combined sample, the average responses to the items dealing with how influential different factors were in a respondent's decision to continue teaching in a rural or regional school.

The most influential motivating factors overall were enjoyment of the lifestyle and the community spirit. For example:

> I really wanted to teach and live in a small rural community. This was not only influenced by lifestyle and community, but also by the students in rural schools. (Mathematics teacher, Provincial Area, Vic.)

> Best decision I ever made to leave the inertia and stagnation of a large city school and come to the flexibility, vitality and innovation in a smaller centre. (Science teacher, Provincial Area, Qld)

Family links and partner's employment were also very influential. For example:

> I have continued to teach in Western region due to my family commitments and enjoyment of the lifestyle. (Primary teacher, Provincial Area, NSW)
>
> My wife and I both enjoy teaching in a regional centre. We believe it is a better place to live and work than a large city or metropolitan region. It is also a safer place to raise a family, in our opinion. (Mathematics teacher, Provincial Area, WA)

Smaller class sizes was also seen as being an attractive characteristic of many rural schools:

> I wanted my first position to be in a small school with small class sizes (Mathematics teacher, Provincial City, Qld)

Least influential were the availability of a rural or remote allowance, rent subsidy (though again, these would not be available to all teachers), and the opportunity to work with Indigenous students.

Table 4.9 Overall average ratings, standard deviations and valid N for the continuance decision items (items are listed in descending order of mean rating)

How influential were the following on your decision to continue teaching in a rural or regional school?	Mean	s.d.	Valid N
Enjoyment of lifestyle	**2.87**	1.04	2253
Community spirit	**2.43**	1.00	2234
Spouse's/partner's employment situation	**2.16**	1.25	2245
Family connections in the location	**2.11**	1.24	2239
Smaller class sizes	**1.84**	.97	2232
Opportunity for promotion	**1.71**	.93	2239
Expense of moving to the city	**1.66**	.99	2225
Affordable housing	**1.61**	.91	2232
Opportunity to work with Indigenous students	**1.29**	.65	2232
Rent subsidy	**1.26**	.67	2222
Rural or remote area allowance	**1.24**	.63	2222

A principal components analysis of the continuance decision items (Appendix 4.2) yielded four substantive components: Living Costs, Work Context, Lifestyle, and Family Situation. Scores on these four components were analysed using a series of six MANCOVAs in order to make specific group comparisons. Table 4.10 presents the mean ratings and their associated standard errors on these four components across the categories of two of these comparison variables, Sex and Age of Respondent. The other MANCOVAs revealed no meaningful or significant patterns.

Table 4.10 Mean ratings on teacher motivation components regarding respondent's decision to continue teaching in a rural or regional school, broken down by Sex and Age of Respondent [ratings on 1 (Not Influential) to 4 (Extremely Influential) scale] [a]

			Continuance Decision Components				
			Living costs	Work context	Lifestyle	Family situation	Valid N
Sex of respondent	Male	Mean	1.49	1.64	2.71	1.81	
		s.e.(Mean)	.02	.02	.03	.03	902
	Female	Mean	1.41	1.59	2.59	2.35	
		s.e.(Mean)	.02	.02	.02	.03	1278
Age of respondent	≤ 30 years	Mean	1.64	1.85	2.53	1.98	
		s.e.(Mean)	.03	.03	.04	.05	398
	31 - 40 years	Mean	1.48	1.69	2.71	2.15	
		s.e.(Mean)	.03	.03	.04	.05	458
	41 - 50 years	Mean	1.37	1.51	2.66	2.24	
		s.e.(Mean)	.02	.02	.03	.04	709
	> 50 years	Mean	1.37	1.51	2.64	2.07	
		s.e.(Mean)	.02	.02	.04	.04	608

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences (p < .001) on a component; light blue shading indicates suggestive differences (p < .01) on a component.

Variation with sex

The multivariate test for Sex of Respondent differences across the four continuance decision components was significant[26]. Follow-up tests revealed that the primary reasons for this multivariate difference were a significant univariate difference on the Family Situation component and suggestive differences on the Living Costs and Lifestyle components. Female respondents assessed the Family Situation component as significantly more influential on their decision to continue teaching in a rural or regional school than it was for male respondents. However, both the Living Costs and Lifestyle components were somewhat more influential on the continuance decision for male respondents. Figure 4.9 displays the profile plot of original continuance decision item means (ordered by component and labelled across the top of the graph) by Sex of Respondent. The figure makes it clear that the reason for differences on the Family Situation component was that female respondents rated both family connections and spouse's/partner's employment situation as much more influential compared with male responses. On the other hand, male respondents rated affordable housing, the expense of moving to the city and lifestyle as more influential on their decision to continue teaching in a rural or regional school.

Variation with age of respondent

The multivariate test for Age of Respondent differences was also significant[27]. Follow-up investigation revealed that the primary reasons for this significant multivariate difference were significant univariate differences on the Living Costs, Work Context and Family Situation components. The youngest cohort of respondents rated the Living Costs and Work Contexts components as being substantially more influential on their continuance decision than they were for their older colleagues. Conversely, the Family Situation component was substantially less influential for both the youngest and the oldest cohorts. Figure 4.10 shows the profile plot of original continuance decision item means by Age of Respondent. Within the Living Costs component, respondents less than 31 years of age reported a substantially greater degree of influence attached to affordable housing, rent subsidy and the rural or remote allowance than did their older colleagues.

[26] Wilks' lambda = .917, $F(4, 2172) = 49.15$, $p < .001$, partial $\eta^2 = .08$
[27] Wilks' lambda = .921, $F(12, 5723.052) = 15.16$, $p < .001$, partial $\eta^2 = .03$

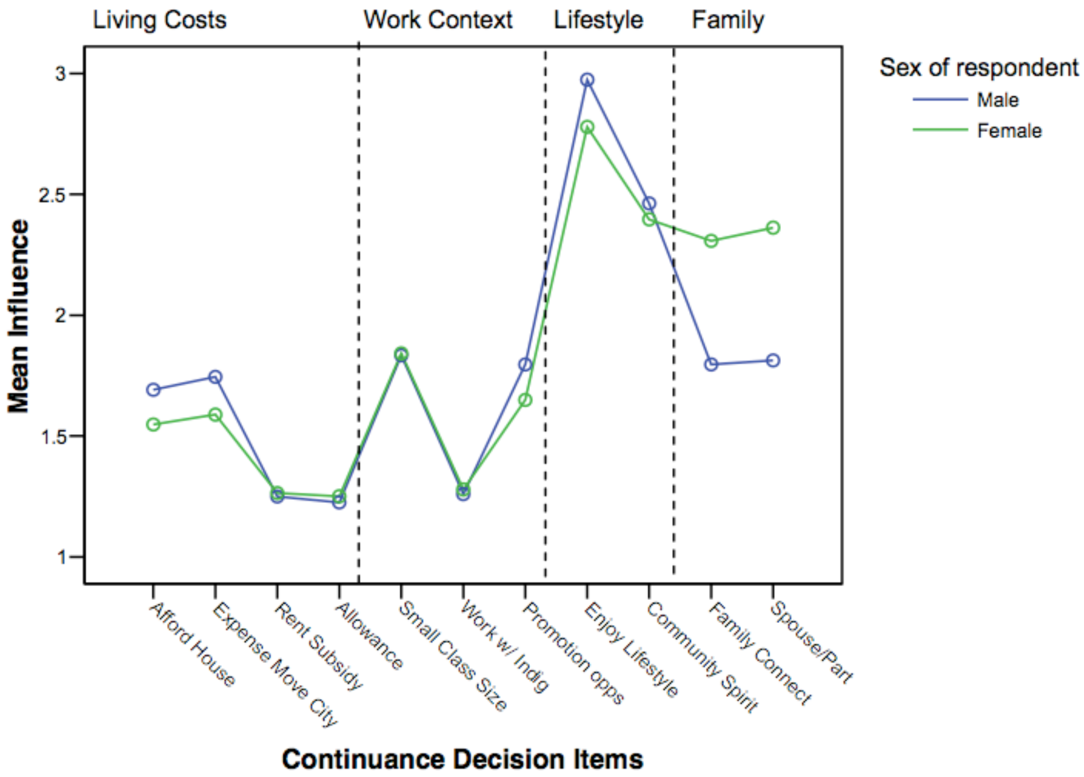

Figure 4.9 Profile plot of means for the eleven continuance decision items, compared by Sex of Respondent (Table 4.9 for item names in full)

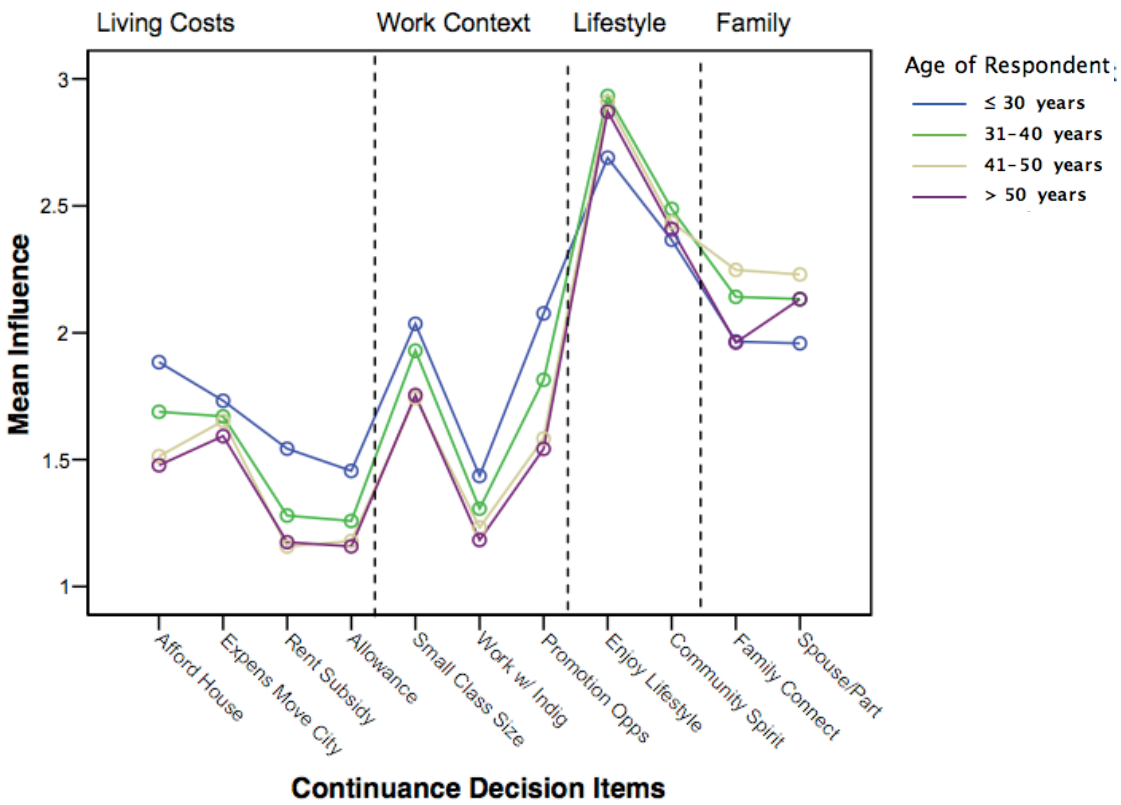

Figure 4.10 Profile plot of means for the eleven continuance decision items, compared by Age of Respondent (Table 4.7 for item names in full)

Promotion opportunities were especially influential for members of the youngest cohort as well. Both of the items within the Family Situation component were substantially more influential for respondents in the middle two age cohorts. Not surprisingly, the spouse's/partner's employment situation was least influential for the youngest cohort (many of whom may not have had a spouse or partner).

4.4.3 Decision to leave a rural or regional school for a metropolitan school

Teachers who had at one time left a rural or regional school to work in a metropolitan school were asked to rate a range of items in terms of their influence on that decision. At least 682 (23%) of respondents made one or more ratings. Table 4.11 summarises, at the level of the entire combined sample, the average responses to the items.

Table 4.11 Overall average ratings, standard deviations and valid N for the 'decision to leave' items (items are listed in descending order of mean rating)

If you left a rural or regional school for a metropolitan school, how influential were the following?	Mean	s.d.	Valid N
Spouse's/partner's employment situation	**2.16**	1.27	678
Educational opportunities for your own children	**1.97**	1.18	682
Sense of social isolation	**1.88**	1.05	669
Sense of professional isolation	**1.75**	.94	679
Limited essential services	**1.72**	.96	655
Education authority placement	**1.71**	1.06	670
Reduced cost of travelling	**1.67**	.93	670
Opportunity for promotion	**1.65**	.95	687
Problems within the school	**1.51**	.90	668
Problems in the community	**1.43**	.83	666

The most influential motivating factors for the majority of those who left were spouse's/partner's employment situation, educational opportunities for their own children and a sense of social isolation. For example:

> My spouse lived in the city whilst I was in the country on a two-year posting. (Primary Teacher, Metropolitan Area, Qld)
>
> I felt it was time to expose my children to city life. They had spent most of their lives in country towns. (Mathematics teacher, Metropolitan Area, NSW)

Least influential, overall, were problems within the school or community.

A principal components analysis of the decision to leave items (Appendix 4.3) produced three substantive components: Work and Professional Context issues, Problems and Family Situation. Scores on these three components were analysed using a series of MANCOVAs in order to make specific group comparisons. Table 4.12 shows the mean ratings and their associated standard errors on the three components across three categories of comparison variables. MANCOVAs for Sex of Respondent, School System and Survey respondent Type revealed no significant differences. The three MANCOVAs in Table 4.12 revealed only suggestive differences. Obviously, with the reduced number of respondents for these analyses, significant differences were much harder to detect.

Table 4.12 Mean ratings on teacher motivation components regarding respondent's decision to move from a rural/regional school to a metropolitan school, broken down by respondents' sex and age, school system and MSGLC categories [ratings on 1 (Not Influential) to 4 (Extremely Influential) scale] [a]

			Decision to Leave Component			
			Work & professional context	Problems	Family situation	Valid N
Age of respondent	≤ 30 years	Mean	1.87	1.75	1.94	
		s.e.(Mean)	.07	.10	.12	69
	31 - 40 years	Mean	1.75	1.58	1.98	
		s.e.(Mean)	.06	.07	.09	119
	41 - 50 years	Mean	1.69	1.43	2.15	
		s.e.(Mean)	.04	.05	.06	232
	> 50 years	Mean	1.72	1.37	2.01	
		s.e.(Mean)	.04	.05	.06	225
Type of School	Primary	Mean	1.68	1.34	2.13	
		s.e.(Mean)	.04	.05	.06	306
	Secondary	Mean	1.82	1.60	1.96	
		s.e.(Mean)	.05	.06	.07	235
	Combined	Mean	1.69	1.58	2.00	
		s.e.(Mean)	.06	.08	.09	105

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences (p < .001) on a component; light blue shading indicates suggestive differences (p < .01) on a component.

Variation with age of respondent

The multivariate test for Age of Respondent differences across the three 'decision to leave' components was suggestive[28]. Follow-up tests revealed that the primary reason for this suggestive multivariate difference was a suggestive univariate difference on the Problems component. Respondents less than 30 years of age rated the Problems component as substantially more influential on their decision to leave than it was for their older colleagues. Figure 4.11 presents the profile plot of the original decision to leave item means by Age of Respondent. The figure shows that respondents less than 30 years old clearly indicated a greater degree of influence attached to problems in school as being a reason for leaving a rural or regional school (the level of the mean placed this outcome close to but still below the somewhat influential scale point).

Variation with type of school

The multivariate test for Type of School differences across the three 'decision to leave' components was suggestive[29]. Follow-up tests revealed that the primary reason for this suggestive multivariate difference was a suggestive univariate difference on the Problems component. Respondents from primary schools rated the Problems component as substantially less influential on their decision to leave than it was for their colleagues from secondary or combined schools. Figure 4.12 presents the profile plot of the original 'decision to leave' item means by Type of School. The figure shows that respondents from primary schools clearly indicated a substantially lesser degree of influence attached to problems in school and problems in the community as being reasons for leaving a rural or regional school.

[28] Wilks' lambda = .963, $F(9, 1548.007) = 2.67$, $p = .005$, partial $\eta^2 = .01$
[29] Wilks' lambda = .970, $F(6, 1276) = 3.23$, $p = .004$, partial $\eta^2 = .01$

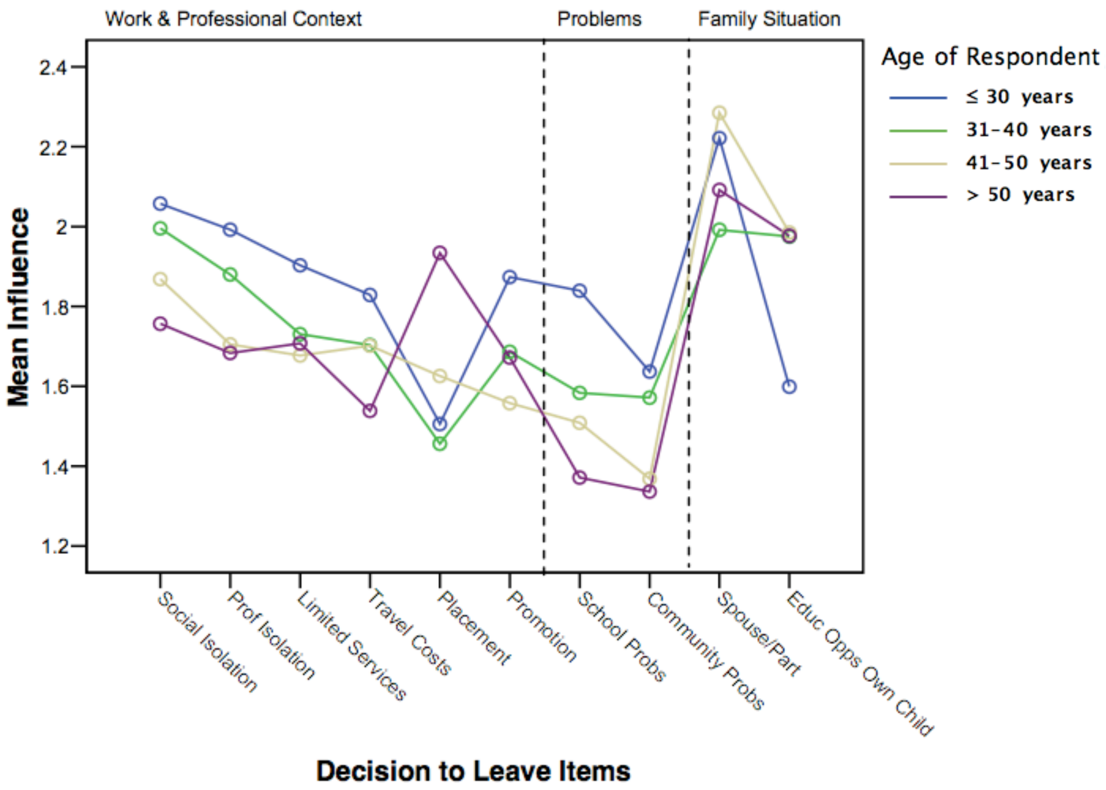

Figure 4.11 Profile plot of means for the ten decisions to move to a metropolitan school items, compared by Age of Respondent (Table 4.11 for item names in full)

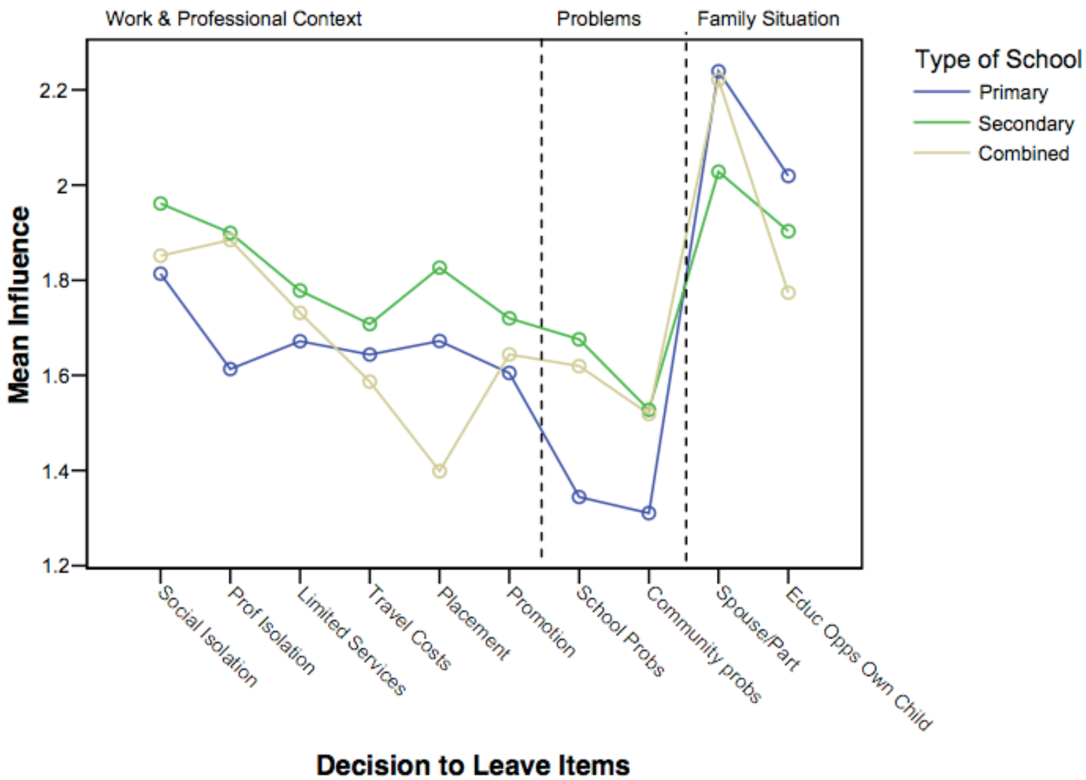

Figure 4.12 Profile plot of means for the ten decisions to move to a metropolitan school items, compared by Type of School (Table 4.11 for item names in full)

4.4.4 Motivations for moving from a metropolitan school to a rural or regional school

Respondents who had only ever taught in metropolitan schools were asked to rate a range of items on their motivational value for taking up a position in a rural or regional school. Table 4.13 summarises, at the level of the entire combined sample, the average responses to the items dealing with how influential different factors would be in motivating respondents, who had not taught in a rural or regional school at some point in their careers, to take up a position in a rural or regional school. At least 603 (about 21%) respondents made one or more ratings indicating what might motivate them to take up a position in a rural or regional school. The most influential motivating factors overall were smaller class sizes, preference for future transfers, affordable housing and rent subsidy. The results with affordable housing and rent subsidy provide an interesting contrast with the initial decision results where these factors were among the least important overall. This perhaps reflects the changing economic times and living costs associated with working in metropolitan areas. Least influential potential motivating factors were opportunity to work with Indigenous students, other factors (listed by a small minority of respondents and to be qualitatively analysed elsewhere) and smaller school staff.

Table 4.13 Overall average ratings, standard deviations and valid N for the motivation to take up a rural or regional teaching position items (items are listed in descending order of mean rating)

How influential would the following be in motivating you to take up a position in a rural or regional school?	Mean	s.d.	Valid N
Smaller class sizes	**2.10**	1.00	603
Preference for future transfers	**2.09**	1.11	590
Affordable housing	**2.05**	1.02	598
Rent subsidy	**2.05**	1.03	597
Travel subsidy	**2.01**	1.03	593
Rural or remote area allowance	**1.98**	.98	596
More holidays	**1.93**	.98	595
Improved opportunities for promotion	**1.89**	.95	600
Smaller school staff	**1.63**	.83	595
Opportunity to work with Indigenous students	**1.42**	.71	596

A principal components analysis of the motivation to take up items (Appendix 4.4) revealed two substantive components: Financial and Advancement Incentives and Work Conditions. Scores on these two components were analysed using six MANCOVAs in order to make comparisons across Sex, Age of Respondent, MSGLC Category, School System, Respondent Type and Type of School. Table 4.14 shows the mean ratings and associated standard errors on this component across the Age of Respondent category, which was the only one to exhibit significant differences.

Variation with age of respondent

Only the multivariate test for Age of Respondent differences across these two components showed any differences and these were suggestive at best[30]. Follow-up tests revealed that the primary reason for this suggestive multivariate difference was a suggestive univariate difference on the Financial and Advancement Incentives component. Respondents less than 30 years of age rated the Financial and Advancement Incentives component as substantially more influential as a potential motivator for taking up a rural or regional position than it was for their older colleagues. Figure 4.13 presents the profile plot of the original motivation item means by Age of Respondent. The figure shows that respondents less than 30 years old clearly indicated a greater degree of influence attached to all of the items within the Financial and Advancement component, but most especially for rent subsidy and preference for future transfers (the level of

[30] Wilks' lambda = .969, $F(6, 1172) = 3.08$, p = .005, partial $\eta^2 = .02$

the means placed these outcome for all items except promotion opportunity above the 'somewhat influential' scale point).

Table 4.14 Mean ratings on teacher motivation components regarding what would motivate respondents to take up a teaching position in a rural or regional school, broken down by respondents' age [ratings on 1 (Not Influential) to 4 (Extremely Influential) scale] [a]

			Motivate to Take Up Position Components		
			Financial & advancement incentives	Work conditions	Valid N
Age of respondent	≤ 30 years	Mean	2.24	1.83	
		s.e.(Mean)	.07	.06	131
	31 - 40 years	Mean	1.95	1.75	
		s.e.(Mean)	.08	.06	122
	41 - 50 years	Mean	1.97	1.68	
		s.e.(Mean)	.06	.05	184
	> 50 years	Mean	1.85	1.66	
		s.e.(Mean)	.07	.05	157

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences (p < .001) on a component; light blue shading indicates suggestive differences (p < .01) on a component.

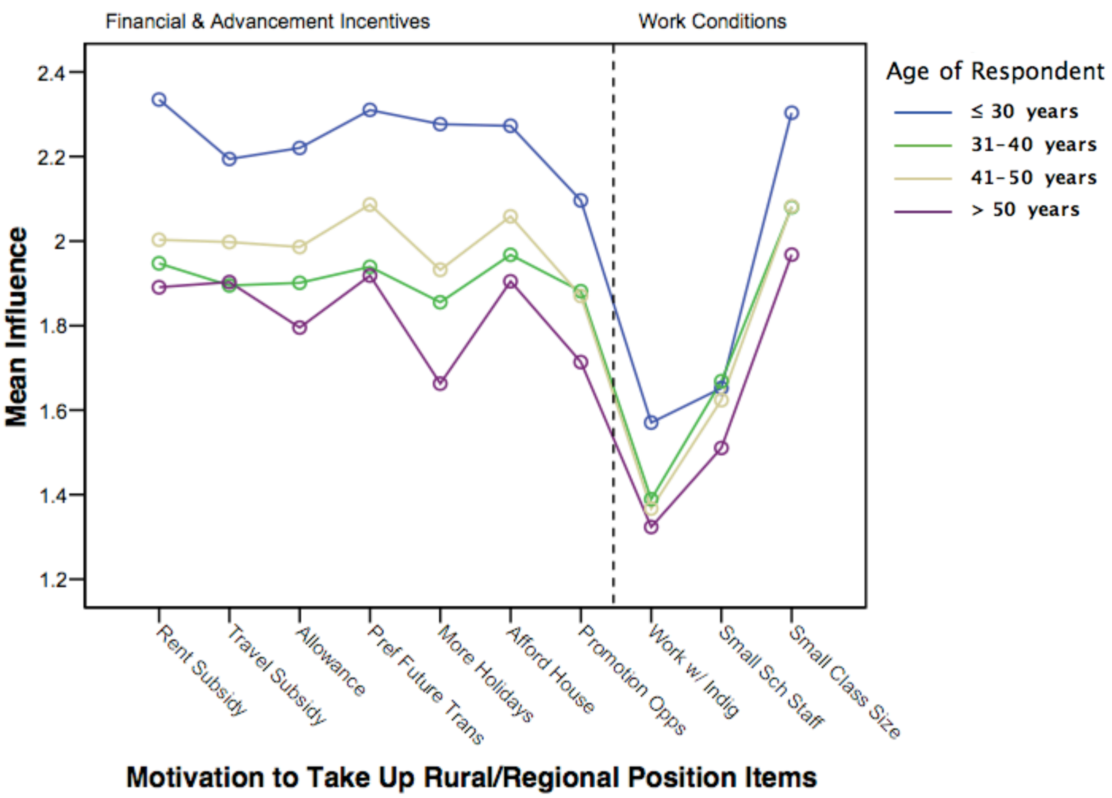

Figure 4.13 Profile plot of means for the ten motivation to take up a rural or regional position items, compared by Age of respondent (Table 4.13 for item names in full)

4.4.5 Summary of findings and implications

Motivations for moving to rural or regional schools

1. Overall, teachers initially taking up positions in these schools appear to have been motivated mostly by job availability, educational authority placement, and having previously lived in the same or a similar location.
2. The influence of motivational factors seems to vary with the sex of the teacher. Male respondents were generally more motivated by financial and advancement considerations whereas females placed greater priority on family factors, such as spouse employment or location of other family members.
3. There is evidence that the influence of motivational factors has changed over time. Those who started their teaching careers 30 or so years ago were often allocated to rural or regional schools by education authorities, either through placement or scholarship bonds. However, these systems were not so influential (or perhaps extant) among younger teachers who were more motivated by job availability and whether they had previously lived in the same or a similar location. Younger teachers were also more motivated by financial inducements such as rent subsidies, affordable housing and allowances, while older teachers were more influenced by the situation of their partners.
4. Respondents from Government schools were more likely to have taken up a position at a rural or regional school due to education authority placement than were teachers in other systems.
5. The low mean ratings for subsidies and allowances possibly reflect the relatively small number of respondents who qualified for these incentives.

Motivations for remaining at a rural or regional school

1. The greatest influences on teachers' decisions to stay in rural and regional schools were their enjoyment of the lifestyle and community spirit. Family links and partner's employment were also very influential.
2. The highest motivating school characteristic was small class sizes.
3. Female teachers considered the family situation to be more influential than did males, who rated the cost of living and quality of the lifestyle higher than did females.
4. Consistent with the findings on initial motivations, younger teachers were more inclined to remain in a rural or regional school because of financial considerations than were their older colleagues.
5. Promotion or advancement opportunities were also a greater incentive among younger teachers.

Motivations for leaving a rural or regional school

1. Respondents had a wide variety of mainly personal reasons for leaving rural and regional schools.
2. For the most part, these reasons were family related, such as changes in a partner's employment situation, or to improve educational opportunities for their own children.
3. Other teachers left due to a sense of social or professional isolation.
4. While problems with the school or community were the least influential factors, younger teacher tended to rate these as more influential than did older teachers.
5. Primary teachers rated these problems as less influential on their decisions than did teachers at secondary or combined schools. Professional isolation was a greater motivation among secondary and combined school respondents.

Motivations for moving from a metropolitan to a rural or regional school

1. Metropolitan teachers considered that smaller class sizes and preference for future transfers had the highest motivational value in terms of moving to a rural or regional school.
2. Financial incentives such as cheaper housing, rent and travel subsidies and allowances were also potentially influential.
3. Opportunities to work with a smaller staff, or with Indigenous students were the least influential items.
4. The youngest group of teachers considered financial and advancement incentives to be substantially more influential than did their older colleagues.

4.5 PERCEPTIONS OF TEACHER EDUCATION AND PREPARATION

All teachers were asked to rate their perceptions of how well their initial teacher education had prepared them for various aspects of their careers, particularly for teaching in rural and regional schools. The findings in this section refer to the suitability and effectiveness of respondents' pre-service education, not to their current skill levels.

4.5.1 Primary teacher preparation

Table 4.15 displays primary respondents' overall mean ratings for how well their teacher education prepared them for handling different facets of teaching. The general impression is that teacher education prepared respondents best for teaching primary mathematics, somewhat less well for teaching primary science, teaching in rural/regional schools and managing student behaviour and least well for teaching Non-English Speaking Background (NESB) and Indigenous students and for using ICT across the curriculum.

Table 4.15 Overall average ratings, standard deviations and valid N for preparation items (items are listed in descending order of mean rating) [Ratings on a 1 (Not at all prepared) to 5 (Extremely well prepared) scale]

How well do you think your teacher education prepared you for:	Mean	s.d.	Valid N
teaching mathematics?	**3.09**	.96	1546
teaching science?	**2.60**	.96	1545
teaching in rural and regional schools?	**2.57**	1.17	1543
managing student behaviour?	**2.55**	1.03	1548
teaching gifted and talented students?	**1.98**	.97	1549
teaching special needs students?	**1.94**	1.02	1550
using ICT across the curriculum?	**1.77**	1.03	1537
teaching Indigenous students?	**1.72**	.94	1550
teaching NESB students?	**1.52**	.84	1551

Table 4.15, however, gives only a whole-of-sample impression. A principal components analysis of the preparation items (Appendix 4.5) showed two substantive components: Specific Teaching Skills Preparation and General Teaching Preparation. Scores on these two components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted, comparing mean levels of preparation on the two components by Age of Respondent and Location During Initial Teacher Education. Table 4.16 shows the means and standard errors for the two preparation components for the categories of the two independent variables.

Table 4.16 Breakdown of the two teacher preparation components, by Age of Respondent and Location During Initial Teacher Education [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] [a]

			Preparation Component		
			Specific teaching skills preparation	General teaching preparation	Valid N
Age of respondent	≤ 30 years	Mean	**2.24**	**2.88**	
		s.e.(Mean)	.04	.04	307
	31 - 40 years	Mean	**1.89**	**2.69**	
		s.e.(Mean)	.04	.04	305
	41 - 50 years	Mean	**1.67**	**2.68**	
		s.e.(Mean)	.03	.03	516
	> 50 years	Mean	**1.50**	**2.61**	
		s.e.(Mean)	.03	.04	388
Location during initial teacher education	Metropolitan centre	Mean	1.74	**2.61**	
		s.e.(Mean)	.03	.03	798
	Provincial City	Mean	1.79	**2.84**	
		s.e.(Mean)	.04	.05	299
	Regional centre	Mean	1.83	**2.81**	
		s.e.(Mean)	.05	.05	235
	Rural centre	Mean	1.88	**2.76**	
		s.e.(Mean)	.06	.06	175

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with age of respondent

The multivariate test for Age of Respondent differences across the two components was significant[31]. Follow-up tests revealed that the reasons for this significant multivariate difference were significant univariate differences on both preparation components. Table 4.16 shows that the youngest primary teachers tended to feel substantially better prepared in the area of both specific teaching skills and general teaching than did their older colleagues. The oldest respondents felt least prepared in both areas, but especially so in terms of specific teaching skills. Figure 4.14 displays a profile plot of original preparation item means by Age of Respondent. Clearly, the youngest cohort of respondents felt substantially better prepared for teaching gifted and talented (most notable difference), Indigenous and special needs students, as well as for managing student behaviour. No age category of primary respondents felt particularly well prepared for teaching NESB students.

Variation with location during initial teacher education

The multivariate test for Location During Initial Teacher Education differences across the two components was significant[32]. Follow-up tests revealed that the chief reason for this significant multivariate difference was a significant univariate difference on the General Teaching Preparation component. Table 4.16 reveals that respondents completing their teacher education in Metropolitan Centres felt less well prepared for teaching in general than did their colleagues completing their teacher education in Provincial Cities, Regional Centres or Rural Centres. Figure 4.15 displays a profile plot of original preparation item means by Location During Initial Teacher Education. Again, the differentiating item in the General Teaching Preparation component was preparation for teaching in rural or regional schools. Respondents living in Provincial Cities, Regional Centres and Rural Centres all indicated a substantially higher level of preparedness compared to those who undertook their teacher education in Metropolitan Centres.

[31] Wilks' lambda = .860, $F(6, 3016) = 39.43$, $p < .001$, partial $\eta^2 = .07$
[32] Wilks' lambda = .979, $F(6, 2998) = 5.34$, $p < .001$, partial $\eta^2 = .01$

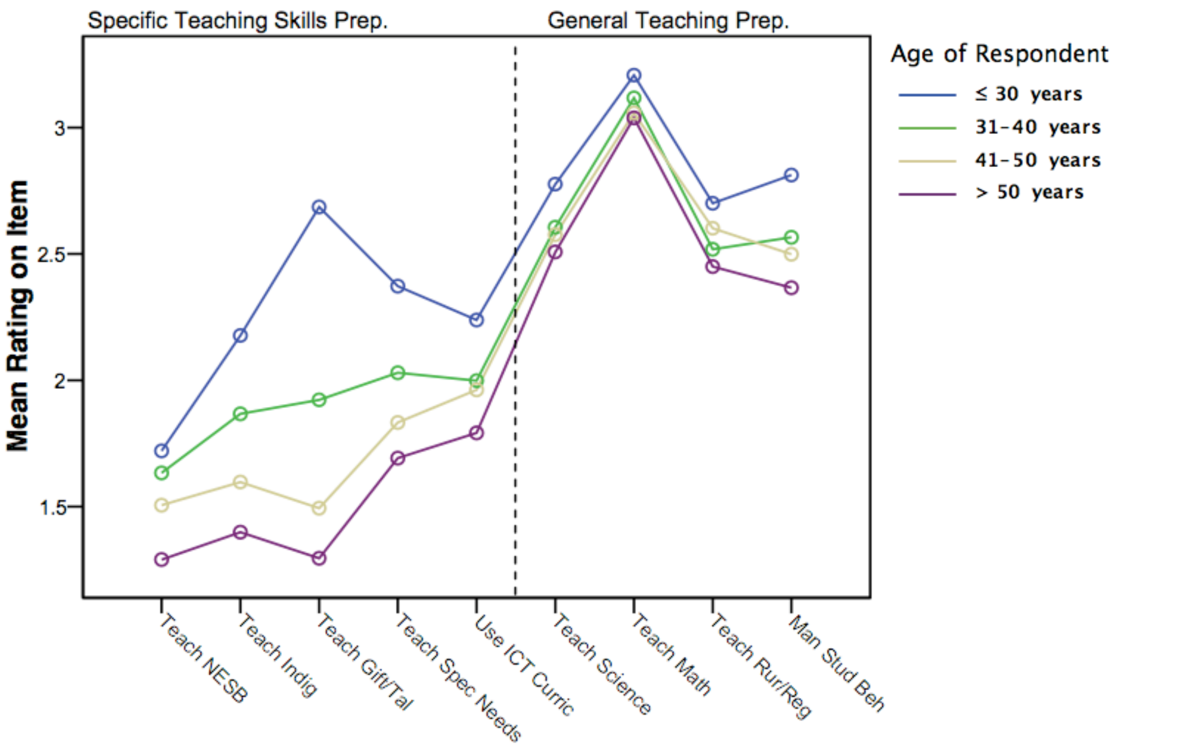

Figure 4.14 Profile plot of teacher preparation items, compared by Age of Respondent [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] (Table 4.15 for item names in full)

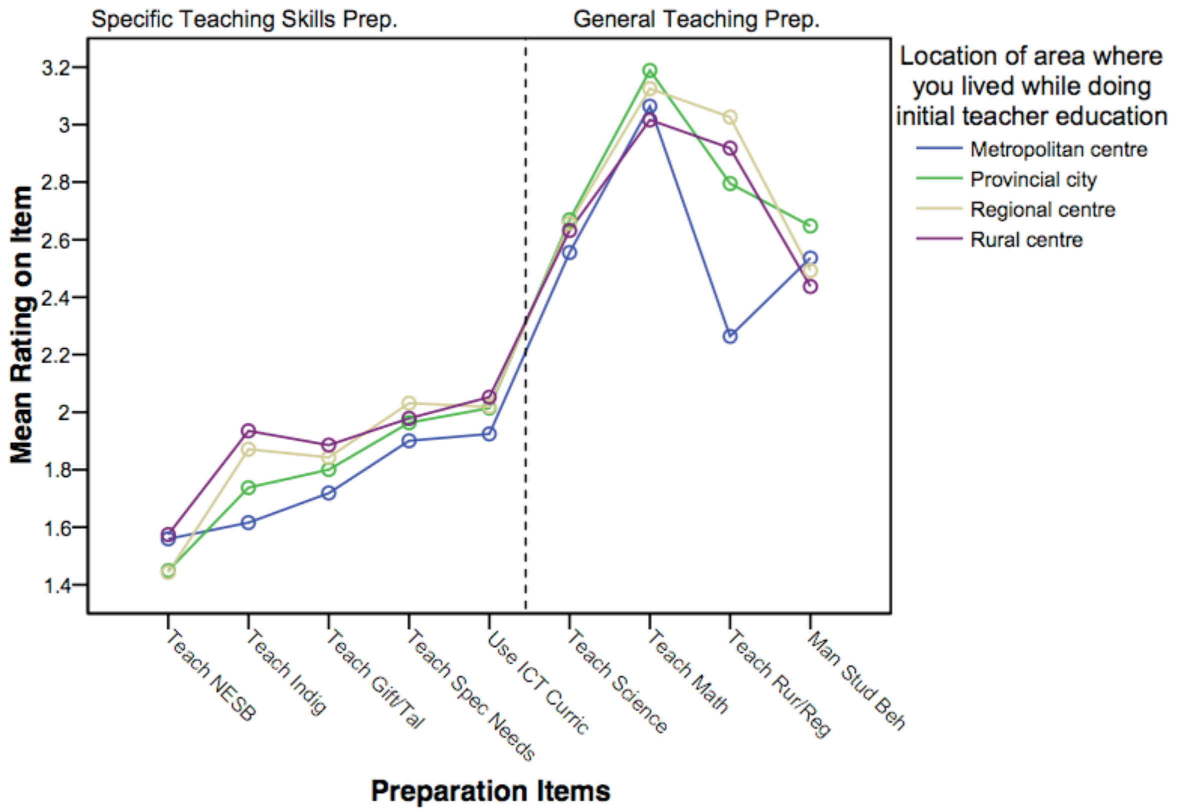

Figure 4.15 Profile plot of primary teacher preparation items, compared by Location During Initial Teacher Education (Table 4.15 for item names in full)

4.5.2 Secondary teacher preparation

It is useful first to examine the three secondary respondent samples as a combined sample ($N = 1364$) in terms of teacher preparation before looking at the analyses for each individual sample. Table 4.17 displays the overall mean ratings for how well teacher education prepared secondary respondents for handling different facets of teaching, including teaching within their specific subject area. The overall impression given in this table is that teacher education prepared secondary respondents best for teaching in their respective subject areas, teaching in rural and regional schools and for managing student behaviour. Secondary respondents indicated they were least well prepared for teaching NESB (preparation seemed particularly low here), Indigenous and special needs students and for using ICT across the curriculum. On average, teacher education only somewhat prepared secondary respondents for teaching gifted and talented students.

Table 4.17 Overall average ratings, standard deviations and valid N for the teacher education preparation items for secondary respondents (items are listed in descending order of mean rating) [Ratings on a 1 (Not at all prepared) to 5 (Extremely well prepared) scale]

How well do you think your teacher education prepared you for:	Mean	s.d.	Valid N
teaching [science/mathematics/ICT]?	**2.89**	1.12	1348
teaching in rural and regional schools?	**2.47**	1.09	1331
managing student behaviour?	**2.41**	1.01	1342
teaching gifted and talented students?	**2.10**	1.00	1342
using ICT across the curriculum?	**1.84**	1.07	1332
teaching special needs students?	**1.77**	.95	1338
teaching Indigenous students?	**1.59**	.84	1339
teaching NESB students?	**1.47**	.83	1344

Table 4.17, however, gives only a whole-of-combined secondary samples impression. A principal components analysis of the preparation items (Appendix 4.6) produced two substantive components for secondary respondents: Specific Teaching Skills Preparation and General Teaching Preparation. Scores on these two components were analysed using a series of MANCOVAs, comparing mean levels of preparation on the two components by Age of Respondent, Location During Initial Teacher Education and Survey Respondent Type. Table 4.18 shows the means and standard errors for the two preparation components for the categories of the three independent variables.

Variation with age of respondent

The multivariate test for Age of Respondent differences across the two components was significant[33]. Follow-up tests revealed that the main reasons for this significant multivariate difference were a significant univariate difference on the Specific Teaching Skills Preparation component and a suggestive different on the General Teaching Preparation component. Table 4.18 reveals that the youngest two cohorts of respondents tended to feel substantially better prepared in the areas of specific teaching skills and, to a lesser extent, general teaching preparation than did their older colleagues. Figure 4.16 displays a profile plot of original preparation item means (ordered by component and labelled across the top of the graph) by Age of Respondent category. Clearly, the youngest cohort of respondents felt substantially better prepared to use ICT across the curriculum (their mean approached the value for the

[33] Wilks' lambda = .881, $F(6, 2594) = 28.15$, $p < .001$, partial $\eta^2 = .06$

anchor point of 'moderately prepared' on the Likert-type scale), especially relative to the oldest two cohorts. Furthermore, the youngest cohort appeared better prepared to teach Indigenous and special needs students, although, in an absolute sense, this was only a feeling of 'somewhat prepared'. The youngest cohort also tended to feel more prepared (mean approached the level of 'moderately prepared') to teach in a rural or regional school than their older colleagues.

Table 4.18 Breakdown of the two secondary teacher preparation components, by Age of Respondent, Location During Initial Teacher Education and Survey Respondent Type [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] [a]

			Preparation Component		
			Specific teaching skills preparation	General teaching preparation	Valid N
Age of Respondent	≤ 30 years	Mean	2.18	2.74	
		s.e.(Mean)	.05	.06	204
	31 - 40 years	Mean	1.91	2.67	
		s.e.(Mean)	.04	.05	285
	41 - 50 years	Mean	1.66	2.50	
		s.e.(Mean)	.03	.04	396
	> 50 years	Mean	1.52	2.55	
		s.e.(Mean)	.03	.04	420
Location During Initial Teacher Education	Metropolitan Centre	Mean	1.73	2.53	
		s.e.(Mean)	.02	.03	935
	Provincial City	Mean	1.83	2.77	
		s.e.(Mean)	.06	.07	140
	Regional Centre	Mean	1.83	2.86	
		s.e.(Mean)	.07	.08	104
	Rural Centre	Mean	1.77	2.62	
		s.e.(Mean)	.06	.07	125
Survey Respondent Type	Secondary Science	Mean	1.75	2.67	
		s.e.(Mean)	.03	.04	561
	Secondary Mathematics	Mean	1.71	2.61	
		s.e.(Mean)	.03	.04	523
	Secondary ICT	Mean	1.87	2.36	
		s.e.(Mean)	.05	.06	225

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with location during initial teacher education

The multivariate test for Location During Initial Teacher Education differences across the two components was significant[34]. Follow-up tests revealed that the primary reason for this significant multivariate difference was a significant univariate difference on the General Teaching Preparation component. Table 4.18 shows that respondents who lived in Provincial Cities or Regional Centres, and to a lesser extent Rural Centres, while doing their initial teacher education tended to feel substantially better prepared in the area of general teaching preparation than did their colleagues who lived in a Metropolitan Centre.

Figure 4.17 displays a profile plot of original preparation item means (ordered by component – labelled across the top of the graph) by Location category. Clearly, the key differentiating item in the General Teaching Preparation component was preparation to teach in a rural or regional school: respondents who lived in Provincial Cities or Regional Centres felt at least moderately prepared for such teaching; colleagues who lived in Rural Centres felt slightly less well prepared, but still substantially more prepared than colleagues who lived in a Metropolitan Centre.

[34] Wilks' lambda = .983, $F(6, 2592) = 3.80$, $p = .001$, partial $\eta^2 = .01$

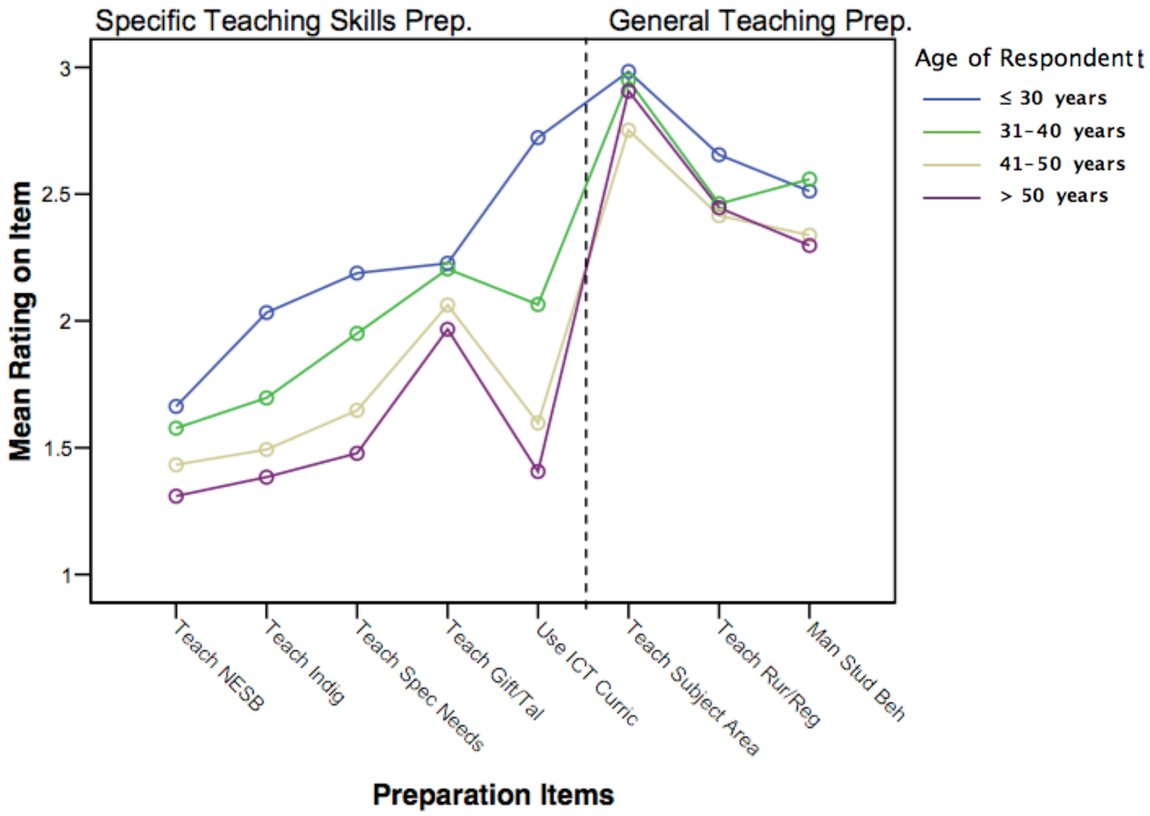

Figure 4.16 Profile plot of secondary teacher preparation items, compared by Age of Respondent [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] (Table 4.17 for item names in full)

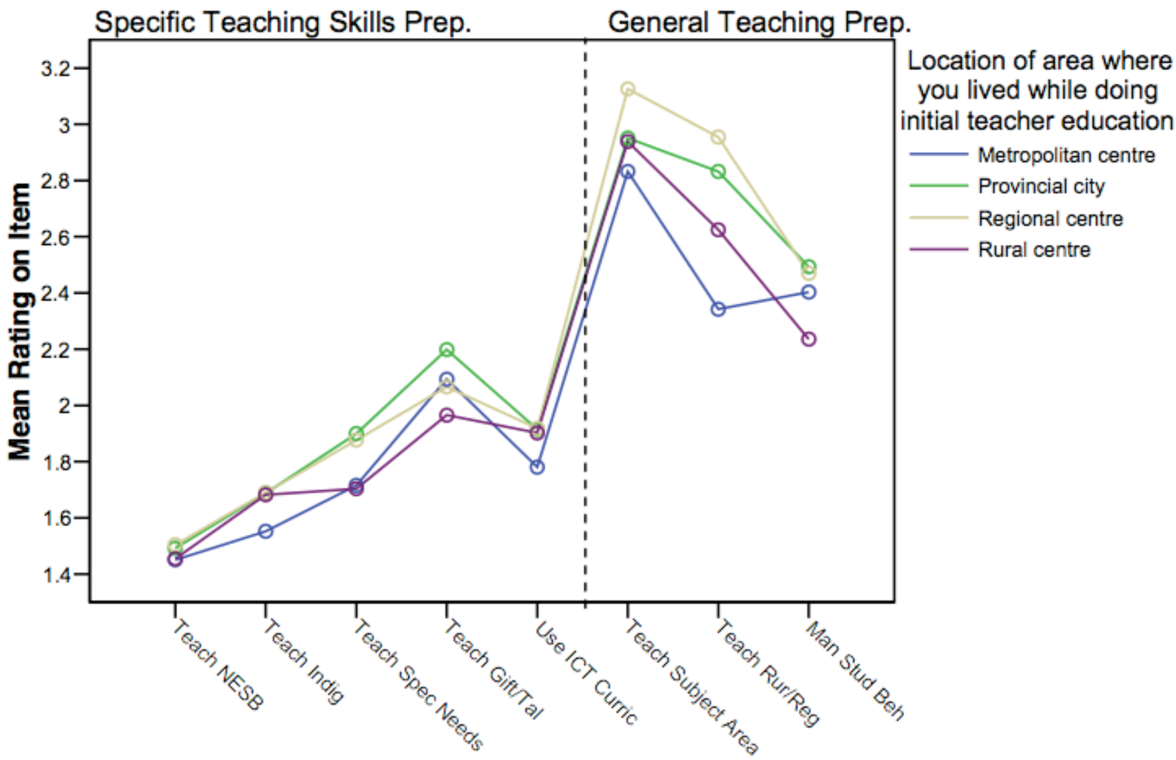

Figure 4.17 Profile plot of secondary teacher preparation items, compared by Location During Initial Teacher Education [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] (Table 4.17 for item names in full)

Variation with survey respondent type

The multivariate test for Survey Respondent Type differences across the two components was also significant[35]. Follow-up tests revealed that the primary reason for this significant multivariate difference was a significant univariate difference on the General Teaching Preparation component. Table 4.18 shows that secondary science and mathematics respondents felt substantially better prepared in the area of general teaching preparation than did their secondary ICT colleagues. Figure 4.18 displays a profile plot of original preparation item means (ordered by component and labelled across the top of the graph) by Survey Respondent Type. The most obvious (and perhaps sobering) trend here was that secondary science and mathematics respondents felt quite substantially better prepared to teach in their subject area than did secondary ICT respondents. Interestingly, secondary ICT respondents felt better prepared for managing student behaviour compared to their science and mathematics colleagues.

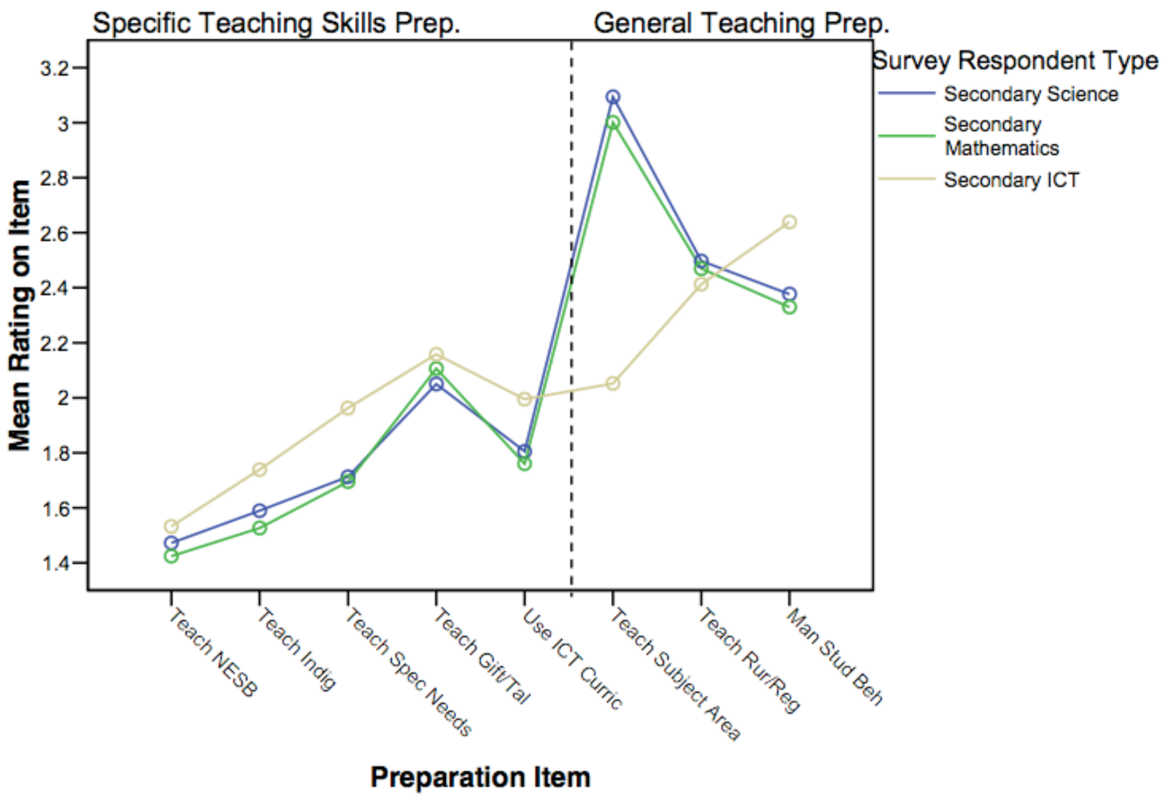

Figure 4.18 Profile plot of secondary teacher preparation items, compared by Survey Respondent Type (science, ICT and mathematics) [ratings on 1 (Not Prepared) to 5 (Extremely Well Prepared) scale] (Table 4.17 for item names in full)

[35] Wilks' lambda = .953, $F(4, 2604) = 15.87$, $p < .001$, partial $\eta^2 = .02$

4.5.3 Summary of findings and implications

Primary teacher preparation

1. The findings suggest that primary teachers in general feel they were well prepared by their teacher education for teaching mathematics, though considerably less so for teaching science. This was the case for teachers of all ages, indicating that there has been little variation over time in the emphasis given to teaching mathematics and science at the primary level.
2. Most primary teachers also seem to feel that they were reasonably well prepared for teaching in rural and regional schools, and for managing student behaviour. While there was little variation with age in the former, the youngest teachers tended to feel they were better prepared for dealing with student behaviour than were their older colleagues. This may be due to changes in the way teacher education institutions approach the issue of student management, or to younger teachers having less experience of a range of student behaviours.
3. The evidence suggests that primary teachers were considerably less well prepared for teaching Indigenous and NESB students, and for using ICT across the curriculum. It is reasonable to argue that the significant variation with age across a range of specific teaching skills is indicative of the changes in emphasis in teacher preparation over time, particularly with regard to using ICT, and catering for student diversity in the classroom. Acknowledgement by older teachers that their initial teacher education did not prepare them well for aspects of their current teaching environments underscores the importance of providing ongoing professional development.
4. In relation to specific skill preparation, the findings indicate that primary teachers who lived in provincial cities or regional centres during their initial teacher education felt better prepared in some respects by this experience than did those who were located in metropolitan centres. This was particularly the case for preparation for teaching in rural and regional schools.

Secondary teacher preparation

1. The findings indicate that secondary science and mathematics teachers feel their teacher education prepared them relatively well for teaching their subjects. This was generally the case for teachers of all ages. However, it is also apparent that most ICT teachers feel their initial teacher education did not prepare them well for teaching their subjects. This is understandable given the relative novelty of ICT as a school subject and the dynamic nature of ICT in general.
2. Secondary teachers appear to have been reasonably well prepared for teaching in rural and regional schools, and for managing student behaviour. There is strong evidence that younger teachers feel better prepared by their pre-service education for incorporating ICT and catering for student diversity than do their older colleagues. As with primary teachers, this is probably indicative of changes in the educational landscape over time, and demonstrates the need for ongoing professional development.
3. The findings indicate that secondary science, ICT and mathematics teachers who lived in provincial cities or regional centres during their initial teacher education feel better prepared in some respects by this experience than do those who were located in metropolitan centres. This was particularly the case for preparation for teaching in rural and regional schools.

4.6 TEACHING QUALIFICATIONS

All teachers were asked to describe their levels of qualification and their breadth of teaching experience, both at their current school and in their careers more generally. Responses were analysed using cross-tabulations with a range of variables, including Sex, MSGLC Category of School, Age of Respondent, and School System, to identify any significant variation in teaching qualifications. Overall, more than 85% of all respondents held either a Bachelor's degree (plus an undergraduate or postgraduate diploma) or some type of postgraduate teaching qualification, with females dominating the percentages in each case. Respondents having qualifications at a level less than a B.Ed. were most frequently older than 41 years of age.

4.6.1 Primary teacher qualifications

As shown in Table 4.19, the vast majority of primary respondents (over 78%) held either Bachelor's degree (plus an undergraduate or postgraduate diploma) or some type of postgraduate teaching qualification, with males dominating the percentages in each case. However, there were no significant differences with sex or age of respondent. There were also no significant differences in the qualifications of respondents from different MSGLC categories.

Table 4.19 Level of teaching qualifications of primary teachers and secondary science, ICT and mathematics teachers [a]

	Primary teachers	Science teachers	ICT teachers	Mathematics teachers
<B.Ed	21%	4%	13%	6%
B.Ed	45%	13%	30%	22%
Bach + UG or PG Dip.	19%	58%	32%	52%
PG degree + other	15%	24%	26%	21%
	100%	**100%**	**100%**	**100%**

[a] For an explanation of qualification categories, see Table 3.8.

4.6.2 Secondary teacher qualifications

As shown in Table 4.19, about 96% of secondary science respondents, 87% of ICT respondents and 94% or mathematics respondents held a Bachelors degree or higher qualification. There were no significant variations with Sex or Age of Respondents. There were also no significant differences in the formal qualifications of secondary respondents across the MSGLC categories.

Requirements to teach subjects for which teacher is not formally qualified

Science, ICT and mathematics teachers were asked to indicate whether they were required to teach subjects for which they were not formally qualified. Table 4.20 shows responses to this question, broken down by MSGLC category. These variables were significantly associated[36]. This was primarily due to significantly fewer respondents than expected from Metropolitan Areas and significantly more respondents than expected from Provincial Areas and Remote Areas coming from schools where teachers were required to teach a subject area for which they were not qualified. Conversely, significantly more respondents than expected from

[36] $\chi^2(3) = 75.37$; $p < .001$; Cramer's V = .24

Metropolitan Areas and significantly fewer respondents than expected from Provincial Areas and Remote Areas came from schools where teachers were not required to teach a subject area for which they were not qualified. Figure 4.19 illustrates the contrast in this requirement across geographic regions. On average, respondents in Provincial Areas indicated they are about twice as likely, and those in Remote Areas more than three times as likely as those in Metropolitan Areas to be required to teach a subject for which they are not qualified.

Table 4.20 Secondary respondents indicating that they are required to teach a subject for which they are not formally qualified, compared by MSGLC categories [a]

		MSGLC categories				
		Metropolitan	Provincial City	Provincial Area	Remote Area	Overall
Science teachers	Count	26	32	96	24	178
	% within Row item	14.6%	18.0%	53.9%	13.5%	100.0%
	% within MSGLC	17.8%	27.4%	36.8%	53.3%	31.3%
ICT teachers	Count	12	12	46	13	83
	% within Row item	14.5%	14.5%	55.4%	15.7%	100.0%
	% within MSGLC	21.4%	26.7%	43.0%	65.0%	36.4%
Mathematics teachers	Count	17	24	75	16	132
	% within Row item	12.9%	18.2%	56.8%	12.1%	100.0%
	% within MSGLC	12.2%	18.9%	31.5%	50.0%	24.6%

[a] Shaded cells indicate categories making a significant ($p < .001$) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

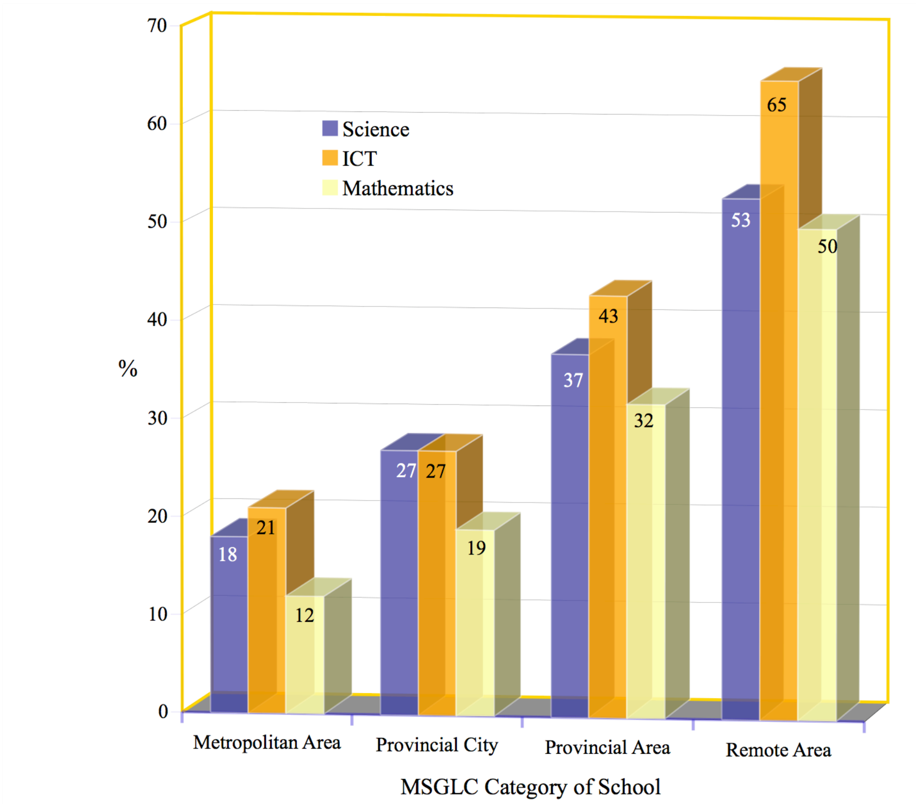

Figure 4.19 Percentages of science, ICT and mathematics respondents indicating they are required to teach subjects for which they are not formally qualified

4.6.3 Summary of findings and implications

1. Overall, more than 85% of respondents held either a Bachelor's degree (plus an undergraduate or postgraduate diploma) or some type of postgraduate teaching qualification.
2. The qualifications of primary and secondary science, ICT and mathematics respondents did not vary significantly with age, sex or geographic location.
3. There was strong evidence that many science, ICT and mathematics teachers are being required to teach subjects for which they are not qualified. Furthermore, the findings suggest that teachers in Provincial Areas are about twice as likely, and those in Remote Areas more than three times as likely as those in Metropolitan Areas to be required to teach a subject for which they are not qualified.
4. The findings also suggest that ICT teachers are more likely to be required to take classes in another subject area than are science teachers. Mathematics teachers are least likely to be asked to take such classes.

The results reported in this chapter are discussed in more detail in Chapter Nine, where they are linked to recommendations. In brief, however, it is apparent that the key findings provide a rural perspective on the overall 'drying up' of human resources in science, ICT and mathematics education across Australia. The most marginal areas, in this case the more remote schools, clearly feel the effects of this teacher shortage first and most dramatically, and the predicted acceleration in teacher retirements over the next five years will only exacerbate the problem. It is hoped that the findings in this chapter regarding motivations for teaching in rural and regional schools will provide some guidance to education authorities grappling with this problem.

CHAPTER FIVE

PROFESSIONAL CONNECTEDNESS AND ISOLATION

5.1 INTRODUCTION

This chapter reports teachers' responses to questions about the nature and scope of their professional development opportunities, and the degree to which they felt professionally connected or isolated. The surveys presented teachers with a set of items relating to potential opportunities and support mechanisms for undertaking professional development related to science, ICT or mathematics teaching, as well as more general opportunities such as staff mentoring, ICT skill development and programs to help address student diversity in their classrooms (Table 5.1). Teachers were asked to rate each item on two scales: the importance of the opportunity for their current teaching situation, and the availability of the opportunity at their school. The two ratings for each item were combined to produce a single 'need' rating (see Chapter Three). Teachers were also given the opportunity to comment about their professional development situation or associated issues not included in the question. This chapter presents the results of analysis of need ratings across a range of variables for each of the teacher respondent groups. Where appropriate, representative comments are used to illustrate or expand on the findings.

5.2 PROFESSIONAL DEVELOPMENT NEEDS OF PRIMARY TEACHERS

Overall needs

Table 5.1 summarises, at the level of the entire primary sample, the average scores on the 'need' items dealing with opportunities for professional interaction and development. The areas of greatest overall 'need' included workshops to develop ICT skills, professional development opportunities to help teach science and mathematics to gifted and talented and special needs students, effective communication between education authorities and teachers and release from face-to-face teaching for in-school collaborative activities. Areas of least 'need' overall included collaboration between teachers in their school, opportunities to attend external in-services or conferences related to teaching and learning mathematics and professional development opportunities to help teach science and mathematics to NESB students.

The high need for professional development in using ICT was reflected in primary respondents' comments. For example:

> The lack of given time to upgrade personal skills and knowledge in the area (ICT) is also serious. Teachers having to do it in their own time and often with own equipment. (Primary Teacher, Provincial Area, WA).
>
> As I have been 'around' so long I have needed to familiarise myself with 3 or 4 different types of computers as they evolved. There is never any time allocated for the amount of PD or contact with an expert that I need to keep my skills up to scratch. (Primary Teacher, Provincial Area, Tas.)

Table 5.1 Overall average 'need' scores, standard deviations and valid N for primary respondents' ratings of the Professional Interaction and Development items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20[37]]

PROFESSIONAL DEVELOPMENT ITEMS	Mean	s.d.	Valid N
Workshops to develop your ICT skills	**9.92**	3.73	1460
Professional development opportunities to help you teach science & maths to gifted & talented students	**9.70**	3.74	1446
Professional development opportunities to help you teach science & maths to special needs students	**9.62**	3.79	1440
Effective communication between education authorities and teachers	**9.57**	3.59	1454
Release from face-to-face teaching for in-school collaborative activities	**9.40**	3.80	1477
Involvement in region or state-wide syllabus development, or research projects in science	**9.35**	3.76	1442
Involvement in region or state-wide syllabus development, or research projects in mathematics	**9.26**	3.73	1427
Opportunities for mentoring new staff	**9.24**	3.77	1468
Financial support for attendance at external in-services or conferences	**9.15**	3.91	1461
Opportunities to attend external in-services or conferences related to teaching & learning science	**9.11**	3.53	1469
Professional development opportunities to help you teach science & maths to Indigenous students	**9.07**	4.25	1396
Professional development opportunities to help you teach science & maths to NESB students	**8.95**	4.25	1355
Opportunities to attend external in-services or conferences related to teaching & learning mathematics	**8.71**	3.27	1454
Collaboration with teachers in your school	**7.62**	2.85	1487

A principal components analysis of the 'need' items (Appendix 5.1) produced four substantive components: Development for Teaching to Targeted Groups, In-Service Development, General Personal Professional Development, and Professional Relationships Development. Scores on these four components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 5.2 shows the mean ratings and their associated standard errors on the three components across the categories of the comparison variables.

Variation with geographic region

The multivariate test for MSGLC category differences across the four professional interaction and development components was significant[38]. Follow-up tests revealed that the reasons for this significant multivariate difference were suggestive univariate differences on the In-Service Development and the Professional Relationships Development components. For both of these components, the highest level of 'need' was indicated by respondents from Remote Areas and the lowest 'need' by respondents from Metropolitan Areas. Figure 5.1 displays the profile plot of the original professional interaction and development 'need' transformed items by MSGLC category. The clear trend in Figure 5.1 is that respondents from Remote Areas indicated a higher level of 'need' across most of the original professional interaction and development items. This disparity was most notable in the areas of release from face-to-face teaching for collaborative activities, opportunities for mentoring new staff, and attending in-services and conferences for both science and mathematics teaching (respondents from Metropolitan Areas perceived the lowest 'needs' on these latter two items whereas respondents from Provincial Cities and Areas were intermediate).

[37] The 'needs' scores constitute ordinal rather than interval measures, since they were transformed from ordinal rating scales. While the possible scores range from 1 to 20, an average 'need' score on an item (that is, an item rated midway on both the importance and availability scales) would be about 7.5, rather than 10.

[38] Wilks' lambda = .975, $F(12, 3751.967) = 3.58$, p = .001, partial $\eta^2 = .01$.

Table 5.2 Mean ratings by primary respondents on Professional Interaction and Development item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Professional Interaction & Development Component				
			Development for Teaching to Targeted Groups	In-Service Development	General Personal Professional Development	Professional Relationships Development	Valid N
MSGLC categories	Metropolitan Area	Mean	9.06	8.27	9.13	8.62	
		s.e. (Mean)	.26	.23	.22	.21	210
	Provincial City	Mean	9.23	8.90	9.13	8.47	
		s.e. (Mean)	.21	.18	.18	.17	323
	Provincial Area	Mean	9.30	9.11	9.68	8.74	
		s.e. (Mean)	.14	.12	.12	.11	743
	Remote Area	Mean	9.92	9.38	9.86	9.55	
		s.e. (Mean)	.30	.26	.25	.24	152
Percentage of students in your school with Indigenous backgrounds	0%	Mean	8.63	8.47	9.48	8.66	
		s.e. (Mean)	.21	.19	.18	.17	298
	1 - 20%	Mean	9.30	9.04	9.35	8.71	
		s.e. (Mean)	.12	.10	.10	.10	910
	21 - 40%	Mean	10.52	9.14	9.91	8.82	
		s.e. (Mean)	.36	.32	.31	.29	95
	> 40%	Mean	11.77	10.49	11.39	10.08	
		s.e. (Mean)	.46	.41	.40	.37	60

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences (p < .001) on a component; light blue shading indicates suggestive differences (p < .01) on a component.

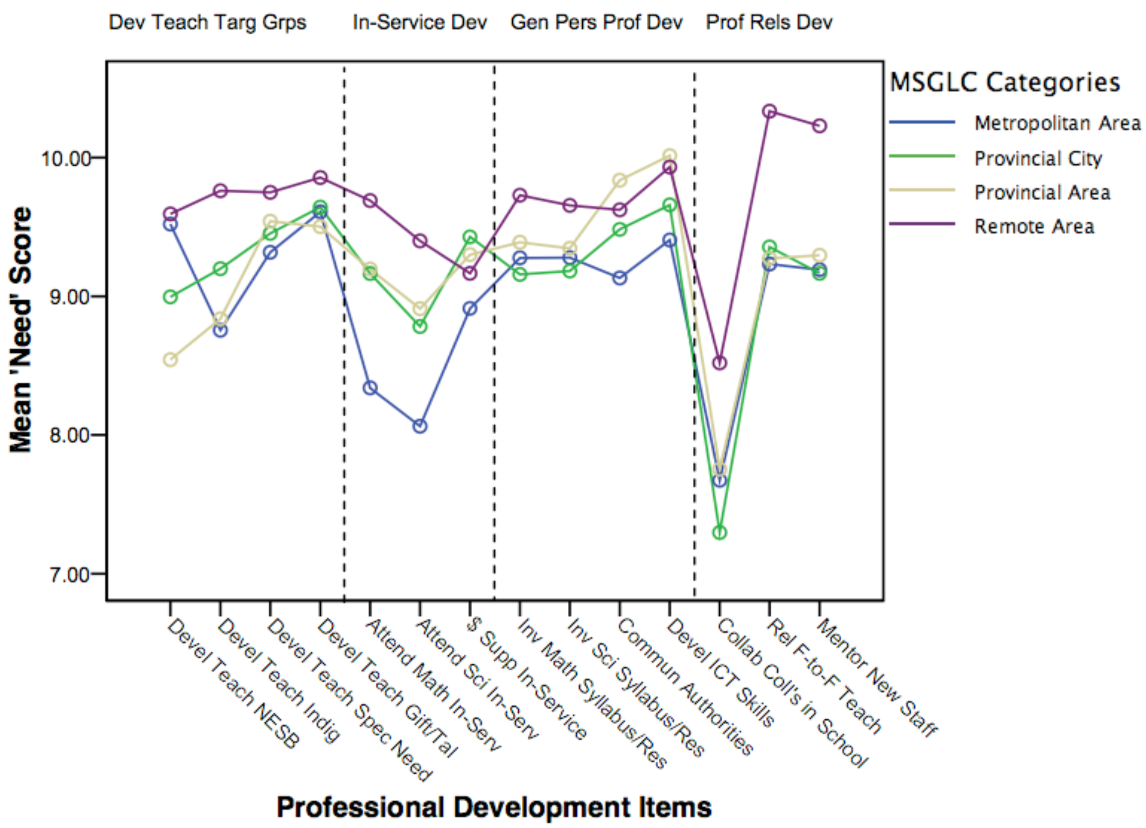

Figure 5.1 Profile plot of mean 'need' scores of primary respondents for the Professional Interaction & Development components, compared by MSGLC categories (Table 5.1 for item names in full)

The greater reported need for professional development opportunities and assistance in non-metropolitan areas was supported by primary teachers' comments. The main obstacles to professional development were identified as distance and associated cost, as most professional development opportunities are located in cities or major centres. A further impediment was the lack of relief staff to take classes while teachers were away at in-services. The contrast between the situations of city and remote area primary teachers is illustrated by the typical comments below:

> We get great PD support in accessing the available PD. We also run PD in-house. If anything, we have too many choices and not enough time to properly utilise the great learning and teaching programs available. (Primary Teacher, Provincial City, Vic.)

> Professional development is not usually available because staff cannot be replaced to allow it to happen. There is very little money available in our school for these activities – professional development priorities are always decided by the employer. (Primary Teacher, Remote Area, Qld)

Variation with Indigenous student population

The multivariate test comparing the four professional interaction and development components across primary schools with different percentages of student with Indigenous backgrounds was significant[39]. Follow-up tests revealed that the reasons for this significant multivariate difference were significant univariate differences on all components except Professional Relationships Development, where a suggestive difference was observed. In each case, respondents from schools where more than 40% of students were Indigenous indicated substantially greater levels of need in these four components compared to respondents from schools where the percentage was 40% or less. The areas of Development for Teaching to Targeted Groups and General Personal Professional Development were clearly of greatest 'need' for these respondents. Additionally, respondents from schools where the percentage of Indigenous students was between 21% and 40% showed a level of 'need' in the area of Development for Teaching to Targeted Groups greater than did respondents from schools with lower Indigenous percentages.

Figure 5.2 displays the profile plot of the original professional interaction and development 'need' transformed items by percentage of students with Indigenous backgrounds. The figure shows that 'needs' are greatest in all specific areas of all components for respondents from schools where the percentage of students with Indigenous backgrounds exceeded 40%. Peak areas of 'need' for these schools included professional development for teaching science and mathematics to gifted and talented, Indigenous, and special needs students, involvement in the regional or state-wide development of the mathematics and science syllabi, attending in-services and conferences related to teaching and learning mathematics and workshops for developing ICT skills. In schools where the percentage of students with Indigenous backgrounds was between 21% and 40%, professional development 'needs' for teaching to all four targeted groups were intermediate between respondents from the 40%+ schools and the less than 21% schools.

[39] Wilks' lambda = .948, $F(12, 3579.993) = 6.02$, $p < .001$, partial $\eta^2 = .02$

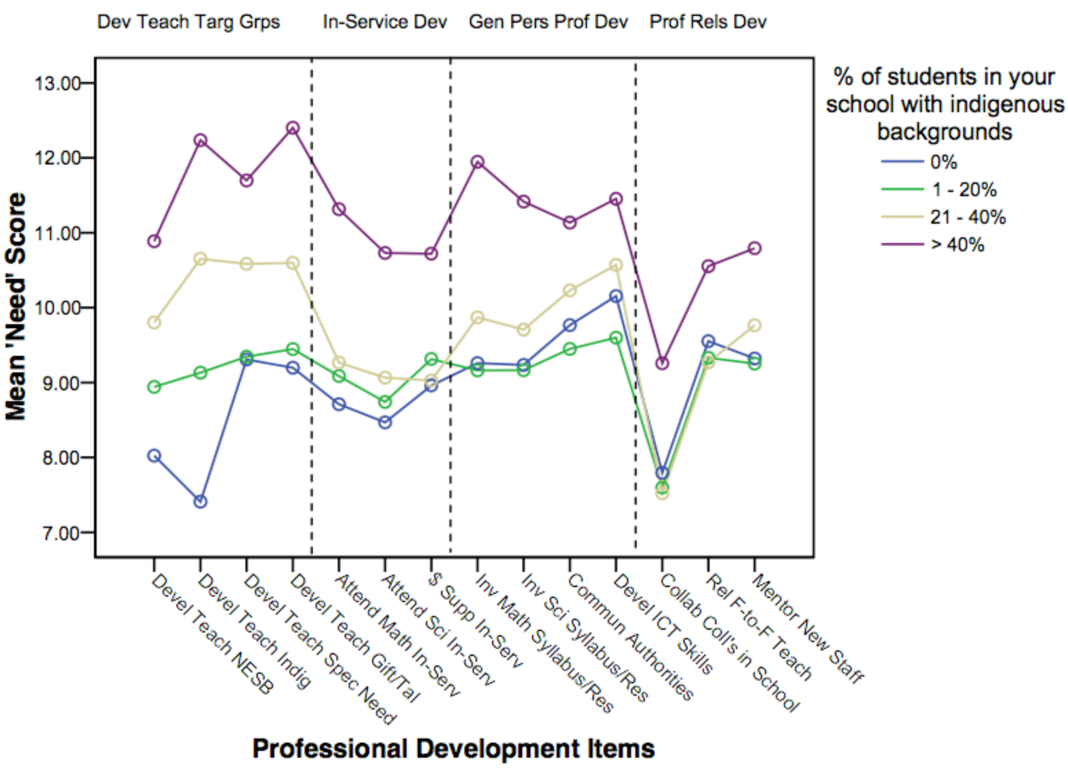

Figure 5.2 Profile plot of mean 'need' scores of primary respondents for the Professional Interaction & Development components, compared by percentage of students from Indigenous backgrounds (Table 5.1 for item names in full)

In their comments, primary teachers in schools with relatively high Indigenous populations reported feeling professionally isolated due to distance, costs and lack of relief teachers. For example:

> Remoteness of location has a huge impact. One day out of school is $300 for a relief teacher, plus a $200 flight and other transport plus registration course fees. It is impossible to attend a one or two hour 'after school' seminar (because of) flight times. (Primary Teacher, Remote Area, SA, Indigenous student population >40%)
>
> There are very few opportunities for PD, and a total lack of funds to cover travel and relief arrangements. There is also a total lack of relief teachers available. (Primary Teacher, Remote Area, NT, Indigenous student population >40%)

Summary of findings and implications

1. The findings indicate a strong need for professional development opportunities for primary teachers to develop their ICT skills, and to help them cater for special needs and gifted and talented students.
2. The findings provide strong evidence that primary teachers in Remote Areas are significantly disadvantaged in terms of accessing professional development opportunities such as mentoring, release time for PD and collaboration with colleagues. Teachers in Metropolitan schools appear to have a considerably lower unmet need for in-services in mathematics and science than teachers in other areas, particularly those in Remote Areas.

3. There appears to be a need to develop or improve structures to support mentoring of teachers in remote schools.
4. The findings provide evidence that primary teachers in remote schools, and in schools with high proportions of Indigenous students, feel professionally isolated. In particular, there is a need for professional development to help these teachers cater for special needs and gifted and talented students, for more financial support to cover the costs of professional development, and for strategies to ensure that classes are covered in their absence.

5.3 PROFESSIONAL DEVELOPMENT NEEDS OF SCIENCE TEACHERS

Overall needs

Table 5.3 summarises, at the level of the entire science teacher sample, the average scores on the 'need' items dealing with opportunities for professional interaction and development. The areas of greatest overall 'need' included release from face-to-face teaching for in-school collaborative activities, effective communication between education authorities and teachers and professional development opportunities to help teach science to gifted and talented students. Areas of least 'need' overall included collaboration between science teachers in their school and professional development opportunities to help teach science to NESB students.

Table 5.3 Overall average 'need' scores, standard deviations and valid N for science respondents' ratings of the Professional Interaction and Development items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20]

PROFESSIONAL DEVELOPMENT ITEMS	Mean	s.d.	Valid N
Release from face-to-face teaching for in-school collaborative activities (e.g., programming)	**11.33**	4.28	539
Effective communication between education authorities and teachers	**10.16**	3.87	539
Professional development opportunities to help you teach science to gifted & talented students	**10.12**	3.88	531
Collaboration with science teachers in other schools	**9.98**	3.66	544
Professional development opportunities to help you teach science to special needs students	**9.97**	4.05	525
Workshops to develop your ICT skills	**9.80**	4.04	542
Involvement in region or state-wide syllabus development, or research projects (e.g., assessment)	**9.69**	3.89	539
Financial support for attendance at external in-services or conferences	**9.46**	3.96	542
Opportunities to attend external in-services or conferences related to teaching & learning science	**9.44**	3.74	543
Opportunities for mentoring new staff	**9.14**	3.74	539
Opportunity to mark/moderate external science assessments	**9.07**	4.12	535
Professional development opportunities to help you teach science to Indigenous students	**9.04**	4.50	522
Professional development opportunities to help you teach science to NESB students	**8.73**	4.22	501
Collaboration between science teachers in your school (e.g., sharing resources, ideas, knowledge)	**8.06**	3.48	542

A principal components analysis of the 'need' items (Appendix 5.2) yielded three substantive components: General Personal Professional Development, Development for Teaching Targeted Groups, and Professional Relationships Development. Scores on these three components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 5.4 shows the mean ratings and their associated standard errors on the three components across the categories of the comparison variables.

Table 5.4 Mean ratings by science respondents on Professional Interaction and Development item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Professional Development Component			
			General Personal Professional Development	Development for Teaching to Targeted Groups	Professional Relationships Development	Valid N
MSGLC categories	Metropolitan Area	Mean	8.88	8.32	8.41	
		s.e. (Mean)	.29	.36	.29	131
	Provincial City	Mean	10.65	9.85	9.08	
		s.e. (Mean)	.30	.38	.30	110
	Provincial Area	Mean	10.12	9.68	9.23	
		s.e. (Mean)	.20	.25	.20	248
	Remote Area	Mean	10.35	11.69	10.10	
		s.e. (Mean)	.51	.63	.51	36
Percentage of students in your school with Indigenous backgrounds	0%	Mean	9.26	8.38	8.96	
		s.e. (Mean)	.42	.52	.41	50
	1 - 20%	Mean	9.71	9.35	8.83	
		s.e. (Mean)	.15	.18	.14	395
	21 - 40%	Mean	11.68	11.97	10.49	
		s.e. (Mean)	.49	.61	.48	35
	> 40%	Mean	10.83	12.04	10.90	
		s.e. (Mean)	.73	.91	.71	16

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with geographic region

The multivariate test for MSGLC category differences across the three professional interaction and development components was significant[40]. Follow-up tests revealed that the reasons for this significant multivariate difference were a significant univariate difference on the Development for Teaching to Targeted Groups component and a suggestive difference on the General Personal Profession Development component. For both of these components the highest level of 'need' was indicated by respondents from Remote Areas and the lowest 'need' by respondents from Metropolitan Areas. Comparatively speaking, 'need' was highest in the area of Development for Teaching to Targeted Groups for respondents from Remote Areas. Figure 5.3 displays the profile plot of the original professional interaction and development 'need' transformed items by MSGLC category. The clear 'pattern' in Figure 5.3 is that respondents from Metropolitan Areas uniformly indicated a lower level of 'need' across all 14 original professional interaction and development items. Also particularly notable is that respondents from Remote Areas strongly indicated a higher level of 'need' for development to teach to all four targeted groups. Respondents from Remote Areas were also distinguished by indicating the highest level of 'need' for involvement in regional or state-wide syllabus development or research projects and having opportunities to mark/moderate external assessments.

[40] Wilks' lambda = .940, $F(9, 1255.96) = 3.58$, $p = .001$, partial $\eta^2 = .02$

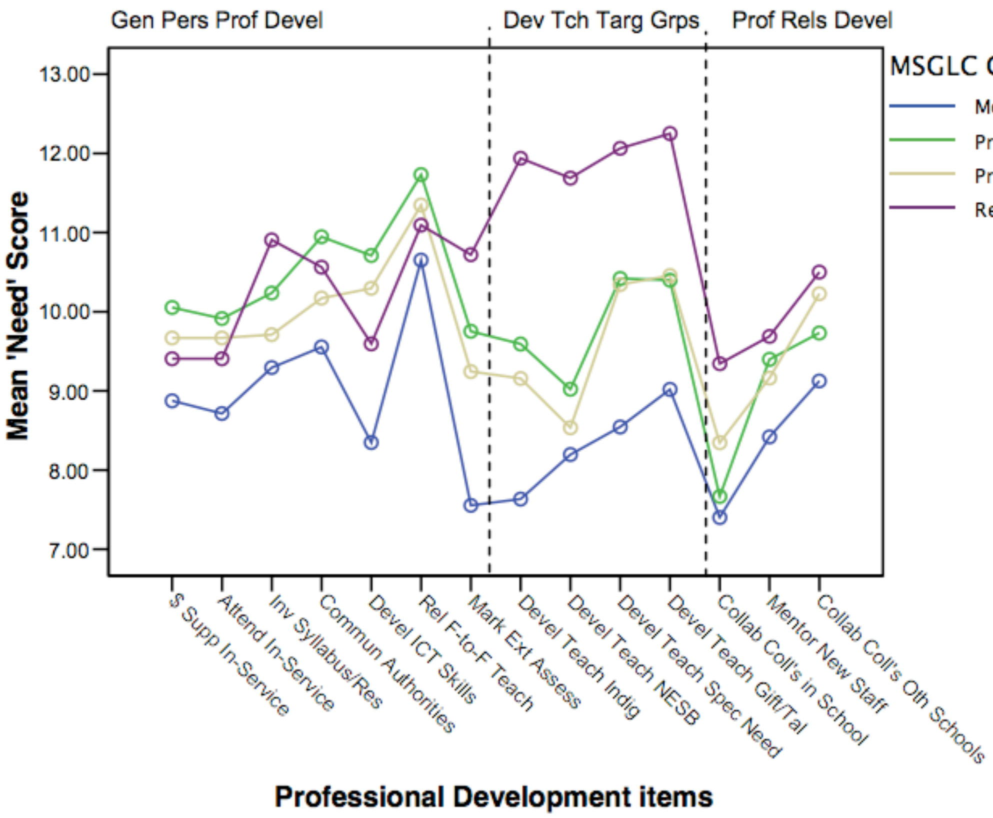

Figure 5.3 Profile plot of mean 'need' scores of science respondents for the Professional Interaction and Development components, compared by MSGLC categories (Table 5.3 for item names in full)

The geographical differences in expressed need were supported by science teachers' comments, of which the following were typical:

> What PD? The school won't even pay for airfares and nearly all PD is in Brisbane. Drive for hours and risk fatigue and accident, or don't go. Schools in regional areas should get much bigger PD budgets as almost all of the good PD is in Brisbane. (Science Teacher, Provincial City, Qld)

> I have been de-skilled by working in my region. (Science Teacher, Provincial Area, SA)

> Being somewhat remote it is time consuming to get to PD in Melbourne and regional PD for physics is seldom available or close. It is easy to feel isolated with the demands of teaching and the difficulty of PD in physics, particularly this year with a new course. (Science Teacher, Provincial Area, Vic.)

Variation with Indigenous student population

The multivariate test comparing the three professional interaction and development components across secondary schools with different percentages of student with Indigenous backgrounds was significant[41]. Follow-up tests revealed that the reasons for this significant

[41] Wilks' lambda = .925, $F(9, 1185.38) = 4.28$, $p < .001$, partial $\eta^2 = .03$

multivariate difference were significant univariate differences on all three components. In each case, respondents from schools having more than 21% of students with Indigenous backgrounds indicated substantially greater levels of 'need' in these three components compared to respondents from schools where the percentage was 20% or less. The area of General Personal Professional Development is clearly of greatest 'need' for respondents from schools where the percentage of students with Indigenous backgrounds was between 21% and 40%. Figure 5.4 displays the profile plot of the original professional interaction and development 'need' transformed items by percentage of students with Indigenous backgrounds. The figure shows that 'needs' are greatest in all specific areas of General Personal Professional Development, except opportunities to mark/moderate external assessments, for respondents from schools where the percentage of students with Indigenous backgrounds was between 21% and 40%. In schools where the percentage of students with Indigenous backgrounds exceeded 20%, 'needs' were greatest in the specific areas of development for teaching to all targeted groups, except gifted and talented.

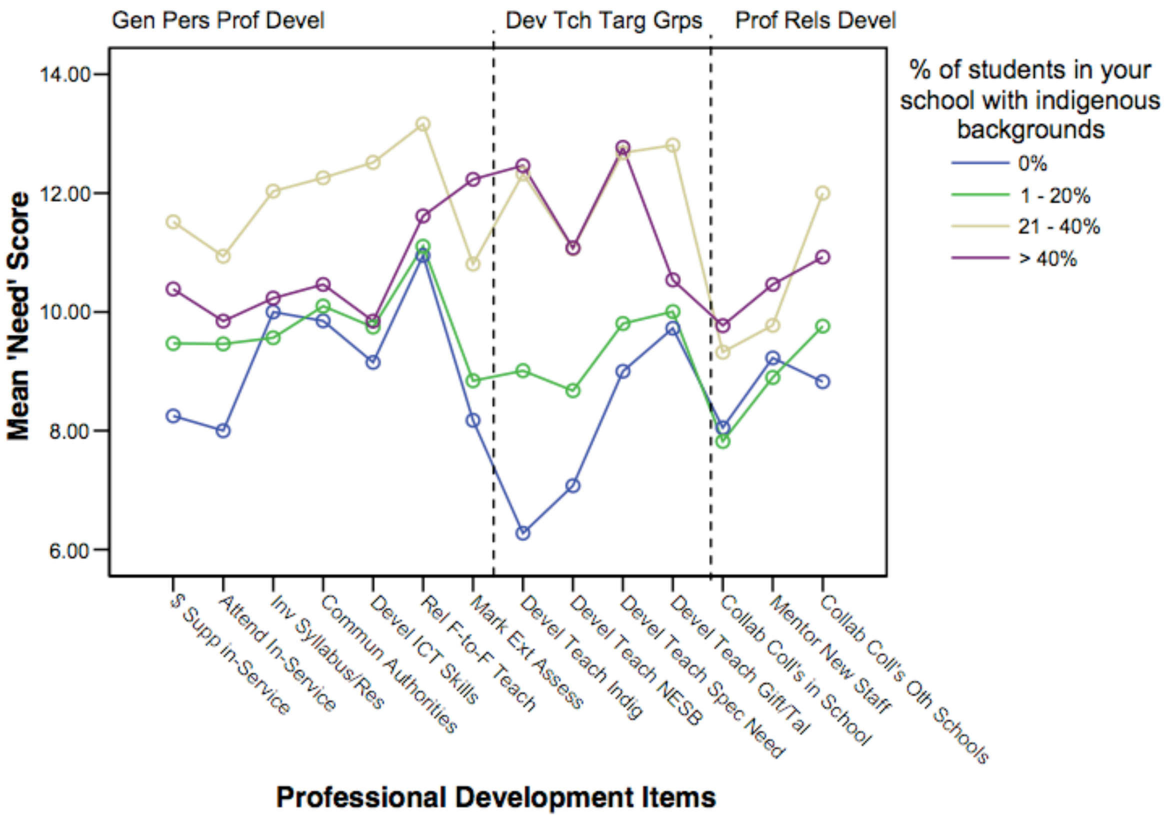

Figure 5.4 Profile plot of mean 'need' scores of science respondents for the Professional Interaction & Development components, compared by percentage of students from Indigenous backgrounds (Table 5.3 for item names in full)

Summary of findings and implications

1. The findings strongly suggest that science teachers in general see the priority areas for professional development as being release from face-to-face teaching for programming and other collaborative activities, and more effective communication with educational authorities. The high level of need may be related to developments in secondary science curriculum that have been, and still are, in progress in a number of Australian states and territories.

2. There was a clear indication that science teachers need professional development opportunities to help them cater for the diversity of students in their classes
3. The unmet need for professional development opportunities increased substantially with distance from Metropolitan and Provincial Cities. Indeed, teachers in metropolitan schools reported a lower mean 'need' score on *every* professional development item.
4. The evidence suggests that science teachers in remote schools feel professionally isolated when it comes to opportunities to contribute to syllabus development. It is also apparent that teachers in Metropolitan Areas have far more opportunity to mark/moderate external science examinations. Such opportunities for teachers in remote schools would clearly benefit their students.
5. The findings suggest that science teachers in schools which have a relatively large proportion of Indigenous students have a substantially greater need for a range of professional development opportunities, particularly those which would help them cater for student diversity. However, the findings imply that science teachers in schools where Indigenous students make up 21 to 40% of the student population have a greater need for general in-service opportunities and support than do those in other schools

5.4 PROFESSIONAL DEVELOPMENT NEEDS OF ICT TEACHERS

Overall needs

Table 5.5 summarises, at the level of the entire ICT teacher sample, the average scores on the 'need'-transformed items dealing with opportunities for professional interaction and development. The areas of greatest overall 'need' included release from face-to-face teaching for in-school collaborative activities, professional development opportunities for teaching ICT to gifted and talented students, collaboration with ICT teachers in other schools, opportunities for mentoring new staff, professional development opportunities for teaching ICT to special needs students and having effective communication between educational authorities and teachers. Areas of least 'need' overall included opportunities to mark/moderate external ICT assessments, collaboration between ICT teachers in their school and professional development opportunities to help teach ICT to Indigenous students.

Table 5.5 Overall average 'need' scores, standard deviations and valid N for ICT teachers' ratings of the Professional Interaction and Development items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20]

PROFESSIONAL DEVELOPMENT ITEMS	Mean	s.d.	Valid N
Release from face-to-face teaching for collaborative activities	**10.79**	4.00	225
Professional development opportunities: teach ICT to gift/talented students	**10.38**	4.34	214
Collaboration with ICT teachers in other schools	**10.34**	3.88	223
Opportunities for mentoring new staff	**10.22**	4.03	223
Professional development opportunities: teaching ICT to special needs students	**10.21**	4.40	214
Effective communication between education authorities & teachers	**10.17**	3.85	218
Involvement in region/state-wide syllabus development/research projects	**9.93**	3.88	218
Financial support to attend external in-services/conferences	**9.59**	4.01	221
Professional development opportunities teaching ICT to NESB students	**9.46**	4.38	205
Opportunities to attend external in-services/conferences related to teaching ICT	**9.43**	3.49	221
Professional development opportunities: teaching ICT to Indigenous students	**9.33**	4.58	211
Collaboration between ICT teachers in your school	**9.23**	3.79	222
Opportunities to mark/mod external ICT assessments	**9.17**	4.27	214

A principal components analysis of the 'need'-transformed professional interaction and development items (Appendix 5.3) produced three substantive components: Development for Teaching to Targeted Groups, General Personal Professional Development, and Professional Relationships Development. Scores on these three components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. The multivariate tests for differences across the three professional interaction and development components were not significant.

Most of the priority areas for ICT teachers relate to the need for on-the-job training, for example, the need for collaboration both within schools and with ICT teachers in other schools, and for mentoring new staff. This is consistent with the fact that there are relatively fewer ICT teachers in a school than mathematics or science teachers. The response below illustrates this point:

> As the only ICT teacher at the school there is very limited interaction between myself and others in my teaching area. Professional Development opportunities seem to always occur in the city and it is not always possible to drive down there (2 hours) attend the course/seminar and return (ICT teacher, Provincial Area, Qld)

These professional development needs are consistent with the acknowledgement by respondents that they lacked relevant pre-service training in what is a very dynamic field.

Table 5.6 shows the mean ratings and their associated standard errors on the two components across the categories of the comparison variables. The multivariate tests for MSGLC category and percentage of students with Indigenous backgrounds differences across the three professional interaction and development components were not significant.

Table 5.6 Mean ratings by ICT respondents on Professional Interaction and Development item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Professional Interaction & Development Component			
			Development for teaching to targeted groups	**General personal professional development**	**Professional relationships development**	**Valid N**
MSGLC categories	**Metropolitan Area**	Mean	**8.04**	**8.68**	**9.32**	
		s.e. (Mean)	.65	.49	.51	56
	Provincial City	Mean	**10.17**	**9.57**	**10.41**	
		s.e. (Mean)	.62	.47	.48	44
	Provincial Area	Mean	**10.32**	**10.08**	**10.24**	
		s.e. (Mean)	.43	.33	.34	98
	Remote Area	Mean	**11.88**	**10.37**	**10.94**	
		s.e. (Mean)	1.04	.79	.81	17
Percentage of students in your school with Indigenous backgrounds	**0%**	Mean	**9.23**	**9.10**	**9.55**	
		s.e. (Mean)	.84	.63	.67	22
	1 - 20%	Mean	**9.55**	**9.59**	**10.07**	
		s.e. (Mean)	.31	.23	.25	155
	21 - 40%	Mean	**11.88**	**10.47**	**11.04**	
		s.e. (Mean)	.87	.66	.70	19
	> 40%	Mean	**12.25**	**9.91**	**10.13**	
		s.e. (Mean)	1.46	1.11	1.17	7

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Summary of findings and implications

1. The findings strongly suggest that ICT teachers see the need for release from face-to-face teaching for collaborative activities as the highest PD priority.
2. This finding is indicative of what appears to be a need for intensive on-the-job training. This conclusion is supported by ICT respondents' emphasis on the need for collaboration with ICT teachers in other schools, and for mentoring new staff. These priority areas are also consistent with what many respondents regarded as a relative lack of pre-service training in teaching ICT courses (see Chapter Four).
3. The tendency for professional development needs to increase with distance from a metropolitan city was not significant for ICT teachers, indicating that distance may be less of an issue for these teachers than is the case with primary and science teachers. Likewise, differences in the proportions of Indigenous students did not significantly affect levels of need. However, given the pattern across variables, the lack of significant associations may also be due to insufficient cell values.

5.5 PROFESSIONAL DEVELOPMENT NEEDS OF MATHEMATICS TEACHERS

Overall needs

Table 5.7 summarises, at the level of the entire secondary mathematics sample, the average scores on the 'need'-transformed items dealing with opportunities for professional interaction and development. The areas of greatest overall 'need' included professional development opportunities for teaching higher-order thinking skills, classroom management[42] and organisation and alternative teaching methods as well as release from face-to-face teaching for in-school collaborative activities.

Table 5.7 Overall average 'need' scores, standard deviations and valid N for mathematics respondents' ratings of the Professional Interaction and Development items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20]

PROFESSIONAL DEVELOPMENT ITEMS	Mean	s.d.	Valid N
Professional development opportunities: teaching of higher-order skills	**10.70**	3.91	492
Professional development opportunities: classroom management & organisation	**10.47**	4.04	496
Professional development opportunities: alternative teaching methods	**10.34**	3.98	494
Release from face-to-face teaching for collaborative activities	**10.33**	4.25	499
Effective communication between education authorities & teachers	**9.92**	3.72	492
Professional development opportunities: teach mathematics to gift/talented students	**9.89**	3.72	490
Professional development opportunities: integrating technology into math lessons	**9.89**	3.85	497
Professional development opportunities: teaching math to special needs students	**9.77**	3.96	493
Collaboration with mathematics teachers in other schools	**9.65**	3.61	501
Professional development opportunities: methods for using group teaching strategies	**9.60**	3.80	489
Opportunities for observing teaching techniques of colleagues	**9.49**	3.97	499
Workshops to develop your ICT skills	**9.47**	3.82	492
Involvement in region/state-wide syllabus development/research projects	**9.29**	3.90	493
Financial support to attend external in-services/conferences	**9.04**	4.00	498
Opportunities for mentoring new staff	**8.90**	3.68	501
Opportunities to attend external in-services/conferences related to T&L math	**8.76**	3.57	502
Professional development opportunities: use of graphics calculators	**8.75**	3.82	495
Professional development opportunities: outcomes/standards-based teaching	**8.72**	3.87	495
Opportunities to mark/mod external mathematics assessments	**8.62**	3.99	488
Professional development opportunities: teaching mathematics to Indigenous students	**8.40**	4.31	480
Professional development opportunities teaching mathematics to NESB students	**8.29**	3.99	459
Collaboration between mathematics teachers in your school	**7.86**	3.44	500

[42] Note that these two items were not included on the other teacher surveys

Areas of least 'need' overall included collaboration between mathematics teachers in their school and professional development opportunities to help teach mathematics to NESB and Indigenous students.

A principal components analysis of the 'need'-transformed professional interaction and development items (Appendix 5.4) produced four substantive components: Mathematics Teaching Professional Development, General Professional Development, Development for Teaching to Targeted Groups, and Professional Relationships Development. Scores on these four components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC categories and percentage of students with Indigenous backgrounds. Table 5.8 shows the mean ratings and their associated standard errors on the four components across the categories of the comparison variables. The multivariate test for MSGLC category differences across the four professional interaction and development components was not significant.

Table 5.8 Mean ratings by mathematics respondents on Professional Interaction and Development item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Professional Interaction & Development Component				
			Mathematics Teaching Professional Development	General Personal Professional Development	Development for Teaching to Targeted Groups	Professional Relationships Development	Valid N
MSGLC categories	Metropolitan Area	Mean	8.86	8.79	7.95	8.46	
		s.e. (Mean)	.33	.31	.36	.31	119
	Provincial City	Mean	10.00	9.36	9.17	8.54	
		s.e. (Mean)	.32	.30	.35	.30	102
	Provincial Area	Mean	10.19	9.57	9.54	9.38	
		s.e. (Mean)	.23	.21	.25	.21	229
	Remote Area	Mean	10.35	10.12	10.52	10.06	
		s.e. (Mean)	.61	.57	.67	.57	28
Percentage of students in your school with Indigenous backgrounds	0%	Mean	9.24	8.86	7.39	8.68	
		s.e. (Mean)	.42	.39	.45	.39	55
	1 - 20%	Mean	9.73	9.29	9.05	8.92	
		s.e. (Mean)	.16	.15	.17	.15	347
	21 - 40%	Mean	10.66	10.08	10.80	9.70	
		s.e. (Mean)	.50	.46	.53	.47	37
	> 40%	Mean	12.10	11.13	12.41	10.68	
		s.e. (Mean)	.82	.76	.86	.76	14

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with Indigenous student population

The multivariate test comparing the four professional interaction and development components across schools with different percentages of students with Indigenous backgrounds was significant[43]. Follow-up tests revealed that the reasons for this significant multivariate difference was a significant univariate difference on the Development for Teaching to Targeted Groups component and a suggestive difference on the Mathematics Teaching Professional Development component. In each case, respondents from schools with more than 40% Indigenous students, and to a lesser extent from schools where the percentage was between 21% and 40%, indicated substantially greater levels of 'need' in these two components compared to respondents from schools where the percentage was 20% or less.

[43] Wilks' lambda = .912, $F(12, 1172.359) = 3.45$, $p < .001$, partial $\eta^2 = .03$

Figure 5.5 displays the profile plot of the original professional interaction and development 'need' transformed items (ordered by component and labelled across the top of the graph) by percentage of students with Indigenous backgrounds. The figure shows that 'needs' were greatest in all specific areas of Mathematics Teaching Professional Development, but especially development in the areas of classroom management and organisation and alternative teaching methods, for respondents from schools where the percentage of students with Indigenous backgrounds was greater than 20% (but particularly marked for respondents from schools where the percentage exceeded 40%). A similar pattern emerged across the items comprising the Development for Teaching to Targeted Groups component: 'needs' were particularly high in the areas of development for teaching to Indigenous and special needs students for respondents from schools where the percentage of Indigenous students exceeded 40%, even when compared with respondents from schools where the percentage was between 21% and 40%.

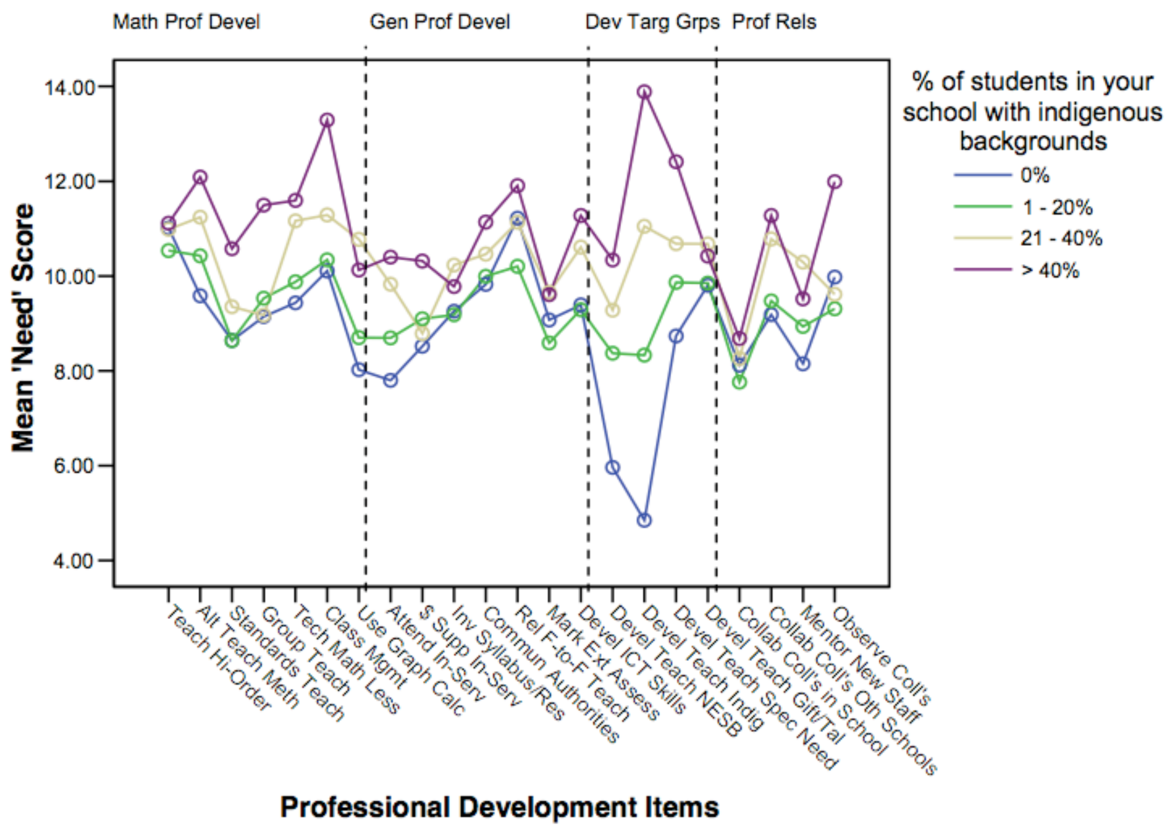

Figure 5.5 Profile plot of mean 'need' scores of mathematics respondents for the Professional Interaction and Development components, compared by percentage of students from Indigenous backgrounds (Table 5.7 for full item names)

Because schools with high Indigenous populations tend to be in Provincial or Remote Areas, it is difficult for teachers to access the professional development opportunities they would find helpful. For example:

> A lot of professional development is available, but at great expense due to distance. It may involve large travel and accommodation cost, and/or extended time away from family. It is very hard to find any help with classroom management and organization. (Mathematics Teacher, Provincial Area, NSW, Indigenous student population 21-40%)

Summary of findings and implications

1. The findings strongly suggest that secondary mathematics teachers throughout Australia see a high need for professional development to help teach higher-order thinking skills, to improve classroom management and to develop alternative teaching methods.
2. There also appears to be a strong need for release from face-to-face teaching for unit programming, and for more effective communication with education authorities.
3. The evidence suggests that mathematics teachers see a substantial need for professional development opportunities to help them cater for student diversity in their classrooms.
4. While there was a pattern in 'need' ratings across MSGLC categories, the differences were not significant, suggesting that the professional development needs of mathematics teachers do not vary as much with location as do those of science and primary teachers.
5. The findings strongly suggest that mathematics teachers in schools with substantial proportions of Indigenous students require more professional development in student management, alternative teaching methods and strategies to cater for student diversity than do those in schools with fewer Indigenous students.

The findings reported in this chapter are discussed in more detail in Chapter Nine, where they are linked to recommendations.

CHAPTER SIX

MATERIAL RESOURCE AND SUPPORT NEEDS OF TEACHERS

6.1 INTRODUCTION

This chapter reports teachers' responses to questions about the material resources and support personnel needed for teaching science, ICT and mathematics. The surveys presented teachers with a set of items relating to these resources, such as textbooks, computers and laboratory equipment, along with support personnel for technical support or to help cater for student diversity. Teachers were asked to rate each item on two scales: the importance of this resource for their current teaching situation, and the availability of this resource at their school. The two ratings for each item were combined to produce a single 'need' rating (see Chapter Three). Teachers were also given the opportunity to comment about resource and support issues not included in the question. The chapter presents the results of analysis of these need ratings across a range of variables for each of the teacher respondent groups. Where appropriate, representative comments are used to illustrate or expand on the findings.

6.2 MATERIAL RESOURCE AND SUPPORT NEEDS OF PRIMARY TEACHERS

Table 6.1 summarises, at the level of the total primary respondent sample, the average scores on the 'need'-transformed items dealing with material resources and support personnel. The areas of greatest overall 'need' related mainly to ICT equipment and support. These included having a suitably skilled assistant to help integrate ICT in the classroom, having suitably skilled ICT support staff, appropriate numbers of computers for student use, and suitable software for teaching and learning science and mathematics. The need for ICT support was reflected in many comments, of which the following are representative:

> We are quite well resourced and have good access to computers. However, the lack of an assistant means there is only the classroom teacher to maintain equipment and order new equipment. (Primary Teacher, Provincial City, NSW)

> We have no ICT support personnel. The technician is $80 an hour and rarely travels to our area. ICT resources are not maintained or serviced well. Other material resources are fine! (Primary Teacher, Provincial Area, WA)

> Our school is well resourced in ICT. However, without a person managing this area in the past one and a half years there have been many problems and I've lost confidence in things/computers/programs working on a given day, so do not rely heavily on this in my learning programs at the present. (Primary Teacher, Remote Area, Qld)

The highest non-ICT need was for suitable learning support assistants, an area that was also identified in respondents' comments:

> Lack of funding means support personnel are only available for certain students/classes where testing has identified them as being below the benchmark or ascertained with special needs. Often classes who need support miss out. Those who receive support may not receive enough. (Primary teacher, Provincial Area, Qld)

Areas of least 'need' overall included worksheets for teaching mathematics and science.

Table 6.1 Overall average 'need' scores, standard deviations and valid N for primary respondents for Material Resources and Support Personnel items (in descending order of mean 'need' score) [Scores can range from 1 to 20] [44]

RESOURCE ITEMS	Mean	s.d.	Valid N
Suitably skilled personnel to assist in integrating ICT in your classroom	**10.23**	4.12	1506
Suitably skilled ICT support staff	**10.07**	4.04	1498
Appropriate numbers of computers for student use	**9.39**	4.01	1505
Suitable software for teaching & learning science & mathematics	**9.17**	3.65	1499
Suitable learning support assistant(s)	**9.08**	3.72	1500
Effective maintenance & repair of teaching equipment	**8.99**	3.42	1486
Computer hardware for your teaching & learning situation	**8.95**	3.76	1513
Adequate consumables for teaching science	**8.72**	3.34	1469
A fast, reliable internet connection	**8.61**	3.55	1517
Suitable equipment for teaching science	**8.55**	3.23	1493
Science & mathematics resources that address the needs of special needs students	**8.51**	3.58	1456
Suitable Indigenous Education Assistants	**8.44**	4.26	1387
Science & mathematics resources that address the needs of gifted & talented students	**8.43**	3.41	1459
Suitable computer resources for teachers use	**8.33**	3.34	1504
Access to a wide range of internet resources	**8.17**	3.22	1515
Adequate consumables for teaching mathematics	**8.00**	2.87	1442
Suitable library resources for teaching & learning science	**7.93**	2.79	1492
Science & mathematics resources that address the needs of Indigenous students	**7.91**	4.01	1389
Science & mathematics resources that address the needs of NESB students	**7.86**	4.04	1340
Suitable equipment for teaching mathematics	**7.76**	2.67	1486
Suitable library resources for teaching & learning mathematics	**7.50**	2.68	1476
Suitable AV equipment	**7.39**	3.03	1467
Worksheets for teaching science	**6.04**	2.81	1471
Worksheets for teaching mathematics	**5.66**	2.58	1461

A principal components analysis of 'need'-transformed material resources and support personnel items (Appendix 6.1) produced four substantive components: ICT Resources and Support, Teaching Resources, Resources for Teaching to Targeted Groups, and Worksheet Resources. Scores on these four components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 6.2 shows the mean ratings and their associated standard errors on the four components across the categories of the comparison variables. The multivariate test for MSGLC category differences across the four material resources and support personnel components was not significant.

[44] The 'needs' scores constitute ordinal rather than interval measures, since they were transformed from ordinal rating scales. While the possible scores range from 1 to 20, an average 'need' score on an item (that is, an item rated midway on both the importance and availability scales) would be about 7.5 rather than 10.

Table 6.2 Mean ratings of primary respondents on Material Resources and Support Personnel item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds[a]

			Material Resources & Support Personnel Component				
			ICT Resources & Support	Teaching Resources	Resources for Teaching to Targeted Groups	Worksheet Resources	Valid N
MSGLC categories	Metropolitan Area	Mean	**8.88**	**7.93**	**8.39**	**5.71**	
		s.e. (Mean)	.20	.16	.22	.19	207
	Provincial City	Mean	**8.82**	**7.93**	**7.99**	**5.64**	
		s.e. (Mean)	.16	.12	.17	.15	326
	Provincial Area	Mean	**9.30**	**8.19**	**8.41**	**5.96**	
		s.e. (Mean)	.10	.08	.11	.10	766
	Remote Area	Mean	**9.24**	**8.31**	**8.91**	**6.01**	
		s.e. (Mean)	.23	.18	.24	.21	154
Percentage of students in your school with Indigenous backgrounds	0%	Mean	**8.95**	**7.96**	**7.83**	**5.57**	
		s.e. (Mean)	.17	.13	.18	.15	296
	1 - 20%	Mean	**9.09**	**8.08**	**8.40**	**5.93**	
		s.e. (Mean)	.09	.07	.10	.08	932
	21 - 40%	Mean	**9.80**	**8.52**	**8.97**	**6.20**	
		s.e. (Mean)	.28	.22	.30	.26	95
	> 40%	Mean	**9.97**	**9.02**	**10.12**	**5.89**	
		s.e. (Mean)	.35	.27	.37	.33	62

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences (p < .001) on a component; light blue shading indicates suggestive differences (p < .01) on a component.

Variation with Indigenous population

The multivariate test comparing the four material resources and support personnel components across schools with different percentages of student with Indigenous backgrounds was significant[45]. Follow-up tests revealed that the reasons for this significant multivariate difference were significant univariate differences on the Teaching Resources and Resources for Teaching to Targeted Groups and a suggestive difference on the ICT Resources and Support component. In each case, respondents from schools having more than 40% of students with Indigenous backgrounds indicated substantially greater levels of 'need' in these three components compared to respondents from schools where the percentage was 20% or less. Figure 6.1 displays the profile plot of the original material resources and support personnel 'need' transformed items by percentage of students with Indigenous backgrounds. Greater 'need' is shown on nearly every material resource and support personnel item for respondents from schools where the percentage of Indigenous students exceeded 40%. However, this trend was especially notable for teaching science and mathematics to Indigenous, special needs and gifted and talented students, having suitable learning support assistants, having sufficient consumables for teaching both science and mathematics, having a wide range of internet resources, having a suitably skilled assistant to help integrate ICT in the classroom and having suitable ICT support staff.

The typical comments below elaborate concerns about assistance and ICT support in schools with high Indigenous student populations:

[45] Wilks' lambda = .969, $F(12, 3638.2) = 5.74$, $p < .001$, partial $\eta^2 = .01$

We have good physical and human resources but have great difficulty accessing Indigenous teacher aides. (Primary Teacher, Remote Area, WA, Indigenous student population >60%)

We have two Aboriginal Education Assistants, but due to large number of Indigenous students AEAs are often not available for classroom activities. ICT support is exceptional given that we have no on-site technical support. It's a combination of a labour of love for interested staff and the fact that school pays local business a retainer (not DET funded) to upgrade and maintain equipment. (Primary Teacher, Provincial City, NSW, Indigenous student population>60%)

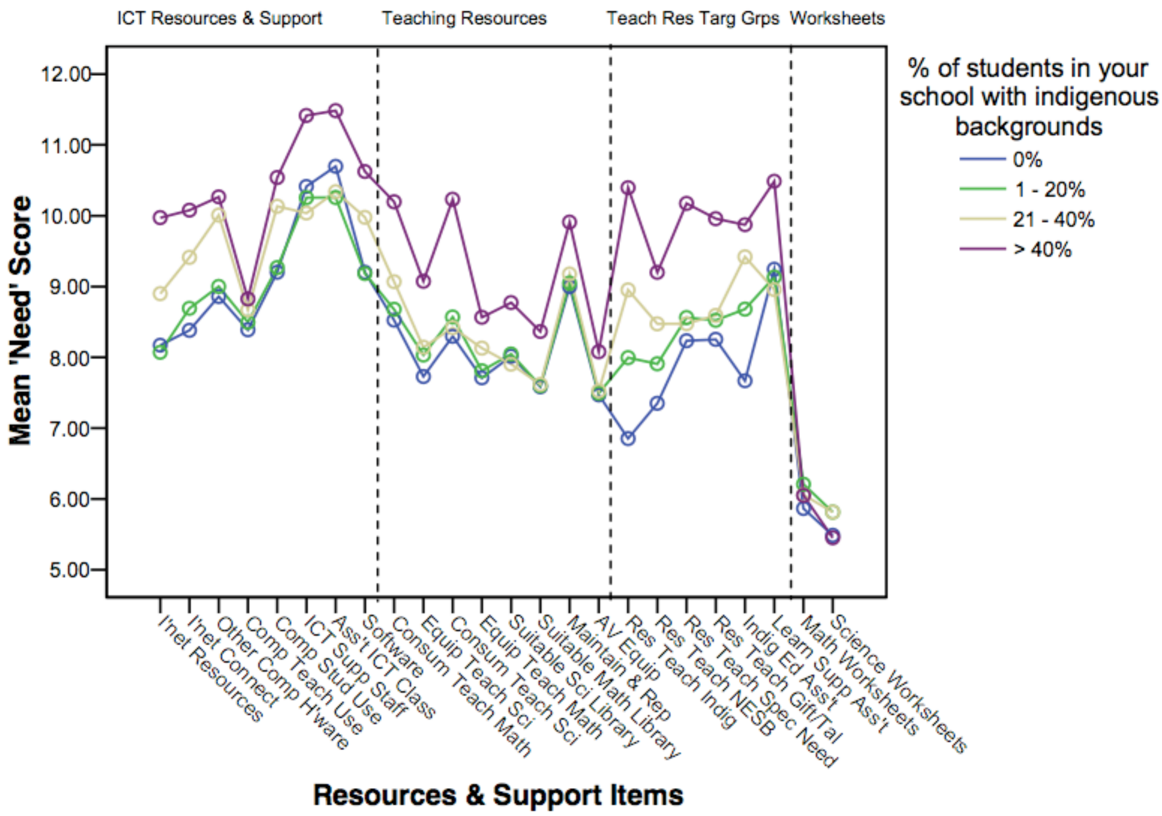

Figure 6.1 Profile plot of mean 'need' scores of primary respondents for the Material Resources and Support Personnel components, compared by percentage of students from Indigenous backgrounds (Table 6.1 for item names in full)

Summary of findings and implications

1. Overall, the findings highlight the priority primary teachers give to adequate ICT resourcing and support. In particular, there appears to be a clear need for additional skilled personnel not only to maintain ICT equipment, but also to help primary teachers incorporate ICT into their teaching.
2. Results indicate that the highest non-ICT need among primary teachers is for learning support assistants. In general, the needs of primary teachers appear to be for support personnel rather than material resources such as books, worksheets or AV equipment.
3. There is strong evidence that primary teachers' needs in many areas increase with the proportion of Indigenous students in their schools. For the most part, these needs relate to resources and support to cater for student diversity in their classrooms – not only for

Indigeneity, but also for special needs and gifted and talented students. This is an important finding, as teachers' 'need' ratings did not vary significantly with MSGLC category of school.

6.2 MATERIAL RESOURCE AND SUPPORT NEEDS OF SECONDARY SCIENCE TEACHERS

Table 6.3. summarises, at the level of the entire science teacher sample, the average scores on the 'need'-transformed items dealing with material resources and support personnel. As was the case among primary respondents, the areas of greatest overall 'need' related to ICT. These included appropriate numbers of computers for student use, having a suitably skilled assistant to help integrate ICT in the classroom, having suitable software for teaching and learning science, having suitable learning support assistant(s) and having other computer hardware for teaching and learning science. Areas of least 'need' overall included worksheets for classroom teaching and having class sets of suitable texts.

Table 6.3 Overall average 'need' scores, standard deviations and valid N for science respondents' ratings of the Material Resources and Support Personnel items (items listed in descending order of mean 'need' score) [Scores can range from 1 to 20]

SCIENCE RESOURCE AND SUPPORT PERSONNEL ITEMS	Mean	s.d.	Valid N
Appropriate numbers of computers for student use	**10.11**	3.83	552
Suitably skilled personnel to assist in integrating ICT in your classroom	**9.80**	4.07	549
Suitable software for teaching & learning science	**9.73**	3.77	542
Suitable learning support assistant(s)	**9.65**	3.60	538
Other computer hardware for teaching & learning science	**9.56**	3.63	542
Suitably skilled ICT support staff	**8.99**	3.76	542
Effective maintenance & repair of teaching equipment	**8.88**	3.60	544
Classroom resources suitable for teaching science to gifted & talented students	**8.85**	3.54	531
Classroom resources suitable for teaching science to special needs students	**8.85**	3.76	520
A fast, reliable internet connection	**8.81**	3.70	551
Suitable computer resources for teachers use	**8.62**	3.71	554
Suitable Indigenous Education Assistants	**8.54**	4.38	518
Access to a wide range of internet science resources	**8.42**	3.49	546
Well-equipped science laboratories	**8.24**	3.10	552
Classroom resources suitable for teaching science to Indigenous students	**8.15**	4.05	519
Classroom resources suitable for teaching science to NESB students	**7.87**	3.89	489
Suitable laboratory assistant(s)	**7.74**	3.70	545
Suitable library resources (e.g., magazines, books) for teaching & learning science	**7.73**	3.24	547
Sufficient laboratory consumables	**7.70**	2.87	548
Suitable AV equipment	**7.33**	2.91	546
Class sets of suitable texts	**6.69**	3.32	543
Worksheets for classroom teaching	**6.01**	2.90	544

A principal components analysis of 'need'-transformed material resources and support personnel items (Appendix 6.2) produced four substantial components: ICT Resources, Teaching Resources for Targeted Groups, General Teaching Resources, and General Teaching Support. Scores on these four components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 6.4 shows the mean ratings and their associated standard errors on the four components across the categories of the comparison variables.

Table 6.4 Mean ratings of science respondents on Material Resources and Support Personnel item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds[a]

			Material Resources & Support Personnel Component				
			ICT Resources	**Teaching Resources for Targeted Groups**	**General Teaching Resources**	**General Teaching Support**	**Valid N**
MSGLC categories	**Metropolitan Area**	**Mean**	**8.45**	**7.27**	**6.51**	**7.89**	
		s.e. (Mean)	.29	.30	.21	.26	135
	Provincial City	**Mean**	**9.37**	**8.80**	**7.44**	**9.00**	
		s.e. (Mean)	.30	.32	.22	.28	113
	Provincial Area	**Mean**	**9.72**	**8.69**	**7.62**	**9.06**	
		s.e. (Mean)	.21	.21	.15	.19	250
	Remote Area	**Mean**	**9.67**	**9.87**	**7.65**	**9.47**	
		s.e. (Mean)	.52	.53	.38	.47	36
Percentage of students in your school with Indigenous backgrounds	**0%**	**Mean**	**9.27**	**7.30**	**7.10**	**8.52**	
		s.e. (Mean)	.42	.43	.30	.38	51
	1 - 20%	**Mean**	**9.22**	**8.33**	**7.14**	**8.67**	
		s.e. (Mean)	.15	.15	.11	.13	402
	21 - 40%	**Mean**	**10.91**	**10.80**	**8.60**	**9.99**	
		s.e. (Mean)	.51	.53	.37	.46	33
	> 40%	**Mean**	**10.10**	**10.34**	**10.10**	**10.63**	
		s.e. (Mean)	.75	.77	.53	.37	16

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences (p < .001) on a component; light blue shading indicates suggestive differences (p < .01) on a component.

Variation with geographic region

The multivariate test for MSGLC category differences across the four material resources and support personnel components was significant[46]. Follow-up tests revealed that the reasons for this significant multivariate difference were significant univariate differences on the Teaching Resources for Targeted Groups and General Teaching Resources components and suggestive differences on the ICT Resources and General Teaching Support components. Teaching Resources for Targeted Groups, General Teaching Resources and General Teaching Support were components exhibiting the highest level of 'need' for respondents from Remote areas and the lowest 'need' for respondents from Metropolitan Areas. In absolute terms, ICT Resources exhibited the highest level of 'need' across the four components and across the four MSGLC categories, followed by General Teaching Support. Comparatively speaking, though, 'need' was highest in the area of ICT Resources for respondents from both Remote and Provincial Areas. Figure 6.2 displays the profile plot of the original material resources and support personnel 'need' transformed items by MSGLC code. The clear trend in Figure 6.2 is that respondents from Metropolitan Areas uniformly indicated a lower level of 'need' across all 22 original material resources and support personnel items. Also particularly notable is that respondents from Remote Areas generally indicated a higher level of 'need' for resources for teaching science to Indigenous and special needs students. Respondents from Provincial Areas and Cities indicated the greatest level of 'need' for having appropriate numbers of computers for student use.

[46] Wilks' lambda = .941, $F(12, 1386.67) = 7.03$, p = .001, partial $\eta^2 = .02$

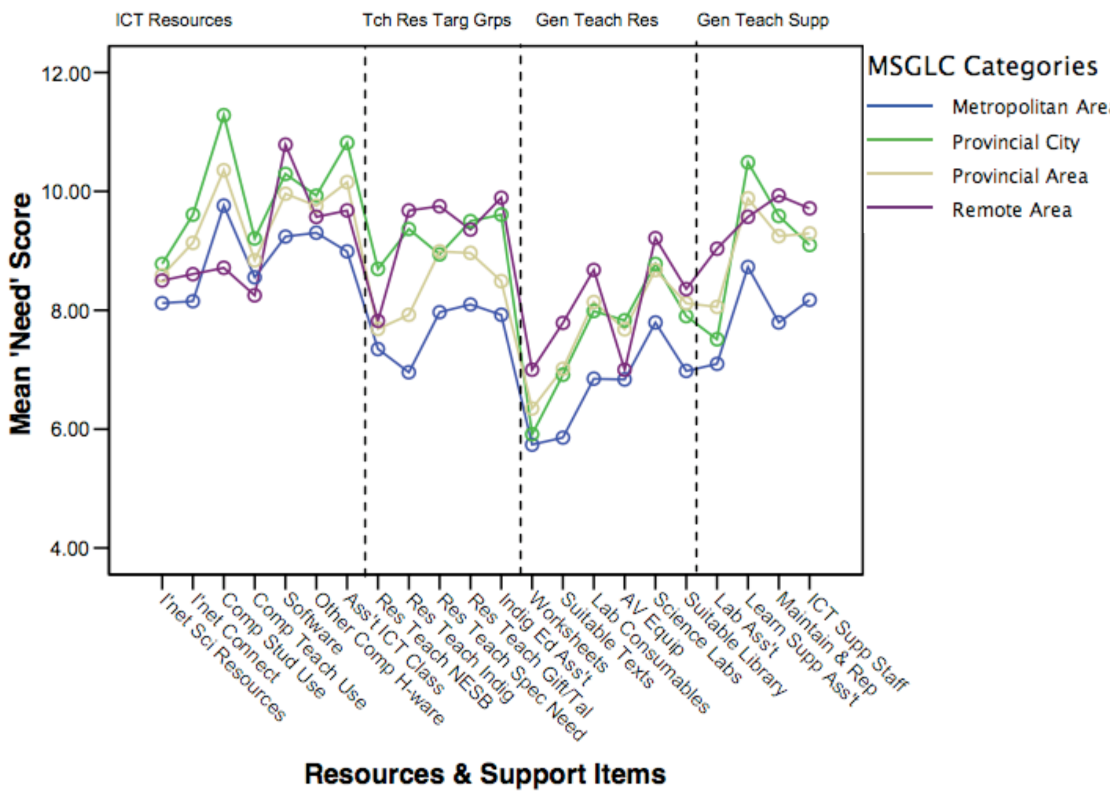

Figure 6.2 Profile plot of mean 'need' scores of science respondents for the Material Resources and Support Personnel components, compared by MSGLC categories

Over forty percent of science respondents' comments about resources concerned the availability and quality of support staff for laboratory assistance, ICT technical help, or learning assistance. The comments were of two general types: expressions of appreciation for existing support staff, or dissatisfaction with the unavailability of such staff. A greater than expected proportion of the first type of comment came from metropolitan science teachers, whereas a greater than expected proportion of the second type of comment came from teachers in Provincial and Remote Areas. For example:

> Excellent and professional lab technicians increase the range of practical activities that can be conducted, and reduce the time taken by individual teachers to prepare pracs. (Science Teacher, Metropolitan Area, NSW)

> Being a rural school makes it difficult to access qualified lab assistants. We only have a 0.2FTE allocation as well, which makes it doubly hard to get someone for one day a week. Material resources aren't really a problem. (Science teacher, Provincial Area, Tas.)

> Adequate resources are available, however the lack of qualified laboratory assistance is a significant issue. A lot of teacher time is spent preparing laboratory work … In addition to poor resourcing there is a massive lack of technical support. Once again teacher time is significantly affected trying to set up and/or fix and maintain resources, particularly technology resources. (Science Teacher, Provincial Area, NSW)

Variation with Indigenous population

The multivariate test comparing the four material resources and support personnel components across schools with different percentages of students with Indigenous backgrounds was significant[47]. Follow-up tests revealed that the reasons for this significant multivariate difference were significant univariate differences on the Teaching Resources for Targeted Groups and General Teaching Resources components and a suggestive difference on the General Teaching Support component. In each case, respondents from schools having more than 21% of students with Indigenous backgrounds indicated substantially greater levels of 'need' in these three components compared to respondents from schools where the percentage was 20% or less. Figure 6.3 displays the profile plot of the original material resources and support personnel 'need' transformed items by percentage of students with

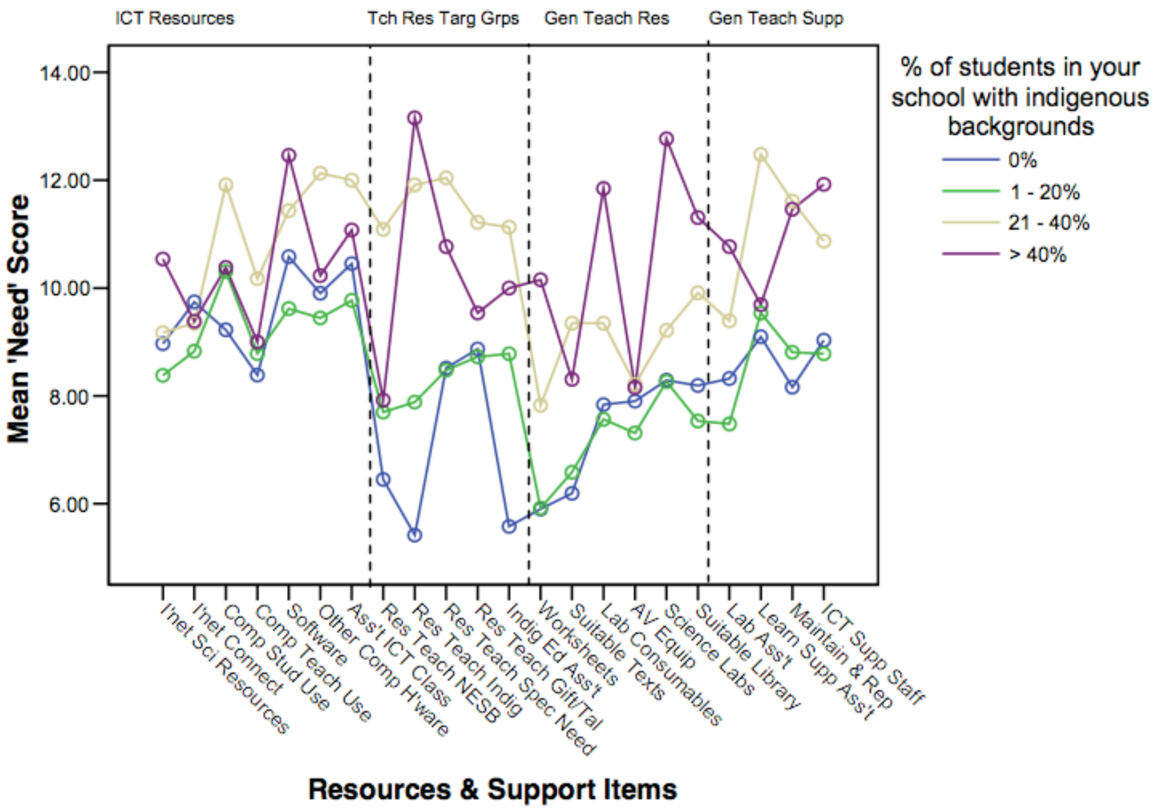

Figure 6.3 Profile plot of mean 'need' scores of science respondents for the Material Resources and Support Personnel components, compared by percentage of students from Indigenous backgrounds

Indigenous backgrounds. The figure shows that 'needs' are greatest in the specific areas of resources for teaching science to Indigenous students, having sufficient laboratory consumables, having well-equipped science laboratories and having suitable ICT support staff for respondents from schools having more than 40% of students with Indigenous backgrounds. In schools where the percentage of students with Indigenous backgrounds was between 21% and 40%, 'needs' were greatest in the specific areas of resources for teaching to all targeted groups, having suitable Indigenous Education Assistants and learning support assistants and having appropriate numbers of computers for student use. In general, however, it is clear that in schools where the percentage of students with Indigenous backgrounds exceeds 20%, 'needs' are greater in most areas.

[47] Wilks' lambda = .873, $F(12, 1302) = 5.74$, $p < .001$, partial $\eta^2 = .04$.

The resourcing priorities identified by respondents in schools with high Indigenous student populations were illustrated by their comments:

> This is a small school, which means the teacher is the Lab Assistant, ICT coordinator, Special Needs teacher, Gifted & Talented assistant, etc. We make do with what we have, and try and find substitutes for what we don't have. (Science teacher, Remote Area, SA, Indigenous student population 21-40%)
>
> ICT support is me … but that is limited by time as I'm often assisting others. Indigenous area is limited and lacking in support staff. We have a good structure to focus on literacies and numeracy [my area as well], and I support others in science resourcing for science challenges and do lab tech work, though poorly due to time limitations. I also take the primary students twice a week with arts/technology focus. (Science teacher, Provincial Area, Tas., Indigenous student population 21-40%)
>
> I am only new to this school (4 weeks) and resources really need to be built up to an acceptable standard. There are Aboriginal support staff, but they are shared across all subjects. (Science teacher, Remote Area, WA, Indigenous student population >40%)

Summary of findings and implications

1. The findings indicate that science teachers in general see ICT infrastructure and support as the highest priority areas for resourcing.
2. Science 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.
3. There is an interesting contrast in the ICT needs of Remote Area science teachers. While their expressed need for computers for students' use was lower than that of teachers in other areas, their need for ICT support staff was considerably higher. The comments of Remote Area science teachers suggest that this may be because remote schools have adequate hardware, but lack access to the technical support to properly maintain and utilise it.
4. Science teachers in schools with relatively high proportions of Indigenous students appear to have a substantially higher level of need for most resources and support. However, this need is not always highest among teachers in schools with the highest proportions of Indigenous students. For many items, teachers in schools with 21-40% Indigenous students indicated a higher need than did those with >40% Indigenous students. One possible explanation is that schools with the highest populations of such students qualify for extra support and/or funding. Further research is needed to investigate this finding.

6.3. MATERIAL RESOURCE AND SUPPORT NEEDS OF SECONDARY ICT TEACHERS

Table 6.5 summarises, at the level of the entire ICT teacher sample, the average scores on the 'need'-transformed items dealing with material resources and support personnel. The areas of greatest overall 'need' included having a suitably skilled assistant to help integrate ICT in the classroom, having skilled ICT management personnel, having suitable learning support assistants, having up-to-date ICT resources for teacher use and effective maintenance and repair of teaching equipment. Areas of least 'need' overall included having worksheets for classroom teaching, suitable library resources and class sets of suitable texts.

Table 6.5 Overall average 'need' scores, standard deviations and valid N for ICT respondents' ratings of the Material Resources and Support Personnel items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20]

ICT RESOURCES AND SUPPORT ITEMS	Mean	s.d.	Valid N
Suitably skilled personnel to assist in integrating ICT in your classroom	**10.14**	4.00	223
Skilled ICT resource management personnel	**9.71**	4.16	217
Suitable learning support assistant(s)	**9.65**	3.77	220
Up-to-date ICT resources for teacher use	**9.43**	3.49	224
Effective maintenance & repair of teaching equipment	**9.32**	3.16	223
ICT resources that address the needs of gifted/talented students	**9.18**	3.95	211
Appropriate number of computers for student use	**9.08**	3.390	225
Suitable Indigenous Education assistant(s)	**8.90**	4.30	210
ICT resources that address the needs of special needs students	**8.87**	3.89	213
Well-equipped learning spaces for teaching ICT	**8.78**	3.31	223
ICT resources that address the needs of NESB students	**8.59**	3.90	198
Suitable AV equipment	**8.55**	3.34	224
Other computer hardware for teaching & learning ICT	**8.48**	3.13	224
Suitable software for teaching & learning ICT	**8.44**	3.03	224
Fast, reliable internet connection	**8.23**	3.65	224
ICT resources that address the needs of Indigenous students	**8.08**	3.91	209
Class sets of suitable texts	**7.60**	3.62	216
Suitable library resources for teaching & learning ICT	**7.58**	3.26	217
Worksheets for classroom teaching	**7.03**	3.01	214

A principal components analysis of 'need'-transformed material resources and support personnel items (Appendix 6.3) produced four substantial components: ICT Resources, Resources for Teaching to Targeted Groups, ICT Teaching Resources and Support, and General Teaching Resources. Scores on these four components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 6.6 shows the mean ratings and their associated standard errors on the four components across the categories of the comparison variables. The multivariate test for percentage of students with Indigenous backgrounds differences across the four material resources and support personnel components was not significant (this would not have been helped by the very low cell size of seven respondents in the over 40% Indigenous percentage category).

Table 6.6 Mean ratings of ICT respondents on Material Resources and Support Personnel item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Material Resources & Support Personnel Component				
			ICT Resources	Teaching resources for targeted groups	ICT teaching resources & support	General teaching resources	Valid N
MSGLC categories	Metropolitan Area	Mean	7.93	7.63	8.57	6.46	
		s.e. (Mean)	.33	.53	.47	.42	56
	Provincial City	Mean	8.41	8.75	9.12	7.08	
		s.e. (Mean)	.32	.50	.45	.40	44
	Provincial Area	Mean	9.13	9.24	10.39	7.68	
		s.e. (Mean)	.22	.35	.32	.28	97
	Remote Area	Mean	8.01	9.30	10.51	9.97	
		s.e. (Mean)	.53	.84	.75	.67	17
Percentage of students in your school with Indigenous backgrounds	0%	Mean	7.69	7.93	9.59	7.82	
		s.e. (Mean)	.43	.68	.64	.59	22
	1 - 20%	Mean	8.48	8.50	9.54	7.38	
		s.e. (Mean)	.16	.25	.23	.22	154
	21 - 40%	Mean	9.81	10.17	10.61	7.31	
		s.e. (Mean)	.43	.67	.63	.59	21
	> 40%	Mean	9.10	9.90	10.11	8.43	
		s.e. (Mean)	.76	1.18	1.11	1.03	7

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with geographic region

The multivariate test comparing the four material resources and support personnel components across schools from different MSGLC categories was significant[48]. Follow-up tests revealed that the reason for this significant multivariate difference was a significant univariate difference on the General Teaching Resources component. Respondents from Remote Area schools indicated substantially greater levels of 'need' on this component compared to respondents from schools in other MSGLC categories. Figure 6.4 displays the profile plot of the original material resources and support personnel 'need' transformed items by MSGLC category. The figure shows that 'needs' for respondents from Remote Areas are greatest in all three specific areas of having worksheets for classroom teaching, having class sets of suitable texts, and having suitable library resources.

While there was no significant geographical difference on the ICT Teaching Resources and Support component, Figure 6.4 shows the higher 'needs' rating given to the contributing item 'ICT Resource Management and Support' by Provincial and Remote Area respondents. This pattern is reflected in the many comments about lack of support, which were dominated by ICT respondents from these areas. For example:

> We are allocated technical support for approximately 3 hours per fortnight from a technician who services something like 15 schools over a huge region (ICT teacher, Remote Area, Vic.)

[48] Wilks' lambda = .829, $F(12, 540.025) = 3.30$, $p < .001$, partial $\eta^2 = .06$

We have one technician to manage a huge number of schools – work that needs to be done is left for months as this person also looks after admin computers. (ICT teacher, Provincial Area, Qld)

This is a joke!!!! I spend almost all of my time providing the resources listed above [questionnaire items]. We run 250 PCs in a school of 1000 plus students. The (education authority) has not allowed for any administration, support or maintenance. They buried their heads in the sand 20 years ago and are still buried (ICT teacher, Provincial Area, NSW).

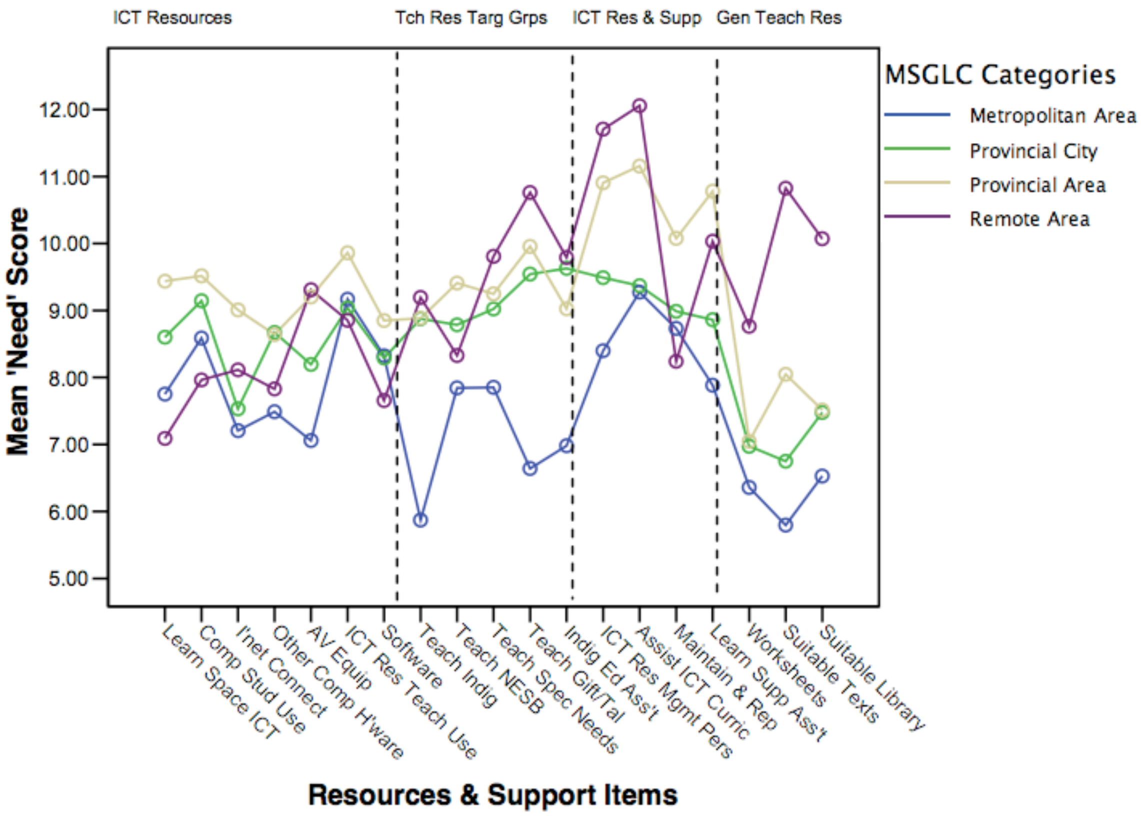

Figure 6.4 Profile plot of mean 'need' scores of ICT respondents for the Material Resources and Support Personnel components, compared by MSGLC categories

6.3.1. ICT resources and time management in schools

ICT teachers were asked to estimate the proportion of their time spent managing and maintaining ICT resources, and for assisting other staff to use ICT resources. They were then asked to estimate the amount of time officially allocated to them for these activities. All three items were recoded into two categories (in order to collapse small *n* cells): 20% or less of their time spent on/allocated to a specific issue and more than 20% of their time spent on/allocated to that issue. Figure 6.5 shows that overall, nearly 40% of respondents indicating spending more than 20% of their time managing and maintaining ICT resources, while about 30% indicated that they spent over 20% of their time assisting other staff to use ICT resources. However, only about 17% indicated that their school actually allocated more than 20% of their time to manage resources and assist other staff.

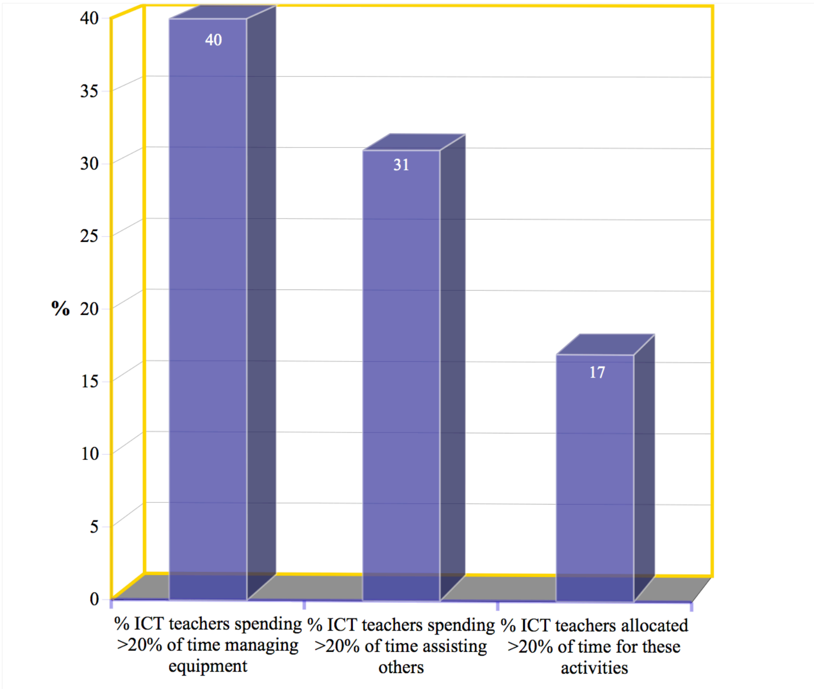

Figure 6.5 Percentages of ICT respondents reporting that >20% of their time is spent managing equipment and assisting others

Table 6.7 summarises the relationships between MSGLC category and the three items on the ICT survey dealing with how much time respondents estimated that they spent in dealing with or were allocated to deal with ICT management issues. There were no significant or suggestive differences in time spent on or allocating managing ICT resources and assisting staff across the MSGLC categories.

ICT respondents' comments highlighted the contrast between the demands placed on them to maintain equipment and support other staff, and the amount of time allocated:

> I am expected to maintain and network software, hardware, develop and enforce policies and procedures, conduct professional development for staff, provide assistance to all staff concerning computer usage, facilitate computers and peripheral booking, system develop and maintain the school's website. I am given (officially) one and a half hours a week to do that. More time is required (and I am a full time teacher). (ICT Teacher, Provincial Area, Qld)

> My role involves managing ICT across the school, as well as maintaining all ICT resources and running three ICT courses (including staff and student discipline). This is far too much for one person to manage. I believe I do none of my jobs to the best of my ability nor do I feel any of the areas under my control are achieving at a level that they should (or could) be … Finding a way to get more than 24hrs in a day would help as well. I work 60 hrs (plus) per week on ICT for my school – this is just to maintain current standards. (ICT teacher, Provincial City, Qld)

> Public schools must be assigned a technical IT support person (Network Administrator) so that all hardware and software is utilised and functioning close to 100% of the time. Teachers should not be Network Administrators, rather they should be teaching and assisting other teachers to integrate ICT into their curriculum. (ICT Teacher, Metropolitan Area, NSW)

Table 6.7 Breakdown of ICT respondents' time management issues by MSGLC category of school [a]

			MCEETYA SGLC codes				
			Metropolitan Area	**Provincial City**	**Provincial Area**	**Remote Area**	*Overall*
Estimated proportion of time spent managing & maintaining ICT resources	**20% of time or less**	**Count**	**34**	**21**	**68**	**11**	**134**
		% of Row	25.4%	15.7%	50.7%	8.2%	100.0%
		% of Column	60.7%	46.7%	67.3%	55.0%	60.4%
	> 20% of time	**Count**	**22**	**24**	**33**	**9**	**88**
		% of Row	25.0%	27.3%	37.5%	10.2%	100.0%
		% of Column	39.3%	53.3%	32.7%	45.0%	39.6%
Estimated proportion of time spent assisting other staff to use ICT resources	**20% of time or less**	**Count**	**35**	**30**	**77**	**13**	**155**
		% of Row	22.6%	19.4%	49.7%	8.4%	100.0%
		% of Column	61.4%	66.7%	76.2%	65.0%	69.5%
	> 20% of time	**Count**	**22**	**15**	**24**	**7**	**68**
		% of Row	32.4%	22.1%	35.3%	10.3%	100.0%
		% of Column	38.6%	33.3%	23.8%	35.0%	30.5%
Estimated proportion of time school allocates to you to manage ICT resources & assist staff	**20% of time or less**	**Count**	**46**	**32**	**87**	**17**	**182**
		% of Row	25.3%	17.6%	47.8%	9.3%	100.0%
		% of Column	80.7%	71.1%	88.8%	85.0%	82.7%
	> 20% of time	**Count**	**11**	**13**	**11**	**3**	**38**
		% of Row	28.9%	34.2%	28.9%	7.9%	100.0%
		% of Column	19.3%	28.9%	11.2%	15.0%	17.3%

[a] Shaded cells indicate categories making a significant ($p < .001$) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; light green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

Summary of findings and implications

1. The findings suggest strongly that ICT teachers in general are most in need of support personnel to help them manage ICT resources and assist teachers and other staff to use these resources effectively. This finding supports the priorities given to greater ICT support by other teacher groups.
2. ICT teachers also expressed a high need for learning support assistants.
3. The results suggest that ICT teachers in non-metropolitan schools have a higher need for a range of resources and support, particularly for addressing student diversity and managing ICT resources. ICT teachers in Remote Area schools have a considerably higher need for basic teaching resources, such as worksheets, texts and library books.
4. The evidence indicates that ICT teachers are spending considerably more time than allocated in managing and maintaining ICT resources, and assisting other staff to use ICT. This increasing demand on their time appears to be the greatest area of concern for many ICT teachers.

6.4 MATERIAL RESOURCE AND SUPPORT NEEDS OF SECONDARY MATHEMATICS TEACHERS

Table 6.8 summarises, at the level of the entire sample, the average scores on the 'need'-transformed items dealing with material resources and support personnel. The areas of greatest overall 'need' included having a suitably skilled assistant to help integrate ICT in the classroom, having appropriate numbers of computers for student use, having suitable learning support assistant(s) and having other computer hardware for teaching and learning mathematics. Areas of least 'need' overall included having worksheets for classroom teaching and having suitable AV equipment.

Table 6.8 Overall average 'need' scores, standard deviations and valid N for mathematics respondents' ratings of the Material Resources and Support Personnel items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20]

MATHEMATICS RESOURCE AND SUPPORT ITEMS	Mean	s.d.	Valid N
Suitably skilled personnel to assist in integrating ICT in your classroom	**9.72**	4.34	517
Appropriate number of computers for student use	**9.44**	3.69	520
Suitable learning support assistant(s)	**9.24**	3.61	523
Other computer hardware for teaching & learning mathematics	**9.06**	3.76	512
Suitable software for teaching & learning mathematics	**8.91**	3.69	520
Suitably skilled ICT support staff	**8.87**	3.75	518
Mathematical resources that address the needs of gifted/talented students	**8.59**	3.48	511
Suitable computer resources for teacher use	**8.58**	3.63	523
Mathematical resources that address the needs of special needs students	**8.57**	3.72	514
Suitable Indigenous Education assistant(s)	**8.21**	4.05	501
Effective maintenance & repair of teaching equipment	**8.07**	3.21	515
Sufficient mathematics equipment & materials	**8.02**	3.03	525
Fast, reliable internet connection	**7.98**	3.68	523
Mathematical resources that address the needs of Indigenous students	**7.91**	4.24	488
Concrete materials for mathematics teaching	**7.85**	3.11	524
Mathematical resources that address the needs of NESB students	**7.80**	4.05	462
Access range of internet mathematics resources	**7.78**	3.45	517
Student access to scientific calculators	**7.55**	3.30	520
Student access to graphics calculators for in class	**6.84**	3.41	519
Class sets of suitable texts	**6.50**	3.22	518
Suitable library resources for teaching & learning mathematics	**6.46**	2.97	515
Suitable AV equipment	**6.39**	3.24	520
Worksheets for classroom teaching	**6.14**	2.77	526

Mathematics respondents' comments about ICT resources helped explain why they, along with the science respondents, tended to rate the need for 'appropriate number of computers for student use' higher than did ICT respondents. These comments concerned the difficulty of gaining access to existing computer labs:

> It's about accessibility. Computers are used up by ICT faculty and seldom accessible for classes. (Mathematics Teacher, Provincial City, NSW)

> Lack of suitable teaching spaces to house ICT is a major problem. ICT classes have consistent access but other subjects trying to integrate ICT into their lessons have trouble booking into a lab. (Mathematics teacher, Provincial Area, Vic.)

> We have three student laboratories. These labs are usually used by computing classes. Some classes are physically unable to access these labs. (Mathematics teacher, Metropolitan Area, ACT)

> We have the 'latest' equipment etc. however it is difficult to access computer labs unless timetabled in. (There are) very few gaps. (Mathematics teacher, Provincial City, Tas.)

Support for students' learning needs was also a high priority with mathematics respondents:

> Class sizes are larger in maths because preparation and marking in Mathematics is seen as less time-consuming. Students with learning difficulties rarely have support personnel in class. (Mathematics teacher, Provincial Area, SA)

A principal components analysis of 'need'-transformed material resources and support personnel items (Appendix 6.4) produced three substantive components: ICT Resources and Support, Mathematics Teaching Resources and Support, and Teaching Resources for Targeted Groups. Scores on these three components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 6.9 shows the mean ratings and their associated standard errors on the three components across the categories of the comparison variables. The multivariate test for MSGLC category differences across the three material resources and support personnel components was not significant.

Table 6.9 Mean ratings of mathematics respondents on Material Resources and Support Personnel item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Material Resources & Support Personnel Component			
			ICT Resources & Support	Mathematics Teaching Resources & Support	Teaching Resources for Targeted Groups	Valid N
MSGLC categories	Metropolitan Area	Mean	8.30	6.65	7.38	
		s.e. (Mean)	.30	.23	.33	122
	Provincial City	Mean	8.68	7.31	7.97	
		s.e. (Mean)	.28	.21	.31	123
	Provincial Area	Mean	9.17	7.21	8.76	
		s.e. (Mean)	.21	.16	.23	233
	Remote Area	Mean	9.33	7.35	8.91	
		s.e. (Mean)	.56	.42	.61	29
Percentage of students in your school with Indigenous backgrounds	0%	Mean	8.32	6.34	6.65	
		s.e. (Mean)	.39	.30	.43	54
	1 - 20%	Mean	8.81	7.12	8.25	
		s.e. (Mean)	.15	.11	.16	368
	21 - 40%	Mean	9.90	7.97	9.83	
		s.e. (Mean)	.44	.34	.48	40
	> 40%	Mean	10.21	8.07	10.23	
		s.e. (Mean)	.73	.56	.79	15

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with Indigenous student population

The multivariate test comparing the three material resources and support personnel components across schools with different percentages of student with Indigenous backgrounds was significant[49]. Follow-up tests revealed that the reasons for this significant multivariate difference were significant univariate differences on the Mathematics Teaching Resources & Support and Teaching Resources for Targeted Groups components. Respondents from schools having more than 21% of students with Indigenous backgrounds indicated substantially greater levels of 'need' in these two components compared to respondents from schools where the percentage was 20% or less. Figure 6.6 displays the profile plot of the original material resources and support personnel 'need' transformed items by percentage of students with Indigenous backgrounds. The figure shows that 'needs' are greatest in the specific areas of resources for teaching mathematics to Indigenous students, having suitable Indigenous Education Assistants, students having access to scientific calculators for respondents and having suitably skilled personnel to assist in integrating ICT in the classroom from schools having more than 40% of students with Indigenous backgrounds. In schools where the percentage of students with Indigenous backgrounds was between 21% and 40%, 'needs' were greatest in the specific areas of resources for teaching to gifted and talented students and having concrete materials for mathematics teaching. In general, however, it is clear that in schools where the percentage of students with Indigenous backgrounds exceeds 20%, 'needs' are greater in most areas.

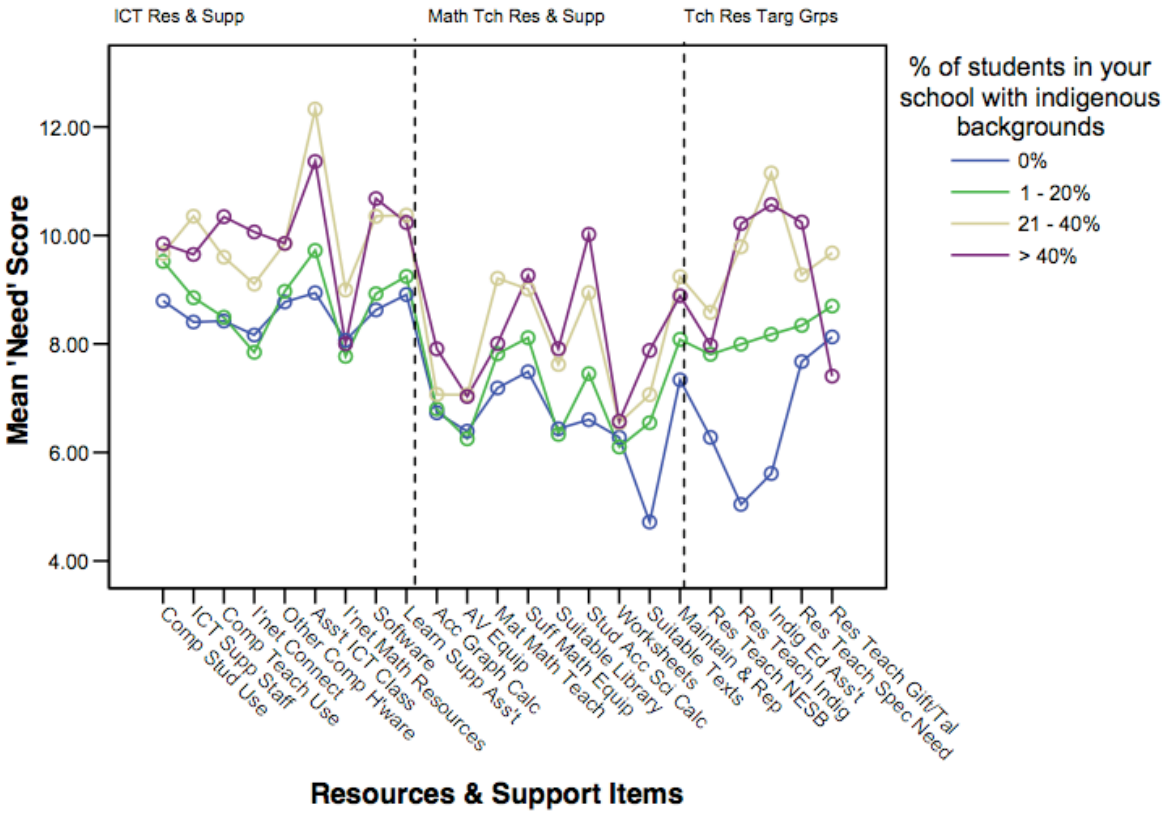

Figure 6.6 Profile plot of mean 'need' scores of mathematics teachers for the Material Resources and Support Personnel components, compared by percentage of students from Indigenous backgrounds

[49] Wilks' lambda = .931, $F(9, 1139.14) = 3.77$, $p < .001$, partial $\eta^2 = .02$

The comments of mathematics respondents from schools with relatively high proportions of Indigenous student illustrate some of their concerns:

> We have one Aboriginal Assistant who works very hard but cannot support all the Indigenous students who need it. We have a large number of students who need STLD (Support Teachers Learning Difficulties) help but have only 0.6 allocation for our school of 1250 students! (Mathematics Teacher, Provincial City, NSW, Indigenous student population 21-40%)

> (It is) difficult to find able Indigenous support personnel. There are generally limited times available and the priority tends to be with literacy support. (Mathematics teacher, Remote Area, NT, Indigenous student population >40%)

Summary of findings and implications

1. The findings indicate that mathematics respondents in general considered ICT equipment and technical support to be their greatest area of resourcing need. Like primary and science teachers, mathematics teachers felt that sufficient computers for student use should be a priority area. Mathematics teachers' comments indicate that their concerns do not necessarily relate to the total number of computers in the school, but the availability of these computers for their classes,
2. Mathematics teachers also see a substantial need for learning support assistants. The findings show a substantial need for resources to cater for the diversity of student abilities in mathematics.
3. In general, schools with moderate to high proportions of Indigenous students appear to be in greater need of most resources. However, the variation in needs across schools with different proportions of Indigenous students illustrates that the greatest needs are not always with schools with the highest Indigenous populations. For many material and personnel resources, teachers in schools with between 21% and 40% Indigenous students expressed a higher need than did those with higher populations.

The findings reported in this chapter are discussed in more detail in Chapter Nine, where they are linked to recommendations.

CHAPTER SEVEN

STUDENT LEARNING OPPORTUNITIES AND EXPERIENCES

7.1 INTRODUCTION

This chapter reports teachers' responses to questions about the needs of their students for a variety of learning experiences and opportunities. The surveys presented teachers with a set of items relating to educational experiences and opportunities such as extension activities, excursions, alternate activities for targeted groups, and a broad range of academic courses. Teachers were asked to rate each item on two scales: the importance of this experience/opportunity for their students' learning, and the availability of this experience/opportunity at their school. The two ratings for each item were combined to produce a single 'need' rating (see Chapter Three). The chapter presents the results of these need ratings across a range of variables for each of the survey respondent groups.

7.2 PRIMARY TEACHERS' VIEWS ON STUDENT LEARNING NEEDS

Table 7.1 summarises, at the level of the entire primary teacher sample, the average scores on the 'need'-transformed items dealing with student learning experiences and opportunities. The areas of greatest overall 'need' include students having opportunities to visit science or mathematics-related educational sites, and having adequate time allocation for teaching to fulfil the syllabus requirements for science. The area of least 'need' overall concerned students being able to participate in external primary competitions and activities in all three subject areas (ICT, science and mathematics).

Table 7.1 Overall average 'need' scores, standard deviations and valid N for primary respondents' ratings of the Student Learning Experience items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20[50]]

PRIMARY STUDENT LEARNING NEEDS ITEMS	Mean	s.d.	Valid N
Opportunities for students to visit science or mathematics related educational sites	**9.84**	3.62	1485
Adequate time allocation for teaching to fulfil the syllabus requirements for science	**9.28**	3.89	1475
Alternative or extension activities in science or mathematics teaching programs for gifted & talented students	**8.93**	3.43	1425
Alternative or extension activities in science or mathematics teaching programs for special needs students	**8.89**	3.53	1413
Adequate time allocation for teaching to fulfil the syllabus requirements for mathematics	**8.76**	3.88	1470
Alternative or extension activities in science or mathematics teaching programs for Indigenous students	**8.48**	3.83	1351
Alternative or extension activities in science or mathematics teaching programs for NESB students	**8.39**	3.87	1316
Student participation in external ICT competitions and activities	**7.07**	3.16	1439
Student participation in external science competitions and activities	**6.67**	2.89	1467
Student participation in external mathematics competitions and activities	**6.60**	2.86	1454

[50] The 'needs' scores constitute ordinal rather than interval measures, since they were transformed from ordinal rating scales. While the possible scores range from 1 to 20, an average 'need' score on an item (that is, an item rated midway on both the importance and availability scales) would be about 7.5 rather than 10.

A principal components analysis of the 'need'-transformed Student Learning Experience items (Appendix 7.1) showed three substantive components: Alternative and Extension Activities for Targeted Groups, External Competitions and Activities for Students, and Time Allocated to Teach Syllabus Requirements. Scores on these three components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 7.2 shows the mean ratings and their associated standard errors on the three components across the categories of the comparison variables.

Table 7.2 Mean ratings by primary respondents on Student Learning Experience item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Student Learning Experience Components			
			Alternative & Extension Activities for Targeted Groups	External Competitions & Activities for Students	Time Allocated to Teach Syllabus Requirements	Valid N
MSGLC categories	Metropolitan Area	Mean	8.34	6.42	9.15	
		s.e. (Mean)	.22	.20	.27	213
	Provincial City	Mean	8.71	6.57	8.78	
		s.e. (Mean)	.17	.16	.21	324
	Provincial Area	Mean	9.02	6.77	9.04	
		s.e. (Mean)	.11	.11	.14	746
	Remote Area	Mean	9.81	7.58	9.10	
		s.e. (Mean)	.25	.23	.31	153
Percentage of students in your school with Indigenous backgrounds	0%	Mean	8.46	6.72	9.09	
		s.e. (Mean)	.18	.17	.22	50
	1 - 20%	Mean	8.88	6.62	8.90	
		s.e. (Mean)	.10	.09	.12	387
	21 - 40%	Mean	10.09	7.31	8.98	
		s.e. (Mean)	.30	.29	.37	35
	> 40%	Mean	10.99	8.26	10.25	
		s.e. (Mean)	.39	.36	.47	16

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with geographic region

The multivariate test for MSGLC category differences across the primary Student Learning Experience components was significant[51]. Follow-up tests revealed that the principal reasons for this significant multivariate difference were significant univariate differences in the mean 'need' scores on the Alternative and Extension Activities for Targeted Groups and External Competitions and Activities for Students components. Respondents from Remote Areas perceived substantially greater 'need' for these two components. Figure 7.1 displays the profile plot of the original primary Student Learning Experience 'need' transformed items by MSGLC category. Within the Alternative/Extension Activities for Targeted Groups component the disparity between the high level of 'need' for opportunities to visit science or mathematics related educational sites, expressed by respondents from Remote Areas and, to a lesser extent by respondents from Provincial Cities and Areas, compared to respondents from other MSGLC categories, especially Metropolitan Areas, was quite marked. Also notable were the relatively

[51] Wilks' lambda = .977, $F(9, 3473.094) = 3.64$, $p < .001$, partial $\eta^2 = .01$

greater levels of 'need' expressed by respondents from Remote Areas for student participation in external competitions and activities in all three subject areas.

The comments of primary respondents in Provincial and Remote Areas provided explanations for their ratings:

> We are isolated from major towns and centres, and excursions require at least two hours just for travel. (Primary teacher, Provincial Area, Qld)

> The biggest obstacle is our inability to visit motivational learning experiences out of the school environment, because of the cost of going on excursions to museums, ScienceWorks etc. Often there are no role models in the community to show the student just how far science and maths can take them. (Primary teacher, Provincial Area, Vic.)

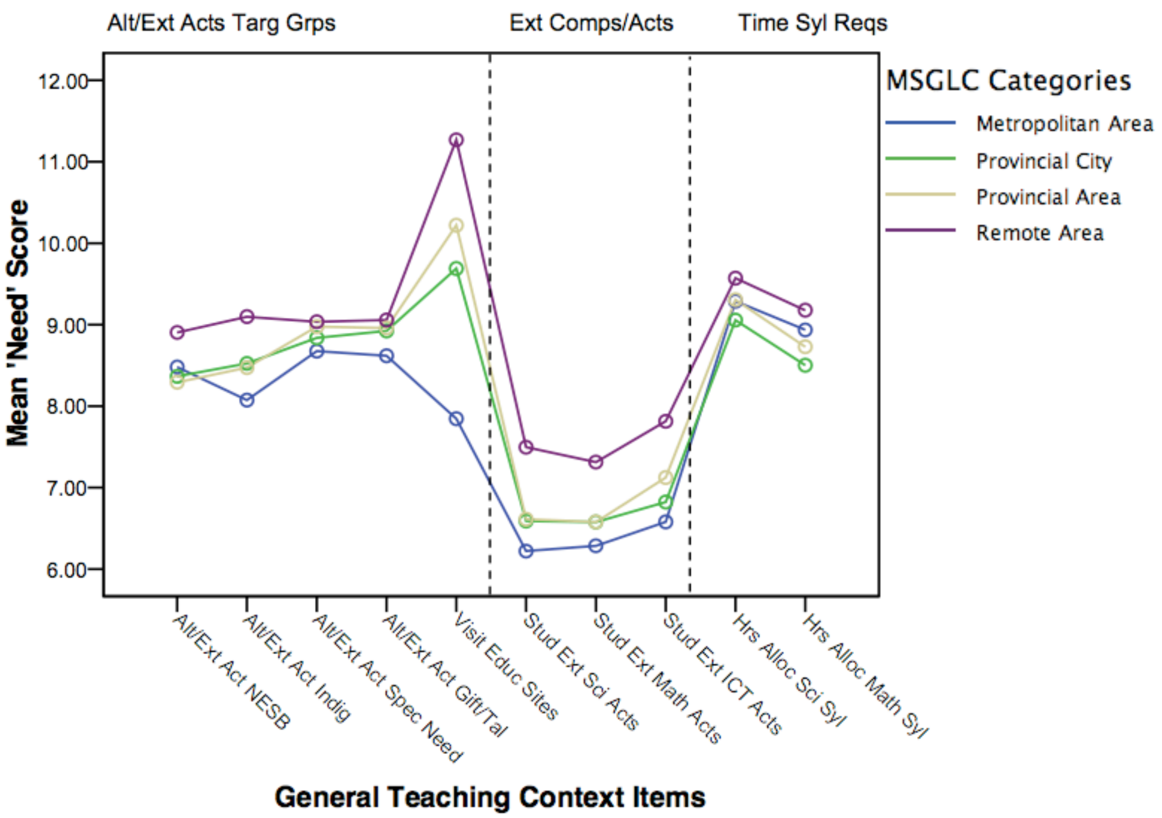

Figure 7.1 Profile plot of mean 'need' scores of primary respondents for the Student Learning Experience components, compared by MSGLC categories (Table 7.1 for item names in full)

Variation with Indigenous student population

The multivariate test for differences between schools having different percentages of students with Indigenous backgrounds across the three primary Student Learning Experience components was significant[52]. Follow-up investigation revealed that the reasons for this significant multivariate difference were significant univariate differences on the Alternative and Extension Activities for Targeted Groups and External Competitions and Activities for

---

[52] Wilks' lambda = .956, $F(9, 3297.865) = 6.83$, $p < .001$, partial $\eta^2 = .02$

Students components. The greatest level of 'need' in these two components was expressed by respondents from schools having a percentage of Indigenous students exceeding 40%, followed by respondents from schools where the percentage was between 21% and 40%. Figure 7.2 displays the profile plot of the original Student Learning Experience 'need' transformed items by percentage of students with Indigenous backgrounds. Within the Alternative/Extension Activities for Targeted Groups component, the disparity between the high level of 'need' for alternative or extension activities for all specific targeted groups of students as well as for opportunities to visit science or mathematics related educational sites, expressed by respondents from schools where greater than 20% of students were from Indigenous backgrounds compared to respondents from other schools, was quite marked. A similar trend was observed for all items comprising the External Competitions and Activities for Students component, albeit at a relatively lower level of absolute 'need'.

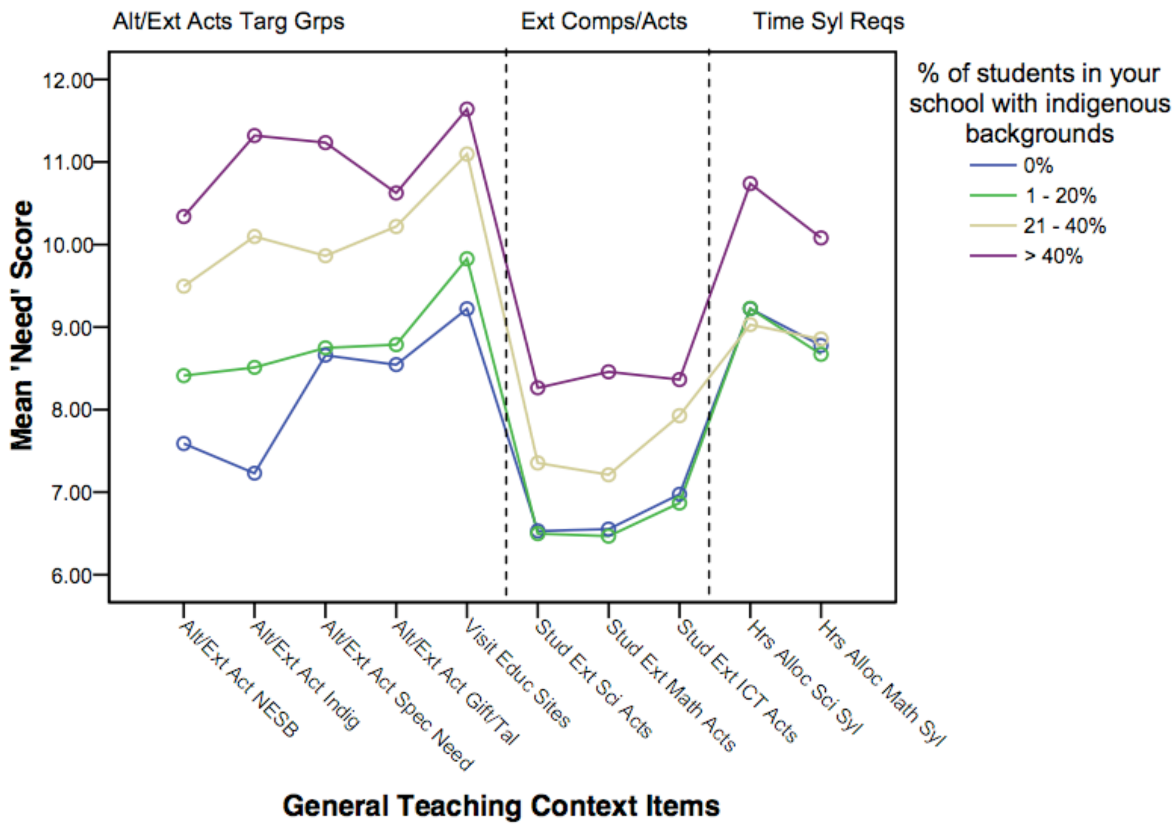

Figure 7.2 Profile plot of mean 'need' scores of primary respondents for the Student Learning Experience components, compared by percentage of students from Indigenous backgrounds (Table 7.1 for item names in full)

A number of respondents commented on the need for alternative activities for engaging Indigenous students:

> The indigenous people have a rich scientific background: their ability to navigate by the stars, read the tides and the seasons is hugely reflective of a culture steeped in scientific and mathematical thinking. This type of thinking could be nurtured in the young ones, but as we have a Western view of science we often forget to explore what has been natural to the local indigenous people for many, many generations. (Primary teacher, Remote Area, Qld)

> More science support materials are required, particularly for Indigenous students and NESB students. (Primary teacher, Provincial Area, WA)

Summary of findings and implication

1. The findings indicate that primary teachers in non-metropolitan schools see a significant need for their students to have more opportunities to visit science or mathematics-related educational sites. Primary teachers in Remote Areas see a substantially greater need than those in other locations for their students to have access to such learning opportunities.
2. There also appears to be some concern that teachers do not have enough time to fulfil the requirement of primary science syllabuses. Teachers in all MSGLC areas shared this concern.
3. The findings suggest that primary teachers generally consider students to have sufficient opportunities to participate in externally organised competitions and activities. However, it seems that primary teachers in Remote Areas see a greater unmet need for more such opportunities than do those in other locations.
4. The findings indicate that teachers in schools with relatively high proportions of Indigenous students see a substantially greater need for a range of learning experiences for their students than do those in schools with fewer Indigenous students. These experiences include alternative and extension activities to cater for the diversity of students and ability levels in their classes, and for opportunities to visit science and mathematics-related educational sites.

7.3 SCIENCE TEACHERS' VIEWS ON STUDENT LEARNING NEEDS

Table 7.3 summarises, at the level of the entire science teacher sample, the average scores on the 'need'-transformed items dealing with the secondary students' learning experiences. The areas of greatest overall 'need' include students having opportunities to visit science-related educational sites, alternative/extension activities in science teaching programs for gifted and talented and for special needs students. The area of least 'need' overall concerned students being able to participate in external science competitions and activities.

Table 7.3 Overall average 'need' scores, standard deviations and valid N for science respondents' ratings of the Student Learning Experience items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20]

STUDENT LEARNING NEEDS ITEMS - SCIENCE	Mean	s.d.	Valid N
Opportunities for students to visit science related educational sites	**10.14**	3.62	545
Alternative or extension activities in science teaching programs for gifted & talented students	**9.69**	3.88	523
Alternative or extension activities in science teaching programs for special needs students	**9.38**	3.98	511
Alternative or extension activities in science teaching programs for NESB students	**8.79**	4.30	496
Alternative or extension activities in science teaching programs for Indigenous students	**8.78**	4.32	513
Having the total indicative hours allocated to face-to-face teaching	**8.48**	3.65	513
Having the full range of senior science courses available in your school	**8.08**	3.53	535
Teachers qualified to teach the science courses offered in your school	**8.03**	2.78	544
Student participation in external science competitions and activities	**6.77**	2.73	543

A principal components analysis of the 'need'-transformed Student Learning Experience items for science (Appendix 7.2) produced three substantive components: Alternative and Extension Activities for Targeted Groups, Teaching Context in the School and Student Learning Opportunities. Scores on these three components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 7.4 shows the mean ratings and their associated standard errors on the three components across the categories of the comparison variables.

Table 7.4 Mean ratings of science respondents on Student Learning Experience item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Student Learning Experience Components			
			Alternative & Extension Activities for Targeted Groups	Teaching Context in the School	Student Learning Opportunities	Valid N
MSGLC categories	Metropolitan Area	Mean	8.24	7.57	6.88	
		s.e. (Mean)	.36	.25	.26	129
	Provincial City	Mean	9.56	8.41	8.60	
		s.e. (Mean)	.38	.26	.27	106
	Provincial Area	Mean	9.20	8.41	9.01	
		s.e. (Mean)	.25	.17	.18	245
	Remote Area	Mean	11.22	8.65	10.20	
		s.e. (Mean)	.62	.43	.44	37
Percentage of students in your school with Indigenous backgrounds	0%	Mean	8.42	8.08	7.93	
		s.e. (Mean)	.51	.35	38	50
	1 - 20%	Mean	8.98	8.15	8.34	
		s.e. (Mean)	.18	.12	.13	387
	21 - 40%	Mean	11.57	9.82	10.20	
		s.e. (Mean)	.60	.41	.44	35
	> 40%	Mean	10.90	7.77	9.96	
		s.e. (Mean)	.90	.61	.66	16

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with geographic region

The multivariate test for MSGLC category differences across the Student Learning Experience components was significant[53]. Follow-up tests revealed that the primary reasons for this significant multivariate difference were significant univariate differences in the mean 'need' scores on the Alternative and Extension Activities for Targeted Groups and Student Learning Opportunities components. Respondents from Remote Areas perceived substantially greater 'need' for these two components. Figure 7.3 displays the profile plot of the original science Student Learning Experience 'need' transformed items by MSGLC category. Within the Alternative/Extension Activities for Targeted Groups component, the disparity between the high level of 'need' for alternative or extension activities for all specific targeted groups, expressed by respondents from Remote Areas compared to respondents in Metropolitan Areas, was quite marked. Within the Student Learning Opportunities component the item that most strongly differentiated respondents from Remote Areas (highest level of 'need') and from Metropolitan Areas (lowest level of 'need') from the rest was perceived need for opportunities for students to visit science related educational sites.

[53] Wilks' lambda = .891, $F(9, 1236.49) = 6.69$, $p < .001$, partial $\eta^2 = .04$

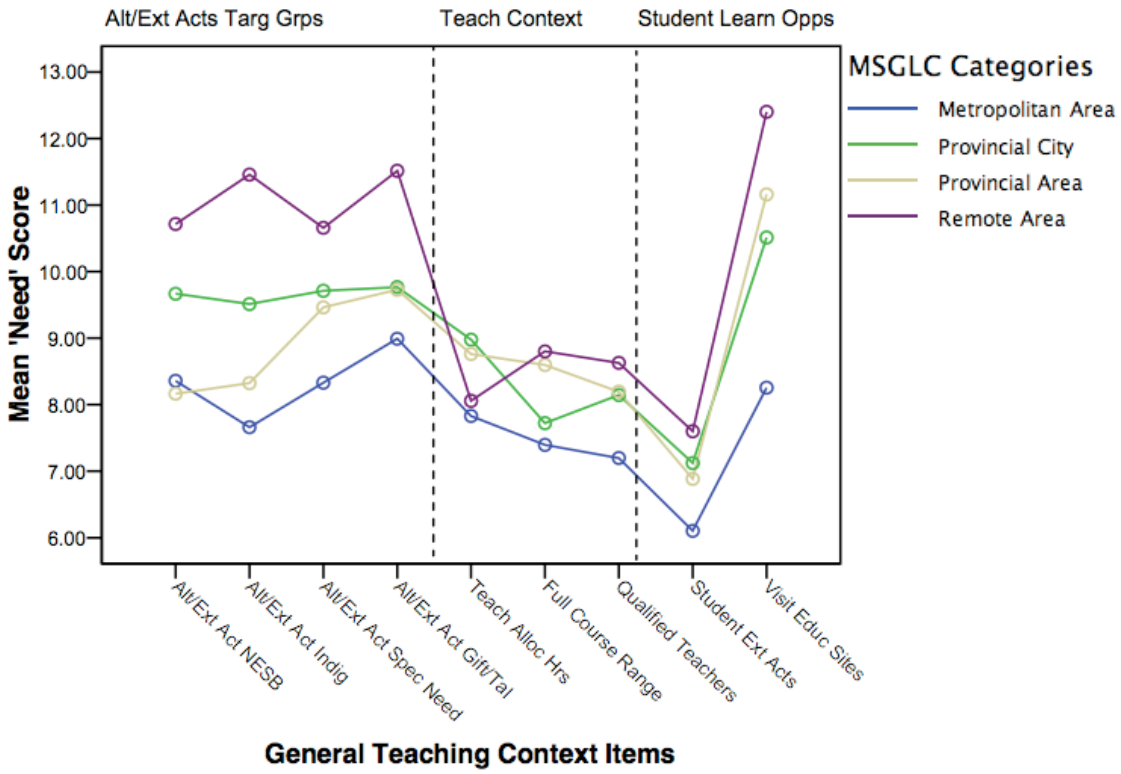

Figure 7.3 Profile plot of mean 'need' scores of science respondents for the Student Learning Experiences components, compared by MSGLC categories (Table 7.3 for item names in full)

The comments of respondents in Provincial and Remote Areas identified distance and cost as major impediments to science excursions:

> As the lack of museums (and) science-based local businesses and places to visit – cost is a big factor in organising excursions here (Science teacher, Provincial Area, Qld).
>
> Distance from venues (e.g. zoo, museum) and the entry costs makes excursions expensive and less well utilised than in the past. (Science teacher, Provincial Area, Vic.).
>
> The problem with excursions to capital cities for Questacon, CSIRO, Taronga Zoo, etc. – is that they all have to be done in one day a year and (are) seen in isolation. (Science teacher, Provincial Area, NSW).

Variation with Indigenous student population

The multivariate test for differences between schools having different percentages of students with Indigenous backgrounds across the three Student Learning Experience components was significant[54]. Follow-up investigations revealed that the reasons for this significant multivariate difference were significant univariate differences on all three components. The greatest level of 'need' in all three components was expressed by respondents from schools having a percentage of Indigenous students between 21% and 40% and the lowest level of 'need' in each case was expressed by respondents from schools with no Indigenous students.

---

[54] Wilks' lambda = .918, $F(9, 1165.91) = 4.61$, $p < .001$, partial $\eta^2 = .03$

Figure 7.4 displays the profile plot of the Student Learning Experience 'need' transformed items by percentage of students with Indigenous backgrounds. Within the Alternative/Extension Activities for Targeted Groups component, the disparity between the high level of 'need' for alternative or extension activities for the specific targeted group of Indigenous students, expressed by respondents from schools where greater than 20% of students were from Indigenous backgrounds compared to respondents from other schools, was quite marked.

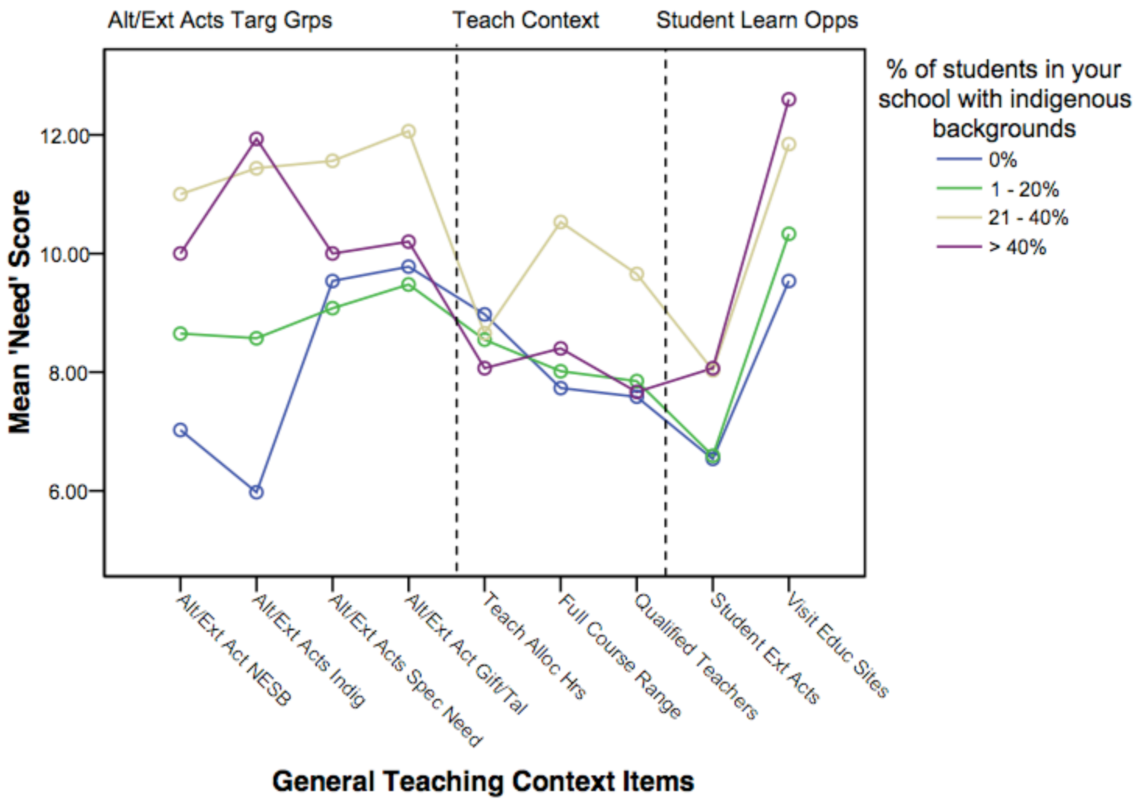

Figure 7.4 Profile plot of mean 'need' scores of science respondents for the Student Learning Experiences components, compared by percentage of students from Indigenous backgrounds (Table 7.3 for item names in full)

Respondents from schools where between 21% and 40% of students were from Indigenous backgrounds indicated a generally high 'need' for alternative or extension activities with respect to all four targeted groups. Within the Teaching Context in the School component having a full range of science courses on offer and having qualified teachers reflected a markedly higher level of 'need' from respondents from schools where between 21% and 40% of students were from Indigenous backgrounds. Within the Student Learning Opportunities component respondents from schools where greater than 20% of students were from Indigenous backgrounds indicated a substantially greater level of 'need' in the areas of student participation in external science competitions and activities and opportunities for students to visit science related educational sites.

Summary of findings and implications

1. The findings indicate that science teachers in non-metropolitan schools see a significant need for their students to have more opportunities to visit science-related educational sites. Science teachers in Remote Areas see a substantially greater need for their students to have access to such learning opportunities.

2. The findings suggest that science teachers in general, and those in Metropolitan Areas in particular, consider students to have sufficient opportunities to participate in externally organised competitions and activities.
3. There appears to be a considerable disparity across locations in teachers' perceptions of the need for alternative or extension science activities to cater for student diversity. The evidence indicates that teachers in Remote Areas see a greater need for such activities than do teachers elsewhere, though in terms of experiences of benefit to NESB and Indigenous students, science teachers in Provincial Cities also see a greater need than do those in Provincial or Metropolitan Areas.
4. The findings show that science teachers in schools with relatively high proportions of Indigenous students see a substantially greater need for a range of learning experiences for their students than do those in schools with fewer Indigenous students. These experiences include alternative and extension activities to cater for the diversity of students and ability levels in their classes, and for opportunities to visit science and mathematics-related educational sites.
5. There is evidence that the greatest need for these experiences is found in schools where Indigenous students make up between 21 and 40% of the student population. Science teachers at these schools seem to feel there is a greater need for qualified teachers, a broader range of science courses and learning experiences for gifted and talented and special needs students, than do those in schools with higher or lower proportions of Indigenous students.

7.4 ICT TEACHERS' VIEWS ON STUDENT LEARNING NEEDS

Table 7.5 summarises, at the level of the entire ICT teacher sample, the average scores on the 'need'-transformed items dealing with the secondary ICT student learning experiences. The areas of greatest overall 'need' include students having opportunities to visit ICT-related educational sites, qualified teachers of ICT, and alternative/extension activities in ICT teaching programs for gifted and talented and for special needs students. The area of least 'need' overall concerned students being able to participate in external ICT competitions and activities.

Table 7.5 Overall average 'need' scores, standard deviations and valid N for ICT respondents' ratings of the Student Learning Experience items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20]

STUDENT LEARNING NEEDS ITEMS - ICT	Mean	s.d.	Valid N
Opportunities for students to visit ICT related educational sites	**9.81**	3.53	219
Teachers qualified to teach the ICT courses offered in your school	**9.47**	3.52	223
Alternative/extension activities in ICT teaching programs for gifted & talented students	**9.21**	3.91	213
Having the full range of senior ICT courses available in your school	**9.04**	3.58	218
Alternative/extension activities in ICT teaching programs for special needs students	**8.99**	3.72	209
Alternative/extension activities in ICT teaching programs for NESB students	**8.92**	3.85	206
Alternative/extension activities in ICT teaching programs for Indigenous students	**8.67**	4.07	206
Having the total indicative hours allocated to face-to-face teaching	**8.19**	3.24	203
Student participation in external ICT competitions and activities	**7.29**	2.72	222

A principal components analysis of the 'need'-transformed Student Learning Experience items (Appendix 7.3) showed three substantive components: Alternative and Extension Activities for Targeted Groups, Teaching Context in the School, and Student Learning Opportunities. Scores on these three components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 7.6 shows the mean ratings and their associated standard errors on the three components across the categories of the comparison variables. The multivariate test for differences in the percentage of students with Indigenous backgrounds across the three Student Learning Experience components was not significant.

Table 7.6 Mean ratings of ICT respondents on Student Learning Experience item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Student Learning Experience Components			
			Alternative/ Extension Activities for Targeted Groups	Teaching Context in the School	Student Learning Opportunities	Valid N
MSGLC categories	Metropolitan Area	Mean	7.08	7.68	7.20	
		s.e. (Mean)	.59	.43	.43	53
	Provincial City	Mean	9.49	9.27	9.09	
		s.e. (Mean)	.55	.40	.40	43
	Provincial Area	Mean	9.41	9.22	8.78	
		s.e. (Mean)	.38	.28	.28	96
	Remote Area	Mean	10.57	9.73	10.63	
		s.e. (Mean)	.95	.69	.68	16
Percentage of students in your school with Indigenous backgrounds	0%	Mean	8.33	8.43	8.67	
		s.e. (Mean)	.79	.58	.58	21
	1 - 20%	Mean	8.67	8.81	8.45	
		s.e. (Mean)	.29	.21	.21	149
	21 - 40%	Mean	10.38	10.13	9.23	
		s.e. (Mean)	.78	.57	.58	20
	> 40%	Mean	10.42	8.13	8.80	
		s.e. (Mean)	1.34	.98	.99	7

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences ($p < .001$) on a component; light blue shading indicates suggestive differences ($p < .01$) on a component.

Variation with geographic region

The multivariate test for differences between schools from different MSGLC categories across the three Student Learning Experience components was also suggestive[55]. Follow-up investigation revealed that the reasons for this suggestive multivariate difference were suggestive univariate differences on the Alternative and Extension Activities for Targeted Groups and Student Learning Opportunities components. Respondents from Remote Area schools perceived a substantially greater 'need' on both components. Figure 7.5 displays the profile plot of the original Student Learning Experience 'need' transformed items (ordered by component and labelled across the top of the graph) by MSGLC category. Within the Alternative/Extension Activities for Targeted Groups component the disparity between the high level of 'need' for alternative or extension activities for all four specifically-targeted student groups, expressed by respondents from Remote schools, and to a lesser extent from Provincial Cities and Areas, compared to respondents from schools in Metropolitan Areas, was quite marked. Within the Student Learning Opportunities component, respondents from Remote Area schools indicated a far greater level of 'need' in the area of opportunities for students to

[55] Wilks' lambda = .891, $F(9, 484.464) = 4.51$, $p = .006$, partial $\eta^2 = .04$

visit ICT-related educational sites compared to all other MSGLC categories; the 'need' was relatively greater for respondents from Provincial Cities and Areas compared to respondents from Metropolitan Areas.

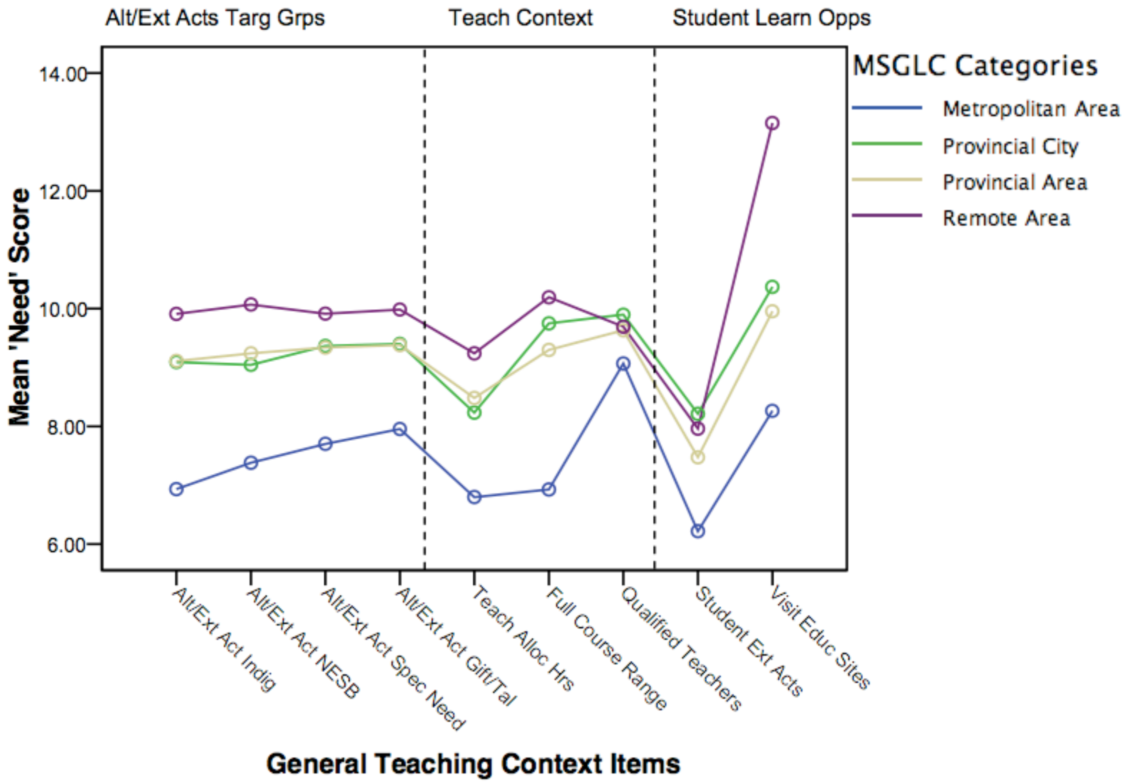

Figure 7.5 Profile plot of mean 'need' scores of ICT respondents for the Student Learning Experience components, compared by MSGLC categories (Table 7.5 for item names in full)

The comments of some ICT respondents in Provincialand Remote Areas reflected on the distance to relevant excursion sites and the time required to organise alternative activities.
For example:

> Remoteness to large business ICT infrastructures for excursion purposes. (ICT teacher, Provincial City NSW)
>
> (we need) more time release for professional development and collaboration for teachers to improve their implementation of ICT rich activities in the classroom. (ICT teacher, Provincial Area, Vic.)

Summary of findings and implications

1. The findings indicate that ICT teachers see a substantial need for their students to have the more opportunities to visit ICT-related sites. This need appears to be very high in remote schools, though ICT teachers in Provincial City schools all perceive a relatively high need for these experiences compared to those in metropolitan schools.
2. The evidence indicates that ICT teachers see a substantially higher need than science and mathematics teachers for qualified teachers in their subject area. The level of this need varies little with MSGLC category of school. This is consistent with findings that

ICT teachers are less formally qualified in their areas than are other subject teachers, and feel a greater need for ongoing professional development and collaboration.

3. ICT teachers also appear to require more alternative or extension activities for gifted and talented students. Teachers felt there was a moderate to low need for their students to participate in more external competitions and activities.
4. While the geographic differences in general were suggestive rather than significant, the findings clearly show that metropolitan ICT teachers perceive a markedly lower need for a range of student experiences than do teachers in other locations.

7.5 MATHEMATICS TEACHERS' VIEWS ON STUDENT LEARNING NEEDS

Table 7.7 summarises, at the level of the entire mathematics teacher sample, the average scores on the 'need'-transformed items dealing with secondary mathematics student learning experiences. The areas of greatest overall 'need' include students having opportunities to visit mathematics-related educational sites, alternative/extension activities in mathematics teaching programs for gifted and talented and for special needs students. The area of least 'need' overall concerned students being able to participate in external mathematics competitions and activities.

Table 7.7 Overall average 'need' scores, standard deviations and valid N for mathematics respondents' ratings of the Student Learning Experience items (items are listed in descending order of mean 'need' score) [Scores can range from 1 to 20]

STUDENT LEARNING NEED ITEMS	Mean	s.d.	Valid N
Opportunities for students to visit mathematics related educational sites	**9.36**	3.70	505
Alternative/extension activities in mathematics teaching programs for gifted & talented students	**9.22**	3.58	500
Alternative/extension activities in mathematics teaching programs for special needs students	**8.86**	3.64	496
Alternative/extension activities in mathematics teaching programs for Indigenous students	**8.47**	4.16	474
Alternative/extension activities in mathematics teaching programs for NESB students	**8.43**	4.05	455
Teachers qualified to teach the mathematics courses offered in your school	**8.15**	3.06	505
Having the total indicative hours allocated to face-to-face teaching	**8.12**	3.48	492
Having the full range of senior mathematics courses available in your school	**7.14**	3.24	506
Student participation in external mathematics competitions and activities	**5.92**	2.49	510

Mathematics respondents' mean need rating for opportunities for students to visit educational sites was lower than that of science, primary and ICT respondents, indicating that this is a moderate rather than high need. In contrast to primary and science respondents, for example, no comments from mathematics respondents referred to excursions or visits.

A principal components analysis of the 'need'-transformed Student Learning Experience items (Appendix 7.4) showed three substantive components: Alternative and Extension Activities for Targeted Groups, Teaching Context in the School, and Student Learning Opportunities. Scores on these three components were analysed using a series of MANCOVAs in order to make specific group comparisons. Two MANCOVAs were conducted comparing mean component 'need' scores by MSGLC category and percentage of students with Indigenous backgrounds. Table 7.8 shows the mean ratings and their associated standard errors on the three components across the categories of the comparison variables. The multivariate test for MSGLC category differences across the three Student Learning Experience components was not significant.

Table 7.8 Mean ratings of mathematics respondents on Student Learning Experience item components, broken down by MSGLC categories and percentage of students with Indigenous backgrounds [a]

			Student Learning Experience Components			
			Alternative/ Extension Activities for Targeted Groups	Teaching Context in the School	Student Learning Opportunities	Valid N
MSGLC categories	Metropolitan Area	Mean	8.39	7.34	6.82	
		s.e. (Mean)	.35	.25	.28	114
	Provincial City	Mean	8.22	7.82	7.19	
		s.e. (Mean)	.33	.23	.27	117
	Provincial Area	Mean	9.27	7.92	8.07	
		s.e. (Mean)	.24	.17	.20	225
	Remote Area	Mean	9.05	8.31	8.53	
		s.e. (Mean)	.64	.46	.52	28
Percentage of students in your school with Indigenous backgrounds	0%	Mean	7.82	6.78	6.52	
		s.e. (Mean)	.45	.32	.36	52
	1 - 20%	Mean	8.71	7.79	7.56	
		s.e. (Mean)	.17	.12	.13	354
	21 - 40%	Mean	9.91	9.17	8.52	
		s.e. (Mean)	.52	.36	.41	37
	> 40%	Mean	10.64	8.01	9.43	
		s.e. (Mean)	.85	.59	.68	14

[a] Shading denotes components where significant or suggestive mean differences exist between the groups being compared. Gold shading indicates significant differences (p < .001) on a component; light blue shading indicates suggestive differences (p < .01) on a component.

Variation with Indigenous student population

The multivariate test for differences between schools having different percentages of students with Indigenous backgrounds across the three Student Learning Experience components was significant[56]. Follow-up investigation revealed that the reasons for this significant multivariate difference were significant univariate differences on the Teaching Context in the School and Student Learning Opportunities components as well as a suggestive difference on the Alternative and Extension Activities for Targeted Groups component. The greatest level of 'need' in the Teaching Context in the School component was expressed by respondents from schools having a percentage of Indigenous students between 21% and 40%, and the lowest level of 'need' in each case was expressed by respondents from schools with no Indigenous students.

Figure 7.6 displays the profile plot of the original Student Learning Experience 'need' transformed items by percentage of students with Indigenous backgrounds. Within the Alternative/Extension Activities for Targeted Groups component, the disparity between the high level of 'need' for alternative or extension activities for the specific targeted groups of NESB, Indigenous and special needs students, expressed by respondents from schools where greater than 40% of students were from Indigenous backgrounds compared to respondents from other schools, was quite marked. Respondents from schools where between 21% and 40% of students were from Indigenous backgrounds indicated generally high 'need' for alternative or extension activities with respect to all four targeted groups. Within the General School Teaching Context component, having a full range of mathematics courses on offer and having total indicative hours allocated to face-to-face teaching reflected a markedly higher level of 'need' from respondents from schools where between 21% and 40% of students were from Indigenous backgrounds; having qualified teachers was at a high level of need for respondents from schools where the percentage of student with Indigenous backgrounds exceeded 20%.

[56] Wilks' lambda = .915, $F(9, 1090.465) = 4.51$, $p < .001$, partial $\eta^2 = .03$

Within the Student Learning Opportunities component, respondents from schools where greater than 20% of students were from Indigenous backgrounds indicated a substantially greater level of 'need' in the area of opportunities for students to visit mathematics related educational sites (the 'need' was relatively greater for respondents from schools where more than 40% of students had Indigenous backgrounds).

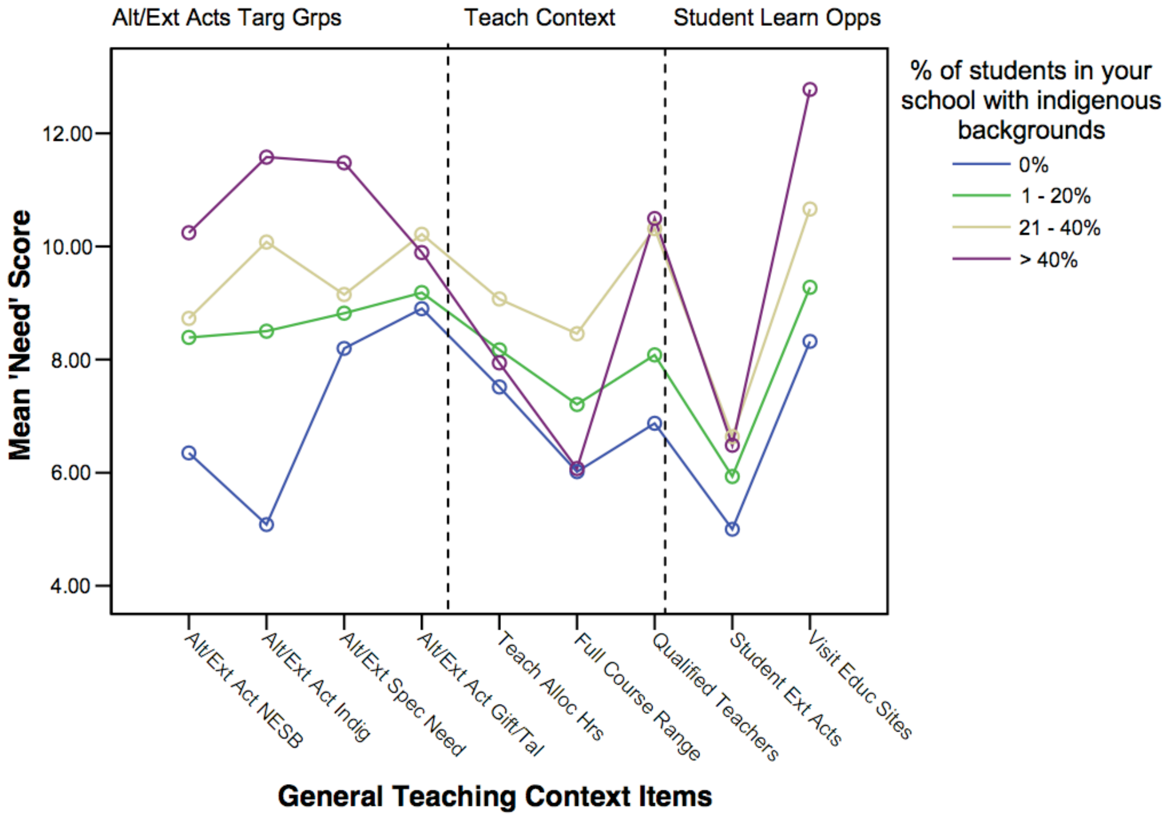

Figure 7.6 Profile plot of mean 'need' scores of mathematics respondents for the Student Learning Experience components, compared by percentage of students from Indigenous backgrounds (Table 7.7 for item names in full)

Summary of findings and implications

1. The findings indicate that mathematics teachers see a need for their students to have more opportunities to visit mathematics-related educational sites, though the overall need rating was not as high as for science respondents. Mathematics teachers also see a need for alternative/extension activities for gifted and talented and special needs students. The geographic trend found among other teacher groups was not significant for mathematics teachers thus suggesting that the need for these experiences is more general.
2. Teachers felt there was a moderate-to-low need for their students to participate in more external mathematics competitions and activities.
3. The greatest level of 'need' in the Teaching Context in the School component was expressed by respondents from schools having a percentage of Indigenous students between 21% and 40% and the lowest level of 'need' in each case was expressed by respondents from schools with no Indigenous students.
4. The findings indicate that mathematics teachers in schools with high proportions of Indigenous students perceive a higher need for activities which cater for students with

special needs, and for opportunities to visit educational sites. Mathematics teachers in schools where more than 20% of students are Indigenous tend to feel there is a need for more qualified teachers.

7.6 STUDENTS LEARNING IN COMPOSITE CLASSES

Secondary teachers were asked whether senior science, ICT or mathematics courses at their schools were being taught in composite classes (e.g. Years 11 and 12 physics students taught in the same class) in order to have sufficient numbers to offer courses in these subject areas. Overall, more than 27% of secondary respondents indicated that at least some senior science, ICT or mathematics courses were taught in composite classes in their schools. Figure 7.7 shows that a greater percentage of ICT respondents reported this arrangement for their senior classes compared with science or mathematics respondents.

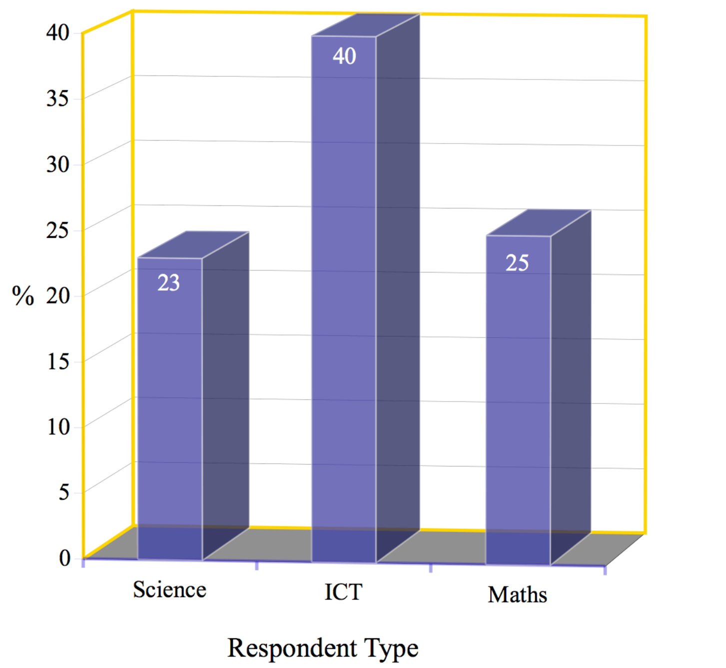

Figure 7.7 Percentages of secondary respondents in different subject areas indicating that composite senior courses in these subjects were taught in their schools

Table 7.9 summarises the variations in responses to this question across MSGLC categories. For each subject area, MSGLC category and secondary courses being taught in composite classes were significantly associated[57]. This was primarily due to significantly fewer respondents than expected from Metropolitan Areas and significantly more respondents than expected from Provincial and Remote Areas coming from schools where some secondary courses in these subject areas were taught in composite classes.

[57] Science: $\chi^2(3) = 46.43$; $p < .001$; Cramer's V = .29; ICT: ($\chi^2(3) = 67.56$; $p < .001$; Cramer's V = .36; Mathematics: $\chi^2(3) = 67.56$; $p < .001$; Cramer's V = .36.

Table 7.9 Science, ICT and mathematics respondents reporting senior courses taught in composite classes, by MSGLC categories [a]

			MSGLC categories				
			Metropolitan Area	Provincial City	Provincial Area	Remote Area	*Overall*
Are some science courses taught in composite classes?	No	Count	132	103	176	25	436
		% within Row item	30.3%	23.6%	40.4%	5.7%	100.0%
		% within MSGLC	91.0%	87.3%	67.4%	56.8%	76.8%
	Yes	Count	13	15	85	19	132
		% within Row item	9.8%	11.4%	64.4%	14.4%	100.0%
		% within MSGLC	9.0%	12.7%	32.6%	43.2%	23.2%
Are some ICT courses taught in composite classes?	No	Count	44	30	57	4	135
		% within Row item	32.6%	22.2%	42.2%	3.0%	100.0%
		% within MSGLC	77.2%	69.8%	53.3%	20.0%	59.5%
	Yes	Count	13	13	50	16	92
		% within Row item	14.1%	14.1%	54.3%	17.4%	100.0%
		% within MSGLC	22.8%	30.2%	46.7%	80.0%	40.5%
Are some mathematics courses taught in composite classes?	No	Count	129	105	154	11	399
		% within Row item	32.3%	26.3%	38.6%	2.8%	100.0%
		% within MSGLC	92.8%	82.7%	65.0%	34.4%	74.6%
	Yes	Count	10	22	83	21	136
		% within Row item	7.4%	16.2%	61.0%	15.4%	100.0%
		% within MSGLC	7.2%	17.3%	35.0%	65.6%	25.4%

[a] Shaded cells indicate categories making a significant ($p < .001$) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; Light green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

The overall pattern across MSGLC categories is illustrated in Figure 7.8. Only 11% of Metropolitan Area respondents, and 17% of Provincial City respondents, reported that composite science, ICT or mathematics classes were held in their schools. By contrast, 36% of those in Provincial Areas and 58% of those in Remote Areas reported this arrangement.

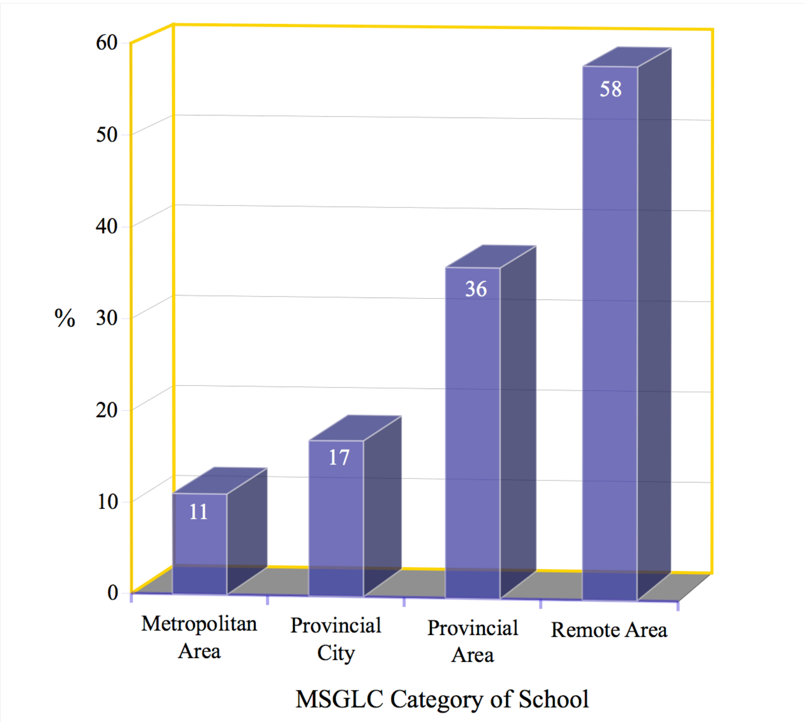

Figure 7.8 Percentages of secondary teachers in different MSGLC categories indicating that science, ICT or mathematics courses were taught in composite classes

Respondents outlined some of the reasons for, and implications of, this arrangement:

> …the loss of specialist teachers results in teachers teaching out of their subject area and teaching composite stage classes. (Science teacher, Provincial Area, NSW)

> It is a significant compromise for student learning to have composite classes in senior science. To be successful, composite classes require students with a high degree of self-motivation, and independent learning skills. Many students in this school are from disadvantaged homes: single parent, low income, dysfunctional family. Because the school has a small population, the more capable, and talented students are few in number, and have a significant pressure on them to fit the mould of under-performing. (Science teacher, Provincial Area, NSW)

> …changes to syllabus requirements then impose great strain upon the teacher who is trying to cope with two different year levels with different spirits to their course requirements. (Science teacher, Provincial Area, Qld)

The findings reported in this chapter are discussed in more detail in Chapter Nine, where they are linked to recommendations.

CHAPTER EIGHT

PARENTS/CAREGIVERS' PERSPECTIVES ON THEIR CHILDREN'S SCIENCE, ICT AND MATHEMATICS EDUCATION

8.1 INTRODUCTION

This chapter reports the perceptions of respondent parents/caregivers about a range of issues relating to their children's science, ICT and mathematics education. Parents/caregivers were invited to complete the survey with reference to the school attended by their eldest school-age child, and to give their perceptions of the educational experiences of that child. Additional questionnaires could be completed if parents/caregivers also wished to refer to schools attended by younger school-age children.

Interpretations of the results presented in this chapter should recognise that while parents/caregivers have a unique and valuable perspective on their children's schooling, they are often a step removed from specific school processes and dynamics. To maximise the reliability of responses, a 'don't know' option was provided for many items on the survey. One implication of this was that the number of useable responses on some items was less than the total number of respondents. Overall, useable responses were received from 928 parents/caregivers.

Parents/caregivers were also given ample opportunity to provide comments and explanations. These were categorised and analysed for common themes, and variation with respondent and school characteristics. Illustrative comments are used throughout the chapter.

8.2 CHARACTERISTICS OF PARENT/CAREGIVER RESPONDENTS

Table 8.1 provides a breakdown of the respondent sample by State/Territory, School System and MSGLC Category of School. About 70% of respondents were located in just three states: NSW, Queensland and Victoria, while about 72% responded with reference to a government school.

Overall, just over 74% of the parents/caregivers were female. Table 8.2 details the schooling circumstances of children referred to by respondents. Over 53% of respondents had two or more children attending the reference school. Nearly 60% of the respondents indicated that their eldest child attending the school was primary-aged. Almost all (nearly 98%) of respondents indicated that their child was a day student.

Table 8.1 Distribution of parent/caregiver respondents by State/Territory, School System and MSGLC categories of School

		School System			MSGLC Category of School				
State		**Government**	**Catholic Systemic**	**Independent**	**Metropolitan city**	**Provincial City**	**Provincial Area**	**Remote Area**	*Overall*
NSW	**Count**	**218**	**45**	**31**	**53**	**66**	**166**	**9**	**294**
	% of Row	74.1%	15.3%	10.5%	18.0%	22.4%	56.5%	3.1%	100.0%
	% of Column	32.7%	34.9%	23.5%	33.3%	35.5%	34.1%	9.4%	31.7%
QLD	**Count**	**152**	**27**	**24**	**23**	**39**	**105**	**36**	**203**
	% of Row	74.9%	13.3%	11.8%	11.3%	19.2%	51.7%	17.7%	100.0%
	% of Column	22.8%	20.9%	18.2%	14.5%	21.0%	21.6%	37.5%	21.9%
VIC	**Count**	**103**	**17**	**33**	**19**	**33**	**100**	**1**	**153**
	% of Row	67.3%	11.1%	21.6%	12.4%	21.6%	65.4%	.7%	100.0%
	% of Column	15.4%	13.2%	25.0%	11.9%	17.7%	20.5%	1.0%	16.5%
SA	**Count**	**87**	**11**	**28**	**30**	**0**	**87**	**9**	**126**
	% of Row	69.0%	8.7%	22.2%	23.8%		69.0%	7.1%	100.0%
	% of Column	13.0%	8.5%	21.2%	18.9%		17.9%	9.4%	13.6%
WA	**Count**	**72**	**22**	**11**	**31**	**17**	**26**	**31**	**105**
	% of Row	68.6%	21.0%	10.5%	29.5%	16.2%	24.8%	29.5%	100.0%
	% of Column	10.8%	17.1%	8.3%	19.5%	9.1%	5.3%	32.3%	11.3%
TAS	**Count**	**10**	**3**	**4**	**0**	**14**	**3**	**0**	**17**
	% of Row	58.8%	17.6%	23.5%		82.4%	17.6%		100.0%
	% of Column	1.5%	2.3%	3.0%		7.5%	.6%		1.8%
NT	**Count**	**24**	**2**	**1**	**0**	**17**	**0**	**10**	**27**
	% of Row	88.9%	7.4%	3.7%		63.0%		37.0%	100.0%
	% of Column	3.6%	1.6%	.8%		9.1%		10.4%	2.9%
ACT	**Count**	**1**	**2**	**0**	**3**	**0**	**0**	**0**	**3**
	% of Row	33.3%	66.7%		100.0%				100.0%
	% of Column	.1%	1.6%		1.9%				.3%
	Count	**667**	**129**	**132**	**159**	**186**	**487**	**96**	**928**
	% of Row	71.9%	13.9%	14.2%	17.1%	20.0%	52.5%	10.3%	100.0%
	% of Column	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 8.2 School-related characteristics of families

	Characteristic	**Count**	**%**
Number of children attending this school	1 child	**428**	46.5%
	2 children	**362**	39.3%
	3 or more children	**130**	14.1%
In what year level is the eldest child at this school?	Kindergarten/Lower primary	**175**	19.1%
	Upper primary	**369**	40.2%
	Junior secondary	**167**	18.2%
	Senior secondary	**206**	22.5%
Is your child a day/ boarder/distance education student?	Day student	**897**	97.7%
	Boarding student	**9**	1.0%
	Distance education student only	**12**	1.3%

8.3 TRAVEL TIME TO SCHOOL

About 82% of parents/caregivers reported that their children had to travel less than half an hour to school. Table 8.3 shows that there was no significant association between MSGLC Category of School and how long a child had to travel to get there. While the figures showed that a greater proportion of children in Remote Areas travelled for longer than one-half hour, this was a very weak trend.

Table 8.3 Parents/caregivers estimates of time taken for children to travel to school [a]

			Metropolitan Area	Provincial City	Provincial Area	Remote Area	*Overall*
If child is a day student, how long to travel to school?	**< Half an hour**	**Count**	**135**	**150**	**385**	**66**	**736**
		% of Row	18.3%	20.4%	52.3%	9.0%	100.0%
		% of Column	87.1%	84.3%	81.1%	71.7%	81.8%
	One-half to one hour	**Count**	**17**	**23**	**78**	**23**	**141**
		% of Row	12.1%	16.3%	55.3%	16.3%	100.0%
		% of Column	11.0%	12.9%	16.4%	25.0%	15.7%
	> One hour	**Count**	**3**	**5**	**12**	**3**	**23**
		% of Row	13.0%	21.7%	52.2%	13.0%	100.0%
		% of Column	1.9%	2.8%	2.5%	3.3%	2.6%

[a] Shaded cells indicate categories making a significant ($p < .001$) contribution to the overall association between a pair of variables. Pink means *more than an expected number were observed*; green means *fewer than an expected number were observed*. 'Expected' refers to what would be expected if the pair of variables were not associated.

8.4 PARENTS/CAREGIVERS' ASPIRATIONS FOR THEIR CHILDREN

Parents/caregivers were asked to rate how important they considered it that their children complete four educational 'landmarks': the final year of compulsory schooling (Year 10 in most states/territories), the final year of schooling (Year 12), a technical course at an Institute of Technical and Further Education (TAFE), and a university degree. Two MANCOVAs were conducted, one each for MSGLC Category of School and School System. Table 8.4 shows that, overall, there were no significant associations between the educational aspirations of parents/caregivers and these variables when controlling for Total FTE (proxy for school size), MWHI (median weekly household income) and SES Index (socio-economic status of the area where the school was located).

It was recognised, however, that the control variables of SES Index and MWHI had a considerably larger modifying effect on results from analysis of parent/caregiver aspirations than was the case for other MANCOVAs. For example, in uncontrolled analyses, it was found that parent/caregiver aspirations for their children to complete a university degree were significantly associated with MSGLC category. Indeed, in this treatment, parents in Metropolitan Areas were about twice as likely as those in Remote Areas to consider it extremely important that their children complete a degree. This is an intriguing finding and one worthy of further investigation. Nevertheless, it is outside the established boundaries of this study's MANCOVA analyses.

Table 8.4 Breakdown of the parent/caregiver aspiration items, by MSGLC categories and School System [ratings on 1 (Not at all Important) to 5 (Extremely Important) scale][a]

			Parent/Caregiver's aspiration for child to:				
			Complete Year 10	Complete Year 12	Complete a TAFE Course	Complete a University Degree	Valid N
MSGLC categories	Metropolitan Area	Mean	4.88	4.55	3.46	3.73	
		s.e.(Mean)	.05	.08	.12	.12	126
	Provincial City	Mean	4.80	4.47	3.08	3.37	
		s.e.(Mean)	.05	.07	.10	.11	153
	Provincial Area	Mean	4.85	4.44	3.12	3.36	
		s.e.(Mean)	.03	.04	.06	.06	407
	Remote Area	Mean	4.71	4.47	2.98	3.27	
		s.e.(Mean)	.06	.10	.15	.15	75
School System	Government	Mean	4.83	4.47	3.19	3.35	
		s.e.(Mean)	.02	.04	.05	.05	549
	Catholic Systemic	Mean	4.91	4.52	3.18	3.62	
		s.e.(Mean)	.05	.08	.12	.12	110
	Independent	Mean	4.80	4.38	2.94	3.52	
		s.e.(Mean)	.05	.08	.12	.12	102

[a]Shading denotes significant or suggestive mean differences between the groups being compared. Gold shading indicates significant differences (p < .001); light blue shading indicates suggestive differences (p < .01).

8.5 PERCEPTIONS OF CAPACITIES OF SCHOOLS TO ATTRACT AND RETAIN TEACHERS OF SCIENCE, ICT AND MATHEMATICS

Parents/caregivers were asked for their perceptions of the capacity of their child's school to attract and retain suitably qualified primary teachers, or secondary science, ICT and mathematics teachers. Their ratings of the attraction and retention items were analysed using univariate ANCOVAs, since there was just the single dependent variable of interest. Two ANCOVAs were conducted – one for MSGLC category of school and one for Type of School.

8.5.1 Perceptions of capacity to attract and retain qualified primary teachers.

Table 8.5 summarises the estimated means and their associated standard errors for the two ANCOVAs relating to primary teachers. The ANCOVA for Type of School was not significant. The univariate test for MSGLC category differences on the attracting and keeping primary teachers item was suggestive[58]. Table 8.5 shows that respondents' levels of agreement were highest for Metropolitan Area schools, followed by Provincial City and then Provincial Area schools. Respondents whose children attended schools in Remote Areas were least inclined to agree. Note, however, that all means were at least positive in the sense of falling at, or above, the 'agree' anchor point on the rating scale. Figure 8.1 illustrates the pattern of decline with geographical location of school.

[58] $F(3, 572) = 4.26$, p = .005, partial $\eta^2 = .02$

Table 8.5 Breakdown of the item focusing on perceptions of school capacity to attract and keep qualified primary teachers, by MSGLC categories and Type of School [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)] [a]

			The school is able to attract and keep suitably qualified primary teachers	Valid N
MSGLC category	Metropolitan Area	Mean	3.43	
		s.e.(Mean)	.08	93
	Provincial City	Mean	3.34	
		s.e.(Mean)	.08	90
	Provincial Area	Mean	3.21	
		s.e.(Mean)	.04	330
	Remote Area	Mean	3.01	
		s.e.(Mean)	.09	66
Type of School	Primary	Mean	3.27	
		s.e.(Mean)	.03	469
	Secondary	Mean	NA	
		s.e.(Mean)	--	--
	Combined	Mean	3.14	
		s.e.(Mean)	.07	110

[a]Shading denotes significant or suggestive mean differences between the groups being compared. Gold shading indicates significant differences ($p < .001$); light blue shading indicates suggestive differences ($p < .01$).

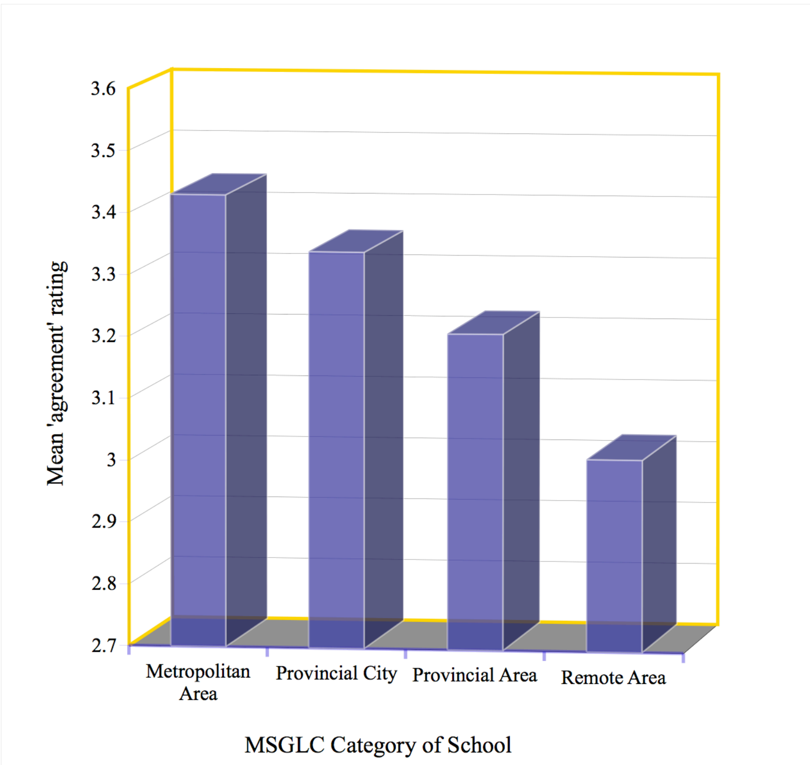

Figure 8.1 Mean 'agreement' by respondents that their child's school is able to attract and keep qualified primary teachers, compared by MSGLC categories [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)]

8.5.2 Perceptions of capacity to attract and retain qualified science, ICT and mathematics teachers

Parent/caregivers responding with reference to secondary schools were asked to rate the capacity of those schools to attract and retain qualified teachers of science, ICT and mathematics. Responses to these questions were analysed using two MANCOVAs for MSGLC Category of School and Type of School. While Table 8.6 displays a similar pattern to Table 8.5 in perceptions across MSGLC categories, the MANCOVAs did not yield significant or suggestive associations, possibly due to the lower number of parents completing the survey with reference to secondary schools.

Table 8.6 Breakdown of items focusing on schools' capacity to attract and keep suitably qualified secondary teachers, by MSGLC categories and Type of School [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)] [a]

			This school is able to attract & keep suitably qualified …			
			Science teachers	**Math teachers**	**ICT teachers**	**Valid N**
MSGLC category	**Metropolitan Area**	**Mean**	**3.36**	**3.39**	**3.32**	
		s.e.(Mean)	.11	.11	.11	52
	Provincial City	**Mean**	**3.17**	**3.15**	**2.97**	
		s.e.(Mean)	.08	.08	.09	85
	Provincial Area	**Mean**	**2.91**	**2.90**	**2.82**	
		s.e.(Mean)	.06	.06	.07	153
	Remote Area	**Mean**	**2.85**	**2.78**	**2.77**	
		s.e.(Mean)	.16	.16	.17	22
Type of School	**Primary**	**Mean**	**--**	**--**	**--**	
		s.e.(Mean)	--	--	--	--
	Secondary	**Mean**	**3.04**	**3.04**	**2.96**	
		s.e.(Mean)	.05	.05	.06	189
	Combined	**Mean**	**3.07**	**3.03**	**2.92**	
		s.e.(Mean)	.07	.07	.07	123

[a]Shading denotes significant or suggestive mean differences between the groups being compared. Gold shading indicates significant differences ($p < .001$); light blue shading indicates suggestive differences ($p < .01$).

Parent/caregivers' comments identified two main concerns about the qualities of rural teachers in science, ICT and mathematics. The first was the apparent lack of specialist primary and secondary teachers in these subject areas. For example:

> Our biggest obstacle for ICT would be (that) we have no specific teacher specialising in this area. (Parent/caregiver, Provincial Area, NSW)
>
> There is a lack of staff specifically trained in science. Additional professional development resources (are needed) to enable teaching staff to gain additional ICT training. (Parent/caregiver, Provincial Area, Vic.)
>
> (Our region) is very limited in being able to access specialty teachers in country schools, at both primary and secondary levels. (The) Internet has been good, to a point, but I wonder whether this will become a greater part of the classroom experience, to the loss of teacher/child interaction. (Parent/caregiver, Remote Area, WA)

Second, respondents from Remote Areas were more inclined than those in other locations to be critical of the inexperience of some teachers in their children's schools. The following quote covers the main elements and implications of these comments:

> In our small community it is not uncommon to get teachers who seem to have no idea what they are teaching. This requires the parents to do countless hours of home schooling to help the child grasp the concepts needed to keep up and it is very demanding on the child's self esteem. In the end they are willing to give up because they have not been taught even the basic concepts. It causes many an argument at home. (Parent/caregiver, Remote Area, SA)

Apart from the issue of inexperience, respondents in Remote Areas were appreciative and supportive of teachers in their local schools.

8.5.3 Summary of findings and implications

1. The findings indicate that parents/caregivers' confidence in the capacity of their children's primary schools to attract and retain qualified teachers decreases with the size and remoteness of school location. The findings also show that parents/caregivers in rural and Remote Areas are aware of staffing difficulties in those locations. Overall, parent/caregiver perceptions are generally in agreement with those of teachers, who considered vacant positions in metropolitan schools easiest to fill.
2. Analysis of the responses of parents/caregivers reporting about secondary schools did not reveal the same significant geographical pattern in staffing difficulties reported by science and mathematics teacher respondents in Chapter Four. However, it may be that many parents/caregivers are unfamiliar with the subject-specific qualifications of secondary teachers, generally assuming that those teaching mathematics or science to their children are qualified to teach those subjects.
3. While parents/caregivers in Remote Areas are generally appreciative of their children's teachers, there appears to be concern about the inexperience and capabilities of the teachers commonly recruited to these schools, and the long-term effects on the education of children.

8.6 PERCEPTIONS OF ACHIEVEMENT AND TEACHER ATTITUDES IN SCIENCE, ICT AND MATHEMATICS EDUCATION

Parents/caregivers were asked to rate, on a four-point scale,[59] their agreement with four statements about the quality of education experienced by their child in each of the three subject areas. The first two statements concerned perceptions about achievement levels while the second pair related to perceptions of teachers' attitudes. The four statements were:

1. Teachers in this school encourage students to achieve to their potential in (science/ ICT/ mathematics);
2. Students achieve to a high standard in (science/ ICT/ mathematics);
3. My child's teachers care if my child is not doing as well as he/she can in (science/ ICT/ mathematics);
4. My child's teachers are enthusiastic in their approaches to teaching (science/ ICT/ mathematics).

[59] 1. Strongly disagree, 2. Disagree, 3. Agree, 4. Strongly agree

Overall, respondents were satisfied with the quality of science, ICT and mathematics teaching experienced by their children. This satisfaction was evidenced by the relatively high mean scores on the four items (Tables 8.7, 8.8 and 8.9), which seldom dropped below the 'agree' anchor point on the scale, and by respondents' comments about the greatest strengths of their children's schools. Over half the respondents referred to the commitment, effort and enthusiasm of teachers. For example:

> The teachers are the greatest strengths of this school, as the teachers my children have had have always been eager to help them in these subjects in every way they possibly can. (Parent/caregiver, Metropolitan Area, WA)
>
> (The greatest strengths are) enthusiastic teachers and a principal who is always striving to improve learning outcomes. Staff understand we live in a changing world and that the learning needs of today's students are different to those of students in the past. (Parent/caregiver, Provincial Area, SA)
>
> The teachers are very dedicated, they have a great rapport with the students and go out of their way to assist and motivate. (Parent/caregiver, Metropolitan Area, NSW)

For each subject area, responses to the four items were analysed as a set using MANCOVAs again controlling for Total FTE (proxy for school size), MWHI (median weekly household income) and SES Index (socio-economic status of the area where the school was located). Separate MANCOVAs were conducted for MSGLC category and Type of School.

8.6.1 Perceptions of student achievement and teacher attitudes in science

Perceptions of achievement levels in science

Table 8.7 summarises the estimated means and their associated standard errors for the two MANCOVAs. The MANCOVA for Type of School was not significant. The multivariate test for MSGLC category differences across the four perceptions of science teaching items was significant[60]. This significant multivariate difference was due to suggestive geographical differences on the two items concerned with perceptions about achievement.

Figure 8.2 shows that respondents with children in Metropolitan Area schools were the most inclined to agree that teachers in those schools encouraged students to achieve to their potential in science. Respondents with children attending Provincial City schools tended to agree more than did those with children in Provincial and Remote Area schools. With respect to respondents' perceptions that students achieved to a high standard in science, Figure 8.2 shows that agreement was highest among those with children in Metropolitan Area schools, and declined steadily with size and remoteness of location. For respondents with children attending Remote Area schools, the mean on this item dipped below the 'agree' point on the scale.

[60] Wilks' lambda = .956, $F(12, 1918.461) = 2.71$, $p = .001$, partial $\eta^2 = .02$

Table 8.7 Breakdown of parent/caregiver perceptions of achievement levels and teacher attitudes in science, by MSGLC categories and Type of School [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)][a]

			Rating of achievement levels		Rating of teacher attitudes		
			Teachers in this school encourage students to achieve to their potential in science	Students achieve to a high standard in science	My child's teachers care if my child is not doing as well as he/she can in science	My child's teachers are enthusiastic in their approaches to teaching science	Valid N
MSGLC categories	Metropolitan Area	Mean	3.47	3.21	3.38	3.35	
		s.e.(Mean)	.06	.07	.07	.07	124
	Provincial City	Mean	3.38	3.11	3.46	3.44	
		s.e.(Mean)	.06	.06	.06	.06	149
	Provincial Area	Mean	3.19	2.98	3.21	3.22	
		s.e.(Mean)	.04	.04	.04	.04	390
	Remote Area	Mean	3.23	2.87	3.28	3.27	
		s.e.(Mean)	.08	.08	.09	.09	72
Type of School	Primary	Mean	3.27	3.04	3.28	3.27	
		s.e.(Mean)	.04	.04	.04	.04	384
	Secondary	Mean	3.27	2.97	3.32	3.4526	
		s.e.(Mean)	.05	.05	.06	.06	212
	Combined	Mean	3.34	3.09	3.31	3.4737	
		s.e.(Mean)	.06	.06	.06	.06	139

[a]Shading denotes significant or suggestive mean differences between the groups being compared. Gold shading indicates significant differences ($p < .001$); light blue shading indicates suggestive differences ($p < .01$).

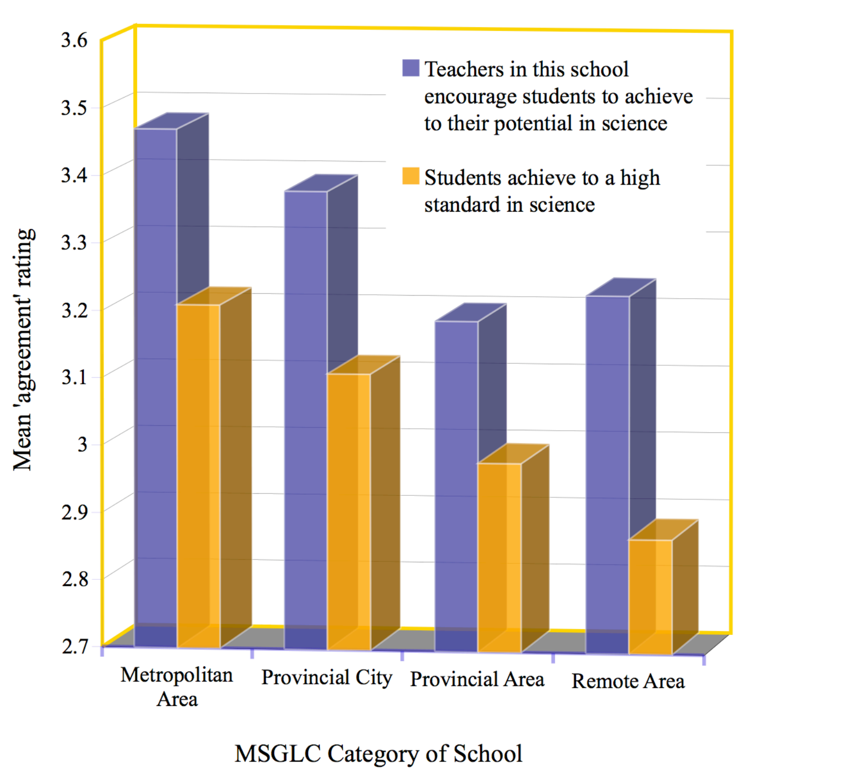

Figure 8.2 Mean 'agreement' of parent/caregiver respondents with statements about science achievement in their children's schools, compared by MSGLC categories [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)]

Perceptions of teacher attitudes

Table 8.7 shows that parents/caregiver perceptions of the care and enthusiasm of their children's teachers with regard to teaching science did not vary significantly with MSGLC category. Nor was there a similar geographical pattern of responses to that found in perceptions of achievement levels. Nevertheless, the lower level of agreement on both items by respondents with children in Provincial Area schools suggests a need for further investigation.

8.6.2 Perceptions of student achievement and teacher attitudes in ICT (secondary only)

Perceptions of achievement levels in ICT

Parents/caregivers with children in secondary schools were asked to indicate their levels of agreement with the four statements concerning ICT education. Table 8.8 summarises the estimated means and their associated standard errors for the two MANCOVAs. The MANCOVA for Type of School was not significant. The multivariate test for MSGLC category differences across the four perceptions of secondary ICT teaching items was significant.[61] This significant multivariate difference emerged due primarily to a significant difference on the item dealing with teachers encouraging students to achieve to their potential in secondary ICT, and a suggestive difference on the item dealing with students achieving to a high standard in secondary ICT.

Table 8.8 Breakdown of parent/caregiver perceptions of achievement levels and teacher attitudes in ICT (secondary only), by MSGLC categories and Type of School [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)] [a]

			Rating of achievement levels		Rating of teacher attitudes		
			Teachers in this school encourage students to achieve to their potential in ICT	Students achieve to a high standard in ICT	My child's teachers care if my child is not doing as well as he/she can in ICT	My child's teachers are enthusiastic in their approaches to teaching ICT	Valid N
MSGLC categories	Metropolitan Area	Mean	3.59	3.29	3.26	3.35	
		s.e.(Mean)	.11	.11	.11	.11	49
	Provincial City	Mean	3.29	3.08	3.30	3.33	
		s.e.(Mean)	.09	.08	.09	.08	76
	Provincial Area	Mean	3.08	2.83	3.10	3.03	
		s.e.(Mean)	.06	.06	.06	.06	145
	Remote Area	Mean	2.95	2.76	3.09	3.27	
		s.e.(Mean)	.17	.17	.17	.17	18
Type of School	Primary	Mean	--	--	--	--	
		s.e.(Mean)	--	--	--	--	--
	Secondary	Mean	3.17	2.94	3.16	3.15	
		s.e.(Mean)	.05	.05	.05	.05	178
	Combined	Mean	3.28	3.03	3.20	3.22	
		s.e.(Mean)	.07	.07	.07	.07	110

[a]Shading denotes significant or suggestive mean differences between the groups being compared. Gold shading indicates significant differences ($p < .001$); light blue shading indicates suggestive differences ($p < .01$).

Figure 8.3 shows that respondents with children in Metropolitan Area schools were the most inclined to agree that teachers in those schools encouraged students to achieve to their potential in ICT. Respondents with children attending Provincial City schools tended to agree more than

[61] Wilks' lambda = .887, $F(12, 735.81) = 2.83$, $p = .001$, partial $\eta^2 = .04$

did those with children in Provincial Areas, while those with children attending Remote Area schools were least inclined to agree. This last group indicated a mean perception less than the 'agree' point on the scale.

With respect to respondents' perceptions that students achieved to a high standard in secondary ICT, Figure 8.3 shows that agreement was highest among those with children in Metropolitan Area schools, and declined steadily with size and remoteness of location. For respondents with children attending Provincial and Remote Area schools, the mean on this item dipped below the 'agree' point on the scale.

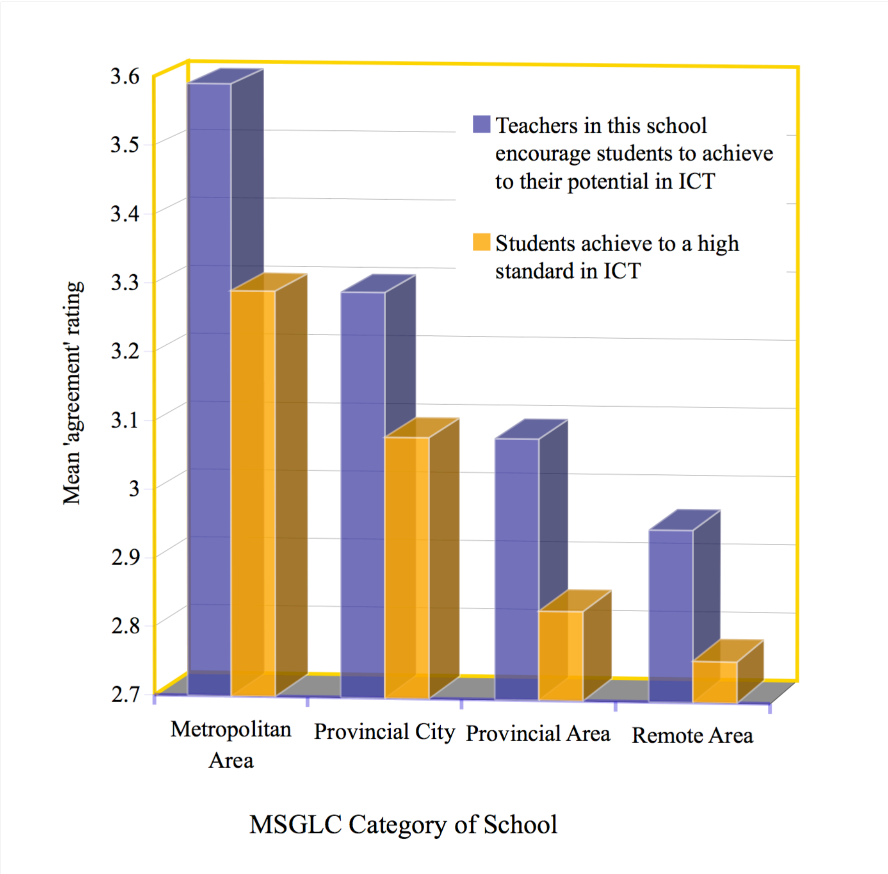

Figure 8.3 Mean ratings by parent/caregiver respondents on perceptions of ICT achievement levels in their child's school, compared by MSGLC categories [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)]

Perceptions of teacher attitudes

Table 8.8 indicates that parents/caregiver perceptions of the care and enthusiasm of their children's teachers with regard to teaching ICT did not vary significantly with MSGLC category. Nor is there a similar geographical pattern of responses to that found in perceptions of achievement levels. Nevertheless, the lower level of agreement on the enthusiasm of teachers in Provincial Area schools suggests a need for further investigation.

8.6.3 Perceptions of student achievement and teacher attitudes in mathematics

Perceptions of achievement levels in mathematics

Parents/caregivers were asked to indicate their levels of agreement with the four statements concerning mathematics education. Table 8.9 summarises the estimated means and their associated standard errors for the two MANCOVAs. The MANCOVA for Type of School was not significant.

The multivariate test for MSGLC category differences across the four perceptions of mathematics teaching items was significant[62]. This significant multivariate difference emerged due primarily to significant differences on all items except that dealing with teachers being enthusiastic in their approaches to teaching mathematics. Figure 8.4 displays a pattern similar to that for science achievement, with respondents having children in Metropolitan Area schools more inclined than others to agree that teachers in those schools encouraged students to achieve to their potential in mathematics. Respondents with children attending Provincial City schools tended to agree more than those with children in Provincial and Remote Area schools, who held similar perceptions.

Table 8.9 Breakdown of parent/caregiver perceptions of achievement levels and teacher attitudes in mathematics, by MSGLC categories and Type of School [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)].[a]

			Rating of achievement levels		Rating of teacher attitudes		
			Teachers in this school encourage students to achieve to their potential in math	Students achieve to a high standard in math	My child's teachers care if my child is not doing as well as he/she can in math	My child's teachers are enthusiastic in their approaches to teaching math	Valid N
MSGLC categories	Metropolitan Area	Mean	3.57	3.33	3.49	3.42	
		s.e.(Mean)	.06	.06	.07	.07	129
	Provincial City	Mean	3.45	3.16	3.53	3.47	
		s.e.(Mean)	.06	.06	.06	.06	151
	Provincial Area	Mean	3.27	3.02	3.24	3.28	
		s.e.(Mean)	.03	.04	.04	.04	398
	Remote Area	Mean	3.23	2.86	3.27	3.26	
		s.e.(Mean)	.08	.08	.08	.09	73
Type of School	Primary	Mean	3.43	3.16	3.41	3.41	
		s.e.(Mean)	.04	.04	.04	.04	398
	Secondary	Mean	3.25	2.98	3.27	3.25	
		s.e.(Mean)	.05	.16	.06	.06	213
	Combined	Mean	3.31	3.04	3.27	3.31	
		s.e.(Mean)	.06	.06	.06	.06	140

[a]Shading denotes significant or suggestive mean differences between the groups being compared. Gold shading indicates significant differences (p < .001); light blue shading indicates suggestive differences (p < .01).

With respect to respondents' perceptions that students achieved to a high standard in mathematics, Figure 8.4 shows that agreement was highest among those with children in Metropolitan Area schools, and declined steadily with size and remoteness of location. For respondents with children attending Remote Area schools, the mean on this item dipped below the 'agree' point on the scale.

[62] Wilks' lambda = .943, $F(12, 1960.793) = 3.65$, $p = .001$, partial $\eta^2 = .02$

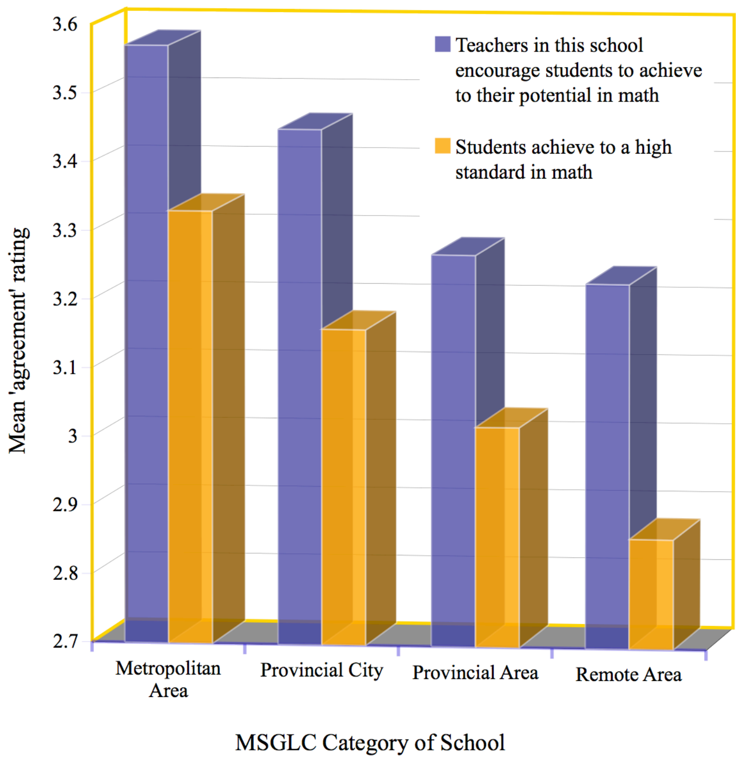

Figure 8.4 Mean ratings by parent/caregiver respondents on perceptions of mathematics achievement levels in their child's school, compared by MSGLC categories [ratings on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree)]

Perceptions of teacher attitudes

Perceptions about whether teachers cared if children were not doing as well as they could in mathematics differed significantly with MSGLC category. However, the differences did not follow the pattern found with student achievement items. Rather, teachers in Provincial City schools were perceived as caring the most, and those in Provincial Area schools as caring the least, though this was still above the 'agree' point on the scale. There were no significant of suggestive differences in parents/caregivers' perceptions about teachers' enthusiasm for teaching mathematics.

8.6.4 Summary of findings and implications

1. The findings indicate firstly that parents/caregivers consider the commitment and enthusiasm of teachers to be one of the greatest strengths of schools. Perceptions of the levels of enthusiasm teachers bring to class do not appear to vary significantly with geographical location or type of school.
2. With regard to parents/caregivers' views on whether teachers care that students work to their potential, there was little evidence of substantial variation with type or location of school. Nevertheless, the weak but consistent (and in the case of mathematics, significant) pattern suggesting that parents/caregivers with children attending Provincial Area schools were less inclined than others to consider that teachers care whether students work to their potential is perhaps cause for further investigation.
3. The evidence suggests that the perceptions of parents/caregivers across Australia about achievement levels in science, ICT and mathematics vary substantially with geographic location. Parents/caregivers with children attending metropolitan primary and secondary

schools are more inclined to agree that children in these schools achieve to a high standard in science, ICT and mathematics, than are parents/ caregivers with children in non-metropolitan schools. Those with children attending schools in Remote Areas are least inclined to agree. The geographical pattern in perceptions is consistent with patterns of achievement levels in science and mathematics revealed in international studies (Thomson et al., 2004).

4. There also seems to be a perception that teachers in primary and secondary schools in larger population centres provide greater encouragement for students to achieve to their potential in these subjects.

8.7 PERCEPTIONS OF STRENGTHS AND OBSTACLES IN SCIENCE, ICT AND MATHEMATICS EDUCATION

Parents/caregivers were asked to comment on the greatest strengths of their children's schools in science, ICT and mathematics, and the greatest obstacles to learning in these subject areas. As might be expected, there was a wide variety of responses. However, the four most common themes concerned the qualities of teachers (discussed above), the availability of student learning opportunities, the ability or inability to cater for individual differences in the classroom, and the availability of ICT resources, training, and support personnel.

8.7.1 Availability of learning opportunities

Many respondents (22%) discussed the greatest strengths and obstacles in terms of the range of learning opportunities available to their children. These opportunities related to learning facilities, excursions and available course options. By and large, parents/caregivers' comments about school facilities were generally positive, with the exception of ICT resources, discussed later. Apart from this issue, there was no indication that parents/caregivers' perceptions about resources and facilities differed substantially with geographic location.

Opportunities for excursions and visits

Comments by parents/caregivers in Provincial and Remote Areas frequently concerned the limited educational opportunities available to their children due to remoteness or small school size. A recurring issue was the distance and cost associated with excursions:

> Being in the country, the school cannot access and take students to visit places like Scitech, the zoo, Underwater World etc. (Parent/caregiver, Remote Area, WA)

> Due to isolation there are reduced opportunities for students to make relevant visits or have relevant visitors to the school. (Parent/caregiver, Provincial Area, NSW)

Complaints about excursion costs were also made by some parent/caregivers in Metropolitan and Provincial Cities, but these related to the frequency of excursions for which they were required to pay, rather than the cost of individual excursions.

Composite classes

One area of concern for parents/caregivers with secondary-age children in smaller Provincial and Remote Area schools was the availability of senior courses and the necessity for composite classes. The following comments illustrate what respondents saw as some of the implications of this arrangement:

> (There is a) lack of … subjects offered when students reach Years 11 and 12. A lack of student numbers means that not all subjects offered meet the requirements needed by a student to go onto university and they need to go to another school involving longer travel. (Parent/caregiver, Provincial City, NT)

> Small classes in senior science (lead to a) lack of fellow students to stimulate each other. (Parent/caregiver, Provincial Area, NSW)

> My son (in Year 12) has to share two out of five of his subjects with Year 11 students. Teachers are trying to achieve the impossible, that is, cater for students who want to achieve high TER scores for future careers, and students 'filling in time' avoiding the real world of working to survive. The overall culture of the Year 12s is not supporting the rigorous study of Maths and Science. They feel like 'nerds'. (Parent/caregiver, Provincial Area, SA)

No doubt the issue of maximising the number of courses available to senior students is a concern for any small school, regardless of location. However, no comments of this type were received from respondents with children in Metropolitan Area schools.

8.7.2 Catering for individual student needs

A second theme, identified by about 18% of parents/caregivers, was the ability (or inability) of schools or systems to cater for the range of individual student differences found in schools. One common area of concern was the availability of support for special needs or gifted and talented students. Parents/caregivers were greatly appreciative of this support when available:

> My daughter started at this school at the beginning of the year, and what attracted us to the school was that they have special classes for those children who are struggling in some areas of their work. Not only that, they have the gifted classes for those in Years 5 and 6. I feel that the school can offer my child a great deal in all areas mentioned. (Parent/caregiver, Provincial Area, NSW)

On the other hand, such support was not always available or adequate. The frequency of comments suggest that the problem is more acute for gifted and talented children, though this probably reflects the smaller number of respondents concerned about special needs.

There was a perception among some respondents that schools in rural areas were not able to support and nurture high achieving students. In a small number of cases, this consideration influenced parents/caregivers to send children to schools in Metropolitan Areas:

> My youngest child is in Year 7 and is very advanced in mathematics. Unfortunately there are NO teacher's aides or 'special need' groups available for him yet there are groups available for children who are 'struggling'. This is unfair and my son should be encouraged and not discouraged! (Parent/caregiver, Provincial Area, Vic.)

> I also think that country schools don't have good quality teachers, because the HSC marks are lower than for students in city schools. My daughter, who is now in high school, wants to be a doctor. She attends a single sex school in Brisbane, two hours away, because I do not believe that the standard of teaching is sufficiently good in country NSW to enable her to compete with children from selective schools in Sydney. (Parent/caregiver, Provincial Area, NSW)

The sentiments expressed in this response reflect the geographic differences in perceptions of achievement levels apparent in Tables 8.7, 8.8 and 8.9.

8.7.3 ICT resources, training, and support personnel

The availability and use of ICT resources was a frequent theme (16%) of parent/caregiver comments about school strengths and obstacles. While some of these comments, both positive and negative, concerned hardware and facilities for ICT, the majority referred to the abilities of staff and students to use effectively the resources for teaching and learning.

> When it comes to ICT, the problem is having the availability of knowledgeable IT staff/parents/department people who can fix problems when they occur, and not have to wait for days/weeks to have things fixed. I think the department has done a great job in providing resources in a material sense; now they need to provide people resources to help train the people that are there. (Parent/caregiver, Metropolitan Area, NSW)

> The biggest obstacle to learning technology is that most teachers and aides do not have the skills themselves to be able to teach students. In this school only two of 16 teachers from Years 4 to 7 have the ability to teach students skills beyond basic computing. (Parent/caregiver, Metropolitan Area, Qld)

A greater-than-expected proportion of such comments came from respondents in Provincial or Remote Areas who identified the lack of ICT maintenance personnel and support for teachers to integrate ICT into their subject areas as the most pressing concerns:

> (There is a) lack of working computers and resources – no IT person in the town to help the resources work correctly. (There is a) lack of trained maths and ICT teachers. (Parent/caregiver, Remote Area, WA)

> The school is under-staffed and under-resourced in most learning areas. Rectification of these would greatly assist the work of the existing staff. They have no classroom network and very few computers that are linked. Most of these are continually off line and getting IT support in remote areas is difficult and costly. (Parent/caregiver, Remote Area, WA)

Nine respondents addressed their remarks to Distance Education programs. Of these, six commented about the difficulty of communicating effectively with centres. For example:

> The biggest obstacles are distance and the lack of infrastructure in the bush for technology to progress. (Parent/caregiver, Provincial Area, Qld)
>
> Teaching communication is via telephone, email and very rarely face-to-face. Some areas of science and mathematics require a face-to-face environment in order to be able to explain and show critical aspects of the subjects being taught. At the senior level the home supervisor (in this case, the mother) is often unable to back up any advice given over the phone as the complexity of the subjects are now beyond the supervisor's capabilities. (Parent/caregiver, Provincial Area, NT)

8.7.4 Summary of findings and implications

1. The findings suggest that, overall, parent/caregivers are appreciative of the commitment, efforts and enthusiasm of teachers involved in science, ICT and mathematics education.
2. Understandably, their greatest concern appears to be that their children have access to an adequate range of learning experiences and opportunities. These include excursions, visits by experts, and a good variety of senior courses from which to choose. Parents/caregivers seem to be aware that student access to these experiences and opportunities is considerably greater in larger population centres. There is also evidence that those outside these centres are concerned that their children are at an educational disadvantage.
3. Parents/caregivers with children having special needs or talents are appreciative where schools are able to provide relevant support. However, there appears to be concern from parents/caregivers in Provincial and Remote Areas that their schools are unable to provide this support adequately, and a tendency to send bright students to metropolitan schools where possible.
4. Finally, ICT education emerged as a key area of interest among parent/caregivers. There seems to be a general concern that children are not incorporating ICT into their learning as effectively as parents/caregivers would like, and a specific concern among those with children in rural schools that there is insufficient expertise and technical support for ICT.

The findings reported in this chapter are discussed in more detail in Chapter Nine, where they are linked to recommendations.

CHAPTER NINE

CONCLUSIONS AND RECOMMENDATIONS

9.1 INTRODUCTION

The National Survey revealed a wealth of information on a broad range of issues concerning science, ICT and mathematics education, with a particular emphasis on the different circumstances and needs in various parts of Australia. The findings point to significant inequities in the abilities of schools in different locations to provide quality education in science, ICT and mathematics to their students. Analysis of the National Survey data revealed that schools in rural areas (pop. < 25 000) have considerably greater staffing problems and higher unmet needs for professional development, material resources, support personnel and student learning opportunities, than do their counterparts in metropolitan centres. While parents/caregivers in rural areas are appreciative and supportive of local teachers, there is recognition that their children are disadvantaged in some respects by comparison with those in metropolitan areas.

This chapter summarises and discusses the main findings of the National Survey, and provides recommendations to education authorities about how the issues or inequities identified might be addressed. In making these recommendations, however, it is recognised that they follow from aggregated national findings. State and territory education authorities are best placed to judge the degree to which the findings and recommendations apply to their own situations.

9.2 STAFFING ISSUES IN SCIENCE, ICT AND MATHEMATICS

Respondents provided ground-level perspectives on a range of issues concerned with staffing, including their perceptions of staffing profiles in their schools, their motivations for teaching in rural or regional schools, their reflections on pre-service teacher education and preparation and finally, their teaching qualifications.

9.2.1 Demand and supply of teachers in rural and regional schools

1. Overall, about 13% of respondents reported a high annual teacher turnover (>20% p.a.) in their schools.
2. Reported rates varied significantly with location. Almost twice as many respondents from Provincial Area schools, and about six times as many from Remote Area schools, reported a high staff turnover rate (>20% p.a.) compared with their colleagues in Metropolitan and Provincial City schools.
3. The evidence indicates that it is significantly more difficult to fill vacant secondary science, ICT and mathematics positions than to fill vacant primary positions. Furthermore, the findings show that vacant primary and secondary positions are substantially more difficult to fill in Provincial and Remote Areas of Australia. Again, this problem appears more acute for secondary teachers.
4. The findings suggest that primary teachers in Provincial Areas are more than twice as likely, and those in Remote Areas up to six times more likely, than those in Metropolitan Areas to be working at a school in which it is very difficult to fill vacant teaching positions.
5. Results indicate that secondary science, ICT and mathematics teachers in Provincial Areas are about twice as likely, and those in Remote Areas about four times as likely, as

those in Metropolitan Areas to be working at a school in which it is very difficult to fill vacant teaching positions in those subjects. Teachers in Provincial City schools are also more likely than those in Metropolitan Area schools to consider it very difficult to fill teacher vacancies in these subjects.

6. Among secondary teachers, the evidence suggests that it is more difficult to fill vacant mathematics positions in Provincial and Remote Areas, than to fill science and ICT vacancies in these locations.
7. The difficulty in filling vacant ICT positions appears to vary less with geographical location. However, ICT teachers seem to be in shorter supply in Metropolitan Areas than are science or mathematics teachers.

Discussion

The findings provide a 'teacher perspective' on the rural school staffing problems revealed elsewhere in the literature (e.g., Harris et al., 2005; MCEETYA, 2003; Skilbeck & Connell, 2003). This is an important perspective, confirming inequities in the supply of qualified primary and secondary science, ICT and mathematics teachers to schools in different locations. These inequities have an obvious effect on the quality of education available to students in these locations. It is unlikely that students in a school that has a high turnover of staff, great difficulty in replacing these staff with qualified teachers, and where staff are required to teach outside their areas of expertise, are receiving the same quality of education, and are as supported in their learning, as are those in schools adequately staffed with established, well qualified and experienced teachers. In view of this situation, it is difficult to avoid the conclusion of Alloway et al. (2004) and others that students in these schools are educationally disadvantaged by comparison with their city peers. The findings indicate that this disadvantage is most acute for secondary students, due to the higher turnover rates in combined and secondary schools and greater difficulty filling science and mathematics vacancies.

9.2.2 Destination schools of city and country educated teachers

Analysis of the teacher surveys revealed a number of associations between the destinations of teachers and their locations while undertaking pre-service teacher education.

1. The findings revealed a tendency for teachers who attended high school in a rural or regional centre to move to a larger centre when undertaking their teacher training. This is not surprising, as nearly all universities and teachers' colleges are, or were, located in large centres, with most in the capital cities. In some states there are no such institutions outside Metropolitan Areas.
2. The findings exposed a tendency for teachers to gain employment in locations similar to those in which they lived while undertaking pre-service education. The study found that 73% of respondents who lived in rural centres while completing their teacher education are currently working in Provincial Area or Remote Area schools. Only 5% of respondents who lived in rural centres during their teacher education were currently working in Metropolitan schools.
3. On the other hand, the findings did not provide any evidence that teachers who lived in Rural Centres while attending high school or completing teacher education gain employment in Remote Areas. Rather, there appears to be a pattern of drift to larger centres.
4. The findings revealed that a greater-than-expected proportion (over 70%) of science, ICT and mathematics teachers lived in metropolitan centres during their teacher education. In view of finding 2, above, it is likely therefore that beginning teachers in these subject areas will tend to seek employment in Metropolitan rather than Provincial or Remote Area schools.

Discussion

The two most important findings in this section are the strong relationship between where teachers lived while undertaking their pre-service teacher education and where they subsequently teach, and the finding that over 70% of secondary science, ICT and mathematics teachers lived in Metropolitan Areas while completing their teacher education. These findings point to a greater supply of science, ICT and mathematics teachers in Metropolitan Areas, which is the current situation. In an environment of overall declining teacher numbers in these subjects (MCEETYA, 2003; 2005), it is clear that demand for these teachers in rural areas will increasingly outweigh supply.

9.2.3 Motivations for teaching in rural and regional schools

In order to understand the influences on staffing patterns and teacher motivations to work in rural and regional schools, the survey investigated the influences on teachers' decisions to work in, or to leave, these schools. The findings provide a solid basis for understanding these motivations and for suggesting what steps can be taken to address the staffing problems identified above.

Motivations for moving to rural or regional schools

1. Overall, teachers initially taking up positions in these schools were primarily motivated by job availability, educational authority placement, and having previously lived in the same or a similar location.
2. The influence of motivational factors seems to vary with the sex of the teacher. Male respondents were generally more motivated by financial and advancement considerations whereas females placed greater priority on family factors, such as spouse employment or location of other family members.
3. There is evidence that the influence of motivational factors has changed over time. Those who started their teaching careers 30 or so years ago were often allocated to rural or regional schools by education authorities, either through placement or scholarship bonds. However, these systems were not so influential (or perhaps extant) among younger teachers who were more motivated by job availability and whether they had previously lived in the same or a similar location. Younger teachers were also more motivated by financial inducements such as rent subsidies, affordable housing and allowances, while older teachers were more influenced by the situation of their partners.
4. Respondents from Government schools were more likely to have taken up a position at a rural or regional school due to education authority placement than were teachers in other systems.
5. The low mean ratings for subsidies and allowances possibly reflect the relatively small number of respondents who qualified for these incentives.

Motivations for remaining at a rural or regional school

1. The greatest influences on teachers' decisions to stay in rural and regional schools were their enjoyment of the lifestyle and community spirit. Family links and partner's employment were also very influential.
2. The highest motivating school characteristic was small class size.
3. Female teachers considered their family situation to be more influential than did males, who rated the cost of living and quality of the lifestyle higher than did females.
4. Consistent with the findings on initial motivations, younger teachers were more inclined to remain in a rural or regional school because of financial considerations than were their older colleagues.
5. Promotion or advancement opportunities were also a greater incentive among younger teachers.

Motivations for leaving a rural or regional school

1. Respondents had a wide variety of mainly personal reasons for leaving rural and regional schools.
2. For the most part, these reasons were family related, such as changes in a partner's employment situation, or to improve educational opportunities for their own children.
3. Other teachers left due to a sense of social or professional isolation.
4. While problems with the school or community were the least influential factors, younger teacher tended to rate these as more influential than did older teachers.
5. Primary teachers rated these problems as less influential on their decisions than did teachers at secondary or combined schools. Professional isolation was a greater motivation among secondary and combined school respondents.

Motivations for moving from a metropolitan to a rural or regional school

1. Metropolitan teachers considered that smaller class sizes and preference for future transfers had the highest motivational value in terms of moving to a rural or regional school.
2. Financial incentives such as cheaper housing, rent and travel subsidies and allowances were also potentially influential.
3. The youngest group of teachers considered financial and advancement incentives to be substantially more influential than did their older colleagues.
4. Opportunities to work with a smaller staff, or with Indigenous students were the least influential items.

Discussion

The finding that education authority bonds or placement were the reasons most teachers initially took up positions in rural and regional schools has a number of implications. First, since most teachers, particularly secondary teachers, were educated in metropolitan centres, it is questionable whether these teachers would have taken up rural teaching positions without such a strategy. Second, it is noteworthy that, once placed, many teachers remained because of satisfaction with the lifestyle and community, or through establishing family ties. However, without the initial placement, it is unlikely these factors alone would have attracted many city-bred teachers.

The analysis of destinations of teachers educated in different areas revealed a pattern of drift from smaller to larger centres. Furthermore, it provided evidence that young teachers are influenced principally by their familiarity with an area and whether they have contacts there. Because of these trends, and the aforementioned fact that most teachers are educated in metropolitan areas, it is difficult to see how rural and regional schools can be properly staffed in the future without either a system of obligatory placement or the development of more effective incentive schemes.

The findings indicate that younger teachers are more motivated than older colleagues by financial inducements such as rent subsidies, affordable housing and allowances. Opportunities for future promotion or preferential transfer were also deemed to be influential, even among experienced teachers. Nevertheless, the present high turnover rates and difficulties filling vacancies indicate that current incentive schemes are not effective, although this would probably vary across states/territories.

Finally, it is significant that a relatively high proportion of teachers who left rural schools did so in order to improve the educational opportunities for their own children. While it is understandable that a teacher would want to maximise these opportunities, such decisions may also suggest to the community that the standard of education in rural schools is inadequate. Thus, the decision has a compounding and self-perpetuating effect, particularly as it removes at least one more professional person from the community.

9.2.4 Perceptions of teacher education and preparation

Primary and secondary teachers were asked to reflect on how well their pre-service teacher education had prepared them for various aspects of their careers. The findings in this section refer to the suitability and effectiveness of respondents' pre-service education, not to their current skill levels.

Primary teacher preparation

1. The findings suggest that primary teachers in general feel they were well prepared by their teacher education for teaching mathematics, though considerably less so for teaching science. This was the case for teachers of all ages, indicating that there has been little variation over time in the emphasis given to teaching mathematics and science at the primary level.
2. Most primary teachers also seem to feel that they were reasonably well prepared for teaching in rural and regional schools, and for managing student behaviour. While there was little variation with age in the former, the youngest teachers tended to feel they were better prepared for dealing with student behaviour than were their older colleagues. This may be due to changes in the way teacher education institutions approach the issue of student management, or to younger teachers having less experience of a range of student behaviours.
3. The evidence suggests that primary teachers were considerably less well prepared for teaching Indigenous and NESB students, and for using ICT across the curriculum. It is reasonable to argue that the significant variation with age across a range of specific teaching skills is indicative of the changes in emphasis in teacher preparation over time, particularly with regard to using ICT, and catering for student diversity in the classroom. Acknowledgement by older teachers that their initial teacher education did not prepare them well for aspects of their current teaching environments underscores the importance of providing ongoing professional development.
4. In relation to specific skill preparation, the findings indicate that primary teachers who lived in provincial cities or regional centres during their initial teacher education felt better prepared in some respects by this experience than did those who were located in metropolitan centres. This was particularly the case for preparation for teaching in rural and regional schools.

Secondary teacher preparation

1. The findings indicate that secondary science and mathematics teachers feel their teacher education prepared them relatively well for teaching their subjects. This was generally the case for teachers of all ages. However, it is also apparent that most ICT teachers feel their initial teacher education did not prepare them well for teaching their subjects. This is understandable given the relative novelty of ICT as a school subject and the dynamic nature of ICT in general.
2. Secondary teachers appear to have been reasonably well prepared for teaching in rural and regional schools, and for managing student behaviour. There is strong evidence that younger teachers feel better prepared by their pre-service education for incorporating ICT and catering for student diversity than do their older colleagues. As with primary teachers, this is probably indicative of changes in the educational landscape over time, and demonstrates the need for ongoing professional development.

3. The findings indicate that secondary science, ICT and mathematics teachers who lived in provincial cities or regional centres during their initial teacher education feel better prepared in some respects by this experience than do those who were located in metropolitan centres. This was particularly the case for preparation for teaching in rural and regional schools.

Discussion

The finding that primary teachers generally felt less well prepared by their pre-service education for teaching science than for teaching mathematics is consistent with the conclusions of Goodrum, Hackling and Rennie (2001) and Harris et al. (2005), who found that primary teachers are not as confident in teaching science as they are in other subjects. Secondary science and mathematics teachers felt they were relatively well prepared for teaching in their subject area. Nevertheless, the findings suggest that few ICT teachers feel their pre-service education prepared them adequately for teaching ICT subjects. In view of the relative novelty and dynamic nature of the subject matter, equipment and pedagogical models, this comes as no surprise. ICT teachers, more than any other group, are required to learn on the job, a situation that has implications for their professional development.

All teacher groups felt generally well prepared to teach in rural and regional schools, although those who had lived in rural or regional centres during their teacher education tended to feel considerably better prepared. While this is understandable since no city universities insist on their students having teaching experiences in a rural area (Boylan, 2003; Halsey, 2005), the finding may be a cause for some concern because of the high proportion of teaching students enrolled in metropolitan universities. In Western Australia, Tasmania and South Australia, for example, all universities are located in Metropolitan Areas.

9.2.5 Teacher qualifications

Primary and secondary teachers were asked to describe their levels of qualification and experience. They were also asked whether they had been required to teach courses for which they are not formally qualified.

1. Overall, more than 85% of respondents held either a Bachelor's degree (plus an undergraduate or postgraduate diploma) or some type of postgraduate teaching qualification.
2. The qualifications of primary and secondary science, ICT and mathematics respondents did not vary significantly with age, sex or geographic location.
3. There was strong evidence that many science, ICT and mathematics teachers are being required to teach subjects for which they are not qualified. Furthermore, the findings suggest that teachers in Provincial Areas are about twice as likely, and those in Remote Areas more than three times as likely as those in Metropolitan Areas to be required to teach a subject for which they are not qualified.
4. The findings also suggest that ICT teachers are more likely to be required to take classes in another subject area than are science teachers. Mathematics teachers are least likely to be asked to take such classes.

Discussion

The study found that the qualifications of teachers do not vary significantly with age, sex or geographic location. While this might be taken as indicating that students in different areas have equal access to qualified teachers, the study also found that secondary teachers in Provincial and Remote Areas are, respectively, two to three times more likely to be required to teach outside their subject areas than are those in Metropolitan Area schools. The implication is that students in metropolitan schools are more certain of having a specialist teacher for each of their subjects than are students in Provincial and Remote Area schools. This has obvious implications for the understanding and achievement levels of senior students in different locations.

9.2.6 Recommendations to address staffing concerns

Attraction and retention of teachers for rural schools

1. It is recommended that education authorities review their rural and remote recruitment incentive schemes in the light of motivational factors identified by the National Survey, with a view to:
   a. extending the eligibility of schemes to apply to a broader range of locations
   b. providing a system of progressive incentives that reward retention
   c. including incentives which would appeal to experienced science, ICT and mathematics teachers and school leaders
   d. ensuring greater awareness of such schemes among pre-service and existing teachers

Components of a progressive incentive scheme could include:

- ongoing career development tied to retention (e.g. targeted leadership training)
- professional development (e.g. qualification for sabbatical after a period of service)
- improved leave entitlements (maturing at intervals of service)
- a progressive rather than flat system of financial incentives
- inbuilt relief in staffing formulae for locations where there is difficulty employing relieving and short term contract teachers.

2. It is recommended that government and non-government education authorities develop or extend scholarship schemes targeting pre-service or beginning science, ICT and mathematics teachers willing to take up appointments in rural and regional schools. Federal and state/territory governments and relevant non-government bodies should examine current scholarship schemes to determine how they might be made more economically efficient, and be monitored for effectiveness.

It is recognized that several state/territories already have scholarship schemes in place, and in some cases these have recently been reviewed. Evidence from the National Survey supports the expansion of such schemes to specifically target pre-service secondary science, ICT and mathematics teachers willing to work in rural or remote schools.

Potential obstacles to the uptake of such scholarships among pre-service teachers include the personal economic difficulties (employment obligations, accommodation, etc.) they may experience in undertaking practical experiences in rural schools. Scholarship schemes would need to take account of these difficulties, especially among students in metropolitan universities. An alternative approach might be to expand the number of places for pre-service teaching programs in science, ICT and mathematics at rural and regional universities (where they exist). Education authorities should also explore scholarship schemes whereby they pay some or all of a teacher's Higher Education Contribution Scheme (HECS) debt. Research by Roberts (2005) suggests that beginning teachers would be strongly motivated by a significant reduction in their HECS debt.

Finally, it is important that such schemes be monitored against outcomes to assess their effectiveness in the short and long term.

3. It is recommended that education authorities, in partnership with universities, local councils, industries and businesses develop or improve strategies to promote the advantages of living and teaching in rural communities.

Strategies could include publicity campaigns promoting rural teaching, aimed at both pre-service and experienced teachers. Education authorities could also collaborate with university education faculties to engage experienced rural teachers to address pre-service teachers about the benefits and challenges of rural schools. Another strategy could be the development of programs whereby groups of pre-service students visit rural and remote schools (e.g. *Beyond the Line* in New South Wales) if something similar is not already in place.

Support for rural teachers

4. It is recommended that state/territory education systems sponsor the establishment of a professional Association of Rural Educators, with a central office in a regional area of each state/territory and branches in rural areas. The charter of the association would include:
    a. supporting the orientation of new teachers
    b. supplementary peer support
    c. advocating for rural teachers
    d. enhancing the status of rural service
    e. promoting a sense of collegiality between rural teachers
    f. maintaining the institutional memory of the profession in rural areas

5. It is recommended that education authorities, in collaboration with universities and professional organisations, establish a Rural School Leadership Program. This program would have both an incentive and a developmental dimension, be highly selective and competitive, and target experienced teachers with significant leadership potential. Components of the program may include:
    a. further university education, such as accredited action research (towards a masters or doctoral degree)
    b. links to international rural teacher networks, with the possibility of an exchange program
    c. fast-tracked entry into regional and state Succession Planning programs
    d. provision of personal online coaches/mentors to assist with professional learning pathways and skill acquisition.

Details of the support mechanisms and financial arrangements underpinning aspects of the program, such as further education, would need to be negotiated by the program partners.

Nevertheless, such a program would enhance the attractiveness of rural service among experienced teachers, and the status of rural teaching in general.

Pre-service preparation for rural teaching

6. It is recommended that Centres of Excellence in rural and regional pre-service teacher education be established at universities in each state and territory. The National Survey findings clearly support the establishment of such centres in regional universities, where these exist. In states/territories without rural universities, the centres could be established in one or more metropolitan universities committed to rural education.

7. It is recommended that the federal government, in partnership with universities, allocate additional student places in primary teaching and secondary science, ICT and mathematics teaching programs in the aforementioned Centres of Excellence in Rural Education.

8. It is recommended that parties involved in the emerging national and state/territory standards frameworks for pre-service education include standards requiring that:
   a. primary teachers are adequately prepared for teaching mathematics, science and ICT
   b. all teachers are able to address the learning needs of students in rural and regional areas, especially Indigenous students.

9.3. PROFESSIONAL CONNECTEDNESS AND ISOLATION OF TEACHERS

Teachers were asked a range of questions to determine their professional development needs in science, ICT and mathematics, and whether they felt professionally connected to, or isolated from, their peers.

9.3.1 Professional development needs of primary teachers

1. The findings indicate a strong need for professional development opportunities for primary teachers to develop their ICT skills, and to help them cater for special needs and gifted and talented students.
2. The findings provide strong evidence that primary teachers in Remote Areas are significantly disadvantaged in terms of accessing professional development opportunities such as mentoring, release time for PD and collaboration with colleagues. Teachers in Metropolitan schools appear to have a considerably lower unmet need for in-services in mathematics and science than teachers in other areas, particularly those in Remote Areas.
3. There appears to be a need to develop or improve structures to support mentoring of teachers in remote schools.
4. The findings provide evidence that primary teachers in remote schools, and in schools with high proportions of Indigenous students, feel professionally isolated. In particular, there is a need for professional development to help these teachers cater for special needs and gifted and talented students, for more financial support to cover the costs of

professional development, and for strategies to ensure that classes are covered in their absence.

9.3.2 Professional development needs of secondary science teachers

1. The findings strongly suggest that science teachers in general see the priority areas for professional development as being release from face-to-face teaching for programming and other collaborative activities, and more effective communication with educational authorities. The high level of need may be related to developments in secondary science curriculum that have been, and still are, in progress in a number of Australian states and territories.
2. There was a clear indication that science teachers need professional development opportunities to help them cater for the diversity of students in their classes
3. The unmet need for professional development opportunities increased substantially with distance from Metropolitan and Provincial Cities. Indeed, teachers in metropolitan schools reported a lower mean 'need' score on *every* professional development item.
4. The evidence suggests that science teachers in remote schools feel professionally isolated when it comes to opportunities to contribute to syllabus development. It is also apparent that teachers in Metropolitan Areas have far more opportunity to mark/moderate external science examinations. Such opportunities for teachers in remote schools would clearly benefit their students.
5. The findings suggest that science teachers in schools which have a relatively large proportion of Indigenous students have a substantially greater need for a range of professional development opportunities, particularly those which would help them cater for student diversity. However, the findings imply that science teachers in schools where Indigenous students make up 21 to 40% of the student population have a greater need for general in-service opportunities and support than do those in other schools.

9.3.3 Professional development needs of secondary ICT teachers

1. The findings strongly suggest that ICT teachers see the need for release from face-to-face teaching for collaborative activities as the highest professional development priority.
2. This finding is indicative of what appears to be a need for intensive on-the-job training. This conclusion is supported by ICT respondents' emphasis on the need for collaboration with ICT teachers in other schools, and for mentoring new staff. These priority areas are also consistent with what many respondents regarded as a relative lack of pre-service training in teaching ICT courses.
3. The tendency for professional development needs to increase with distance from a metropolitan city was not significant for ICT teachers, indicating that distance may be less of an issue for these teachers than is the case with primary and science teachers. Likewise, differences in the proportions of Indigenous students did not significantly affect levels of need. However, given the pattern across variables, the lack of significant associations may also be due to insufficient cell values.

9.3.4 Professional development needs of secondary mathematics teachers

1. The findings strongly suggest that secondary mathematics teachers throughout Australia see a high need for professional development to help teach higher-order thinking skills, to improve classroom management and to develop alternative teaching methods.
2. There also appears to be a strong need for release from face-to-face teaching for unit programming, and for more effective communication with education authorities.
3. The evidence suggests that mathematics teachers see a substantial need for professional development opportunities to help them cater for student diversity in their classrooms.

4. While there was a pattern in 'need' ratings across MSGLC categories, the differences were not significant, suggesting that the professional development needs of mathematics teachers do not vary as much with location as do those of science and primary teachers.
5. The findings strongly suggest that mathematics teachers in schools with substantial proportions of Indigenous students require more professional development in student management, alternative teaching methods and strategies to cater for student diversity than do those in schools with fewer Indigenous students.

9.3.5 Discussion

Teachers' responses to the questions about their professional development needs were consistent with much of the literature in this area (ICPA, 1999; Roberts, 2005; Vinson, 2002), but provided a greater level of detail on the specific professional development priorities of different types of teachers in different locations. All of the teacher groups indicated a substantial need for release from face-to-face teaching to attend in-services, and better lines of communication between themselves and education authorities. Professional development to help teachers cope with both special needs and gifted and talented students was also a common priority area.

There were a number of important differences in the professional development needs of different types of teachers. The most striking of these include the higher need for primary teachers to develop their ICT skills compared with secondary teachers, and the greater need among ICT teachers for collaboration and ongoing training. Mathematics teachers expressed a high need for professional development to help them teach higher-order thinking skills, and for classroom management strategies.

A general tendency for professional development needs to increase with geographic isolation was noticed among all four respondent groups, although this pattern was significant only among primary and science teachers. Primary teachers in Metropolitan Areas appear to have greater access to in-services to help them with science and mathematics teaching, while the greatest needs of primary teachers in Remote Areas appear to be for the mentoring of new staff, and for relief from face-to-face teaching to access professional development opportunities. The ability of the survey to distinguish between the professional development priorities of these teacher groups highlights its value in providing guidance to education authorities in formulating relevant policies.

There is evidence that the professional development needs of science teachers in metropolitan schools are better catered for than are those of science teachers in all other locations. This is particularly the case for access to in-services and opportunities to mark examinations or contribute to syllabus development. It is clear that such opportunities for teachers would have substantial benefits for their students. Moreover, non-metropolitan science teachers, and those in Remote Areas in particular, appear to be far less satisfied with the availability of professional development opportunities to help them cater for special needs and gifted and talented students. Judging by their comments, many teachers working outside cities find the centralisation of most professional development, with the attendant problems of cost, distance, time and teaching relief, to be the biggest obstacle to making the most of such opportunities.

Finally, the findings provide strong evidence that primary teachers and secondary science and mathematics teachers in schools with higher proportions of Indigenous students have a greater need for a range of professional development opportunities. This is most likely a function of low levels of pre-service preparation in teaching Indigenous students (as reported in Chapter

Four), the greater diversity of student backgrounds, and the aforementioned difficulties involved in accessing professional development in larger centres.

9.3.6 Recommendations to address professional isolation

Induction/orientation of teachers new to a rural area

9. It is recommended that education authorities, in collaboration with professional organisations (including the Association of Rural Educators), develop and monitor induction and orientation strategies to support the particular needs of teachers new to rural and regional schools including, as appropriate:
   a. teaching Indigenous students, including an awareness of Indigenous cultural issues within local contexts
   b. teaching multi-grade and multi-subject classes
   c. teaching out of curriculum area
   d. working with limited resources including support staff
   e. teaching students with special needs
   f. living in rural communities

The recommendation that rural teachers be better prepared and supported for teaching outside their curriculum areas is a response to the present realities of rural placement revealed by this study and others. In the longer term, however, this is not an acceptable compromise and it is hoped that actions taken to improve the science, ICT and mathematics staffing situations in these schools will have mitigated the necessity for this practice.

Continuing professional development

10. It is recommended that education authorities, in partnership with schools and school communities, universities, and professional organisations meet the continuing professional development needs of teachers in rural and regional areas through a range of strategies that ensure equitable access to ongoing quality professional learning. Approaches could include:
    a. the development of flexible staffing and school timetabling arrangements to allow scheduling of professional development
    b. the development of improved systems and strategies for collaborative face-to-face and online modes of professional development for teachers in rural and regional locations
    c. promoting cross-sectoral collaboration in meeting the professional development needs of teachers on a local basis
    d. funding research, development and dissemination of strategies to teach science, ICT and mathematics to the diverse range of students found in rural and regional classrooms
    e. implementing strategies for mentoring rural and regional mathematics, science and ICT teachers at various career stages, e.g., establishment of local networks such as the Association of Rural Educators, and initiatives such as the Rural School Leadership Program, suggested above.

Professional Engagement

11. It is recommended that education authorities and curriculum bodies address the professional isolation of rural and regional science, ICT and mathematics teachers by developing and monitoring strategies to ensure equitable access to and involvement in a range of core activities, enabling them to be engaged and contributing members of their professional community. Core professional activities include:
    a. curriculum development
    b. state/territory and system-wide student assessment programs
    c. consultations on pedagogical practice.

9.4. MATERIAL RESOURCE AND SUPPORT NEEDS OF TEACHERS

Teachers were asked about the importance and availability of a range of material resources and support personnel to help them teach science, ICT and mathematics. Their responses were analysed to identify the need priorities of different types of teachers, and compare the priorities across different locations.

9.4.1 Material resource and support needs of primary teachers

1. Overall, the findings highlight the priority primary teachers give to adequate ICT resourcing and support. In particular, there appears to be a clear need for additional skilled personnel not only to maintain ICT equipment, but also to help primary teachers incorporate ICT into their teaching.
2. Results indicate that the highest non-ICT need among primary teachers is for learning support assistants. In general, the needs of primary teachers appear to be for support personnel rather than material resources such as books, worksheets or AV equipment.
3. There is strong evidence that primary teachers' needs in many areas increase with the proportion of Indigenous students in their schools. For the most part, these needs relate to resources and support to cater for student diversity in their classrooms – not only for Indigeneity, but also for special needs and gifted and talented students. This is an important finding, as teachers' 'need' ratings did not vary significantly with MSGLC category of school.

9.4.2 Material resource and support needs of secondary science teachers

1. The findings indicate that science teachers in general see ICT infrastructure and support as the highest priority areas for resourcing.
2. Science 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.
3. There is an interesting contrast in the ICT needs of Remote Area science teachers. While their expressed need for computers for students' use was lower than that of teachers in other areas, their need for ICT support staff was considerably higher. The comments of Remote Area science teachers suggest that this may be because remote schools have adequate hardware, but lack access to the technical support to properly maintain and utilise it.
4. Science teachers in schools with relatively high proportions of Indigenous students appear to have a substantially higher level of need for most resources and support.

However, this need is not always highest among teachers in schools with the highest proportions of Indigenous students. For many items, teachers in schools with 21-40% Indigenous students indicated a higher need than did those with >40% Indigenous students. One possible explanation is that schools with the highest populations of such students qualify for extra support and/or funding. Further research is needed to investigate this finding.

9.4.3 Material resource and support needs of secondary ICT teachers

1. The findings suggest strongly that ICT teachers in general are most in need of support personnel to help them manage ICT resources and assist teachers and other staff to use these resources effectively. This finding supports the priorities given to greater ICT support by other teacher groups.
2. ICT teachers also expressed a high need for learning support assistants.
3. The results suggest that ICT teachers in non-metropolitan schools have a higher need for a range of resources and support, particularly for addressing student diversity and managing ICT resources. ICT teachers in Remote Area schools have a considerably higher need for basic teaching resources, such as worksheets, texts and library books.
4. The evidence indicates that ICT teachers are spending considerably more time than allocated in managing and maintaining ICT resources, and assisting other staff to use ICT. This increasing demand on their time appears to be the greatest area of concern for many ICT teachers.

9.4.4 Material resource and support needs of secondary mathematics teachers

1. The findings indicate that mathematics respondents in general considered ICT equipment and technical support to be their greatest area of resourcing need. Like primary and science teachers, mathematics teachers felt that sufficient computers for student use should be a priority area. Mathematics teachers' comments indicate that their concerns do not necessarily relate to the total number of computers in the school, but the availability of these computers for their classes,
2. Mathematics teachers also see a substantial need for learning support assistants. The findings show a substantial need for resources to cater for the diversity of student abilities in mathematics.
3. In general, schools with moderate to high proportions of Indigenous students appear to be in greater need of most resources. However, the variation in needs across schools with different proportions of Indigenous students illustrates that the greatest needs are not always with schools with the highest Indigenous populations. For many material and personnel resources, teachers in schools with between 21% and 40% Indigenous students expressed a higher need than did those with higher populations.

9.4.5 Discussion

Teachers' responses to the questions about material resource and support needs revealed many commonalities and several interesting differences. The most obvious commonality was the high priority teachers placed on ICT resources and assistance. It is significant that the first or second priority of every teacher group was for more ICT support personnel to help integrate ICT into their teaching. The need for additional assistance in maintaining and managing ICT resources also appears to be very high. These findings were consistent with the high demand on ICT teachers to fill these roles additional to their teaching loads.

The results indicate that a third priority of primary, science and mathematics teachers is for sufficient computers for student use. It was noted that all teacher groups indicated a substantially higher need for computers for their students than for themselves. This suggests that most schools are catering reasonably well for their staff in terms of hardware and software for lesson preparation and administration, but are challenged by the evolution of computers into an increasingly mainstream learning medium.

The high need for learning support personnel was also apparent among all teacher groups. In addition, the relatively high priority teachers gave to resources for special needs, gifted and talented, and in some schools, Indigenous students, indicates that teachers require more support in catering for the diversity of needs among their students.

Conventional resources such as textbooks, worksheets and science equipment (for secondary science teachers) generally rated lower than most other nominated items. However, this should not necessarily be construed as indicating that teachers no longer see these resources as important. Need scores were generated from teachers' ratings of both the importance and availability of resources for their teaching situation. A lower rating may therefore indicate that a resource is relatively important, but readily available.

The findings indicate that there are inequities between metropolitan and non-metropolitan schools in terms of access to resources and support personnel by science and ICT teachers. The geographical trend is most apparent among science teachers, with those in non-metropolitan schools reporting a greater unmet need for a broad range of resources. Considering the importance of equipment and practical work in science, it is reasonable to argue that science students in Metropolitan schools have an advantage over those in Provincial and Remote Area schools.

The geographical trend in resourcing for ICT teachers is less extensive, but indicative of a disadvantage in the area of resources and support to cater for student diversity and general teaching resources. Hardware and connectivity needs in general appear to vary little with geographic location but the necessary support to manage these resources varies considerably, with the needs of Provincial and Remote schools for this support often unmet.

There is strong evidence that teachers in schools with relatively high proportions of Indigenous students feel less well resourced than those in other schools. Primary school teachers in schools where Indigenous students make up more than 40% of the student population appear in greatest need. While relatively well resourced in terms of worksheets, computers and audio visual equipment, teachers in these schools have a greater need for resources to address student diversity, equipment to help them teach science and mathematics, and support personnel to help them get the most out of the ICT equipment they have. Science and mathematics teachers in schools with relatively high Indigenous populations also appear in need of better support and resourcing. The higher needs for resources to cater for special needs and gifted and talented students is perhaps indicative of the range of student abilities in these schools.

9.4.6 Recommendations to address access to resources and support personnel

Provision of compensatory ICT resources

12. It is recommended that education authorities, in collaboration with school communities, industry and business partners, provide improved access for rural and regional students and teachers to ICT hardware and network capacity. The level of access should allow increased use of online learning modes to compensate for reduced resources in other areas.

Access to ICT support personnel

13. It is recommended that education authorities, in collaboration with school communities, industry and business partners, develop and monitor strategies to improve the provision of technical support to rural and regional schools to maximise efficiency of hardware and networks, and reduce the time spent by teachers in maintaining ICT systems. Initiatives could include:
    a. the establishment of strategic partnerships with other ICT users in the local area
    b. the employment of additional human resources for ICT system support

Access to curriculum resources

14. It is recommended that education authorities, in collaboration with schools and other government and non-government agencies, develop and disseminate strategies and resources applicable to rural and regional contexts that support primary teachers in catering for students with diverse backgrounds, learning needs and aspirations, including Indigenous students, gifted and talented students, students from non-English speaking backgrounds and students with special learning needs.

15. It is recommended that education authorities, in collaboration with schools and other government and non-government agencies, develop and disseminate strategies and resources applicable to rural and regional contexts that support secondary science, ICT and mathematics teachers in:
    a. integrating ICT into their teaching
    b. catering for students with diverse backgrounds, learning needs and aspirations, including Indigenous students, gifted and talented students, students from non-English speaking backgrounds and students with special learning needs
    c. teaching subjects out of their curriculum areas, including consideration of alternative flexible staffing strategies and online learning to maximise the quality of teaching and learning where the availability of teachers in specialised areas is constrained.

Access to Learning Support personnel

16. It is recommended that education authorities increase the numbers of teacher assistants, Aboriginal and Islander Education Workers (AIEW) and other para-professionals in rural and remote schools to support teachers in catering for the diverse learning needs of students.

The National Survey findings show that the unmet need for support personnel is higher in rural and remote areas, indicating that present funding formulae do not seem to be addressing needs equitably. Calculations should recognise that the need for para-professional support does not relate simply to student numbers, but to the diversity of students, community characteristics and accessibility to services.

Resource funding formulae

17. It is recommended that education authorities review strategies and funding formulae to recognize that there is a greater unmet need for some resources in schools with 21-40% Indigenous students than in schools with higher Indigenous populations. The variation in resource needs among schools with different proportions of Indigenous students suggests a need for education authorities to allow schools greater flexibility in determining their own resourcing priorities.

9.5 STUDENT LEARNING OPPORTUNITIES AND EXPERIENCES

Teachers were asked about the importance and availability of a range of learning experiences for their students. Their responses were analysed to identify the need priorities of different types of teacher, and compare the priorities across different locations.

9.5.1 Primary teachers' views on student learning needs

1. The findings indicate that primary teachers in non-metropolitan schools see a significant need for their students to have more opportunities to visit science or mathematics-related educational sites. Primary teachers in Remote Areas see a substantially greater need than those in other locations for their students to have access to such learning opportunities.
2. There also appears to be some concern that teachers do not have enough time to fulfil the requirement of primary science syllabuses. Teachers in all MSGLC areas shared this concern.
3. The findings suggest that primary teachers generally consider students to have sufficient opportunities to participate in externally organised competitions and activities. However, it seems that primary teachers in Remote Areas see a greater unmet need for more such opportunities than do those in other locations.
4. The findings indicate that teachers in schools with relatively high proportions of Indigenous students see a substantially greater need for a range of learning experiences for their students than do those in schools with fewer Indigenous students. These experiences include alternative and extension activities to cater for the diversity of students and ability levels in their classes, and for opportunities to visit science and mathematics-related educational sites.

9.5.2 Secondary science teachers' views on student learning needs

1. The findings indicate that science teachers in non-metropolitan schools see a significant need for their students to have more opportunities to visit science-related educational sites. Science teachers in Remote Areas see a substantially greater need for their students to have access to such learning opportunities.
2. The findings suggest that science teachers in general, and those in Metropolitan Areas in particular, consider students to have sufficient opportunities to participate in externally organised competitions and activities.
3. There appears to be a considerable disparity across locations in teachers' perceptions of the need for alternative or extension science activities to cater for student diversity. The evidence indicates that teachers in Remote Areas see a greater need for such activities than do teachers elsewhere, though in terms of experiences of benefit to NESB and Indigenous students, science teachers in Provincial Cities also see a greater need than do those in Provincial or Metropolitan Areas.
4. The findings show that science teachers in schools with relatively high proportions of Indigenous students see a substantially greater need for a range of learning experiences

for their students than do those in schools with fewer Indigenous students. These experiences include alternative and extension activities to cater for the diversity of students and ability levels in their classes, and for opportunities to visit science and mathematics-related educational sites.

5. There is evidence that the greatest need for these experiences is found in schools where Indigenous students make up between 21 and 40% of the student population. Science teachers at these schools seem to feel there is a greater need for qualified teachers, a broader range of science courses and learning experiences for gifted and talented and special needs students, than do those in schools with higher or lower proportions of Indigenous students.

9.5.3 Secondary ICT teachers' views on student learning needs

1. The findings indicate that ICT teachers see a substantial need for their students to have the more opportunities to visit ICT-related sites. This need appears to be very high in remote schools, though ICT teachers in Provincial City schools all perceive a relatively high need for these experiences compared to those in metropolitan schools.
2. The evidence indicates that ICT teachers see a substantially higher need than science and mathematics teachers for qualified teachers in their subject area. The level of this need varies little with MSGLC category of school. This is consistent with findings that ICT teachers are less formally qualified in their areas than are other subject teachers, and feel a greater need for ongoing professional development and collaboration.
3. ICT teachers also appear to require more alternative or extension activities for gifted and talented students. Teachers felt there was a moderate to low need for their students to participate in more external competitions and activities.
4. While the geographic differences in general were suggestive rather than significant, the findings clearly show that metropolitan ICT teachers perceive a markedly lower need for a range of student experiences than do teachers in other locations.

9.5.4 Secondary mathematics teachers' views on student learning needs

1. The findings indicate that mathematics teachers see a need for their students to have more opportunities to visit mathematics-related educational sites, though the overall need rating was not as high as for science respondents. Mathematics teachers also see a need for alternative/extension activities for gifted and talented and special needs students. The geographic trend found among other teacher groups was not significant for mathematics teachers thus suggesting that the need for these experiences is more general.
2. Teachers felt there was a moderate-to-low need for their students to participate in more external mathematics competitions and activities.
3. The greatest level of 'need' in the Teaching Context in the School component was expressed by respondents from schools having a percentage of Indigenous students between 21% and 40% and the lowest level of 'need' in each case was expressed by respondents from schools with no Indigenous students.
4. The findings indicate that mathematics teachers in schools with high proportions of Indigenous students perceive a higher need for activities which cater for students with special needs, and for opportunities to visit educational sites. Mathematics teachers in schools where more than 20% of students are Indigenous tend to feel there is a need for more qualified teachers.

9.5.5 Students learning in composite classes

1. Overall, more than 27% of secondary respondents indicated that at least some senior science, ICT or mathematics courses were taught in composite classes in their schools.

ICT respondents were most often required to combine their senior classes – about 40% compared with science respondents (23%) and mathematics respondents (25%).

2. The practice of combining classes was significantly more common in rural schools. Only 11% of Metropolitan Area respondents, and 17% of Provincial City respondents, reported that composite science, ICT or mathematics classes were held in their schools. By contrast, 36% of those in Provincial Areas and 58% of those in Remote Areas reported this arrangement.

9.5.6 Discussion

Overall, the findings clearly indicate that primary and secondary teachers see a substantial need for their students to visit educational sites related to science, ICT and mathematics. Nevertheless, there appears to be considerable geographical variation in the level of need, with primary, science and mathematics teachers in Metropolitan Areas feeling that their students' needs for such excursions are reasonably well served. The level of need increases with distance from a metropolitan centre, with teachers in Remote Areas expressing the highest level of need. It is reasonable to expect that the range of educational experiences available to students in different areas would differ. For example, while students in Metropolitan Areas might have greater access to museums, businesses and factories, those in Provincial or Remote Areas may have easier access to agricultural and mining sites or national parks. However, the trend in the findings suggests that students in Metropolitan Areas have access to richer educational experiences in science, ICT and mathematics than do those in less populated areas. Distance to sites, cost, and the lack of public transport are factors that inhibit student access to a variety of relevant sites, and sites outside their normal experience.

The finding that primary teachers across Australia appear to have insufficient time to complete the requirements of science syllabuses is concerning, but consistent with literature showing that science often has a lower priority in primary schools than assumed by the syllabuses. Goodrum et al. (2001) suggest that this is partly due to some teachers' reluctance to teach science, due to their lack of confidence in the subject. Another possibility is that the focus on numeracy and literacy as priority areas leaves less time for other subjects. Either way, the finding implies that many classes are not completing the science syllabus requirements for one stage/grade before progressing to the next.

There is convincing evidence that primary and secondary schools with relatively high proportions of Indigenous students are in need of a greater variety of learning opportunities to cater for the diversity of students. While this obviously includes suitable learning opportunities for Indigenous students, teachers indicated that learning experiences suitable for special needs and gifted and talented students are also a priority However, it does not appear to be a matter of simply distributing extra resources in proportion to the numbers of Indigenous students, as the findings showed that in many cases it was the schools with between 21 and 40% Indigenous populations that have the greatest need. One explanation could be that such schools have a greater diversity than those in which Indigenous students make up the majority. Another might be that schools with relatively fewer Indigenous students attract less targeted funding, and therefore have fewer resources. Further investigation of this finding is warranted.

Results from the ICT teachers survey indicated that there is a substantial need for qualified teachers in this subject area. The level of this need varied little with MSGLC category of school. This finding is consistent with findings that ICT teachers are less formally qualified in their areas than are other subject teachers, and feel a greater need for ongoing professional development and collaboration.

Finally, the study shows that about 27% of science, ICT and mathematics teachers are required to teach courses in composite classes in order for those courses to run. Many composite classes are made up of Year 11 and 12 students, or of Year 12 students taking different courses. This appears to be a more common situation for ICT courses.

The findings clearly show that students in Provincial and Remote Areas, and senior students in particular, are required far more often to take science, ICT and mathematics courses in composite classes than their peers in Metropolitan and Provincial Cities. This finding highlights another educational inequity detrimental to students in rural schools.

9.5.7 Recommendations to improve student learning opportunities

18. It is recommended that education authorities, in partnership with schools, rural communities and other agencies develop strategies, allocate funding, and provide resources to enable rural and regional students to access locally and online a broader range of educational experiences in science, ICT and mathematics comparable to those available to metropolitan locations, such as:
    a. on-site visits
    b. summer schools
    c. opportunities to interact with students from other schools nationally and internationally
    d. mentoring by experts and practitioners in the field
    e. high quality learning materials, including interactive simulations and problem-solving activities
    f. activities that address the learning needs of the range of students in composite classes.

To be effective, the strategies would need to include:

- proportionate funding formulae that reflect difficulty of travelling to major centres
- improved broadband access to facilitate use of web-based simulations, communication with mentors and interaction with other schools.

19. It is recommended that government and non-government schools in rural areas form clusters within which staff are shared to maximise the subjects available to students, particularly in the senior years. These clusters could also coordinate (in collaboration with the Association of Rural Educators) visits by educational outreach programs to minimise costs.

9.6 PARENTS/CAREGIVERS' PERSPECTIVES ON THEIR CHILDREN'S SCIENCE, ICT AND MATHEMATICS EDUCATION

Parents/caregivers were asked for their perceptions on a range of issues concerned with their eldest school-age child's education in science, ICT and mathematics. The most significant findings related to perceptions of the capacity of their children's schools to attract and retain qualified teachers, and the qualities of their children's teachers.

9.6.1 Perceptions of capacities of schools to attract and retain teachers of science, ICT and mathematics

1. The findings indicate that parents/caregivers' confidence in the capacity of their children's primary schools to attract and retain qualified teachers decreases with the size and remoteness of school location. The findings also show that parents/caregivers in rural and Remote Areas are aware of staffing difficulties in those locations. Overall, parent/caregiver perceptions are generally in agreement with those of teachers, who considered vacant positions in metropolitan schools easiest to fill.
2. Analysis of the responses of parents/caregivers reporting about secondary schools did not reveal the same significant geographical pattern in staffing difficulties reported by science and mathematics teacher respondents in Chapter Four. However, it may be that many parents/caregivers are unfamiliar with the subject-specific qualifications of secondary teachers, generally assuming that those teaching mathematics or science to their children are qualified to teach those subjects.
3. While parents/caregivers in Remote Areas are generally appreciative of their children's teachers, there appears to be concern about the inexperience and capabilities of the teachers commonly recruited to these schools, and the long-term effects on the education of children.

9.6.2 Perceptions of achievement and teacher attitudes in science, ICT and mathematics education

1. The findings indicate firstly that parents/caregivers consider the commitment and enthusiasm of teachers to be one of the greatest strengths of schools. Perceptions of the levels of enthusiasm teachers bring to class do not appear to vary significantly with geographical location or type of school.
2. With regard to parents/caregivers' views on whether teachers care that students work to their potential, there was little evidence of substantial variation with type or location of school. Nevertheless, the weak but consistent (and in the case of mathematics, significant) pattern suggesting that parents/caregivers with children attending Provincial Area schools were less inclined than others to consider that teachers care whether students work to their potential is perhaps cause for further investigation.
3. The evidence suggests that the perceptions of parents/caregivers across Australia about achievement levels in science, ICT and mathematics vary substantially with geographic location. Parents/caregivers with children attending metropolitan primary and secondary schools are more inclined to agree that children in these schools achieve to a high standard in science, ICT and mathematics, than are parents/ caregivers with children in non-metropolitan schools. Those with children attending schools in Remote Areas are least inclined to agree. The geographical pattern in perceptions is consistent with patterns of achievement levels in science and mathematics revealed in international studies (Thomson et al., 2004).
4. There also seems to be a perception that teachers in primary and secondary schools in larger population centres provide greater encouragement for students to achieve to their potential in these subjects.

9.6.3 Perceptions of strengths and obstacles in science, ICT and mathematics education

1. The findings suggest that, overall, parent/caregivers are appreciative of the commitment, efforts and enthusiasm of teachers involved in science, ICT and mathematics education.
2. Understandably, their greatest concern appears to be that their children have access to an adequate range of learning experiences and opportunities. These include excursions, visits by experts, and a good variety of senior courses from which to choose.

Parents/caregivers seem to be aware that student access to these experiences and opportunities is considerably greater in larger population centres. There is also evidence that those outside these centres are concerned that their children are at an educational disadvantage.

3. Parents/caregivers with children having special needs or talent are appreciative where schools are able to provide relevant support. However, there appears to be concern from parents/caregivers in Provincial and Remote Areas that their schools are unable to provide this support adequately, and a tendency to send bright students to metropolitan schools where possible.
4. Finally, ICT education emerged as a key area of interest among parent/caregivers. There seems to be a general concern that children are not incorporating ICT into their learning as effectively as parents/caregivers would like, and a specific concern among those with children in rural schools that there is insufficient expertise and technical support for ICT.

9.6.4 Discussion

The responses of parents/caregivers provided an illuminating insight into their educational values and attitudes, as well as their perceptions of the schools attended by their children. In some cases these perceptions reflected the views and concerns of teachers.

Parents/caregivers' perceptions of the difficulty of attracting and retaining qualified primary teachers displayed a geographical pattern similar to that of primary teachers themselves, indicating their awareness that it is considerably more difficult to staff rural primary schools with qualified teachers than is the case in larger population centres. It was not clear whether parents/caregivers with children at the secondary level were aware of the staffing difficulties reported by science, ICT and mathematics teachers. However, it is doubtful that parents/caregivers would be aware of the subject-specific qualifications of secondary teachers, and therefore of whether their children's teachers were suitably qualified to teach those courses.

With regard to reflections on the qualities of their children's teachers, it was heartening to find that parents/caregivers are in general appreciative of the commitment, efforts and enthusiasm of teachers involved in these subject areas. There was no evidence that the enthusiasm teachers bring to the classroom varied with type or geographic location of school. Nevertheless, comments from parents/caregivers with children in remote schools suggest that there is greater concern about the inexperience of teachers in these schools, and the long term effects of this on children's learning, than is the case in other locations.

One area in which geographical differences were clear was in perceptions of the achievement levels of students in science, ICT and mathematics. The findings indicate that parents/caregivers with children attending schools in Metropolitan Areas are more inclined to think that students in these schools exhibit high achievement, and are encouraged to do so by their teachers, than are parents/with children in non-metropolitan schools. This geographic pattern in perceptions reflects the achievement patterns in national science and mathematics results from PISA, indicating awareness on the part of parents/caregivers of the achievement levels of their schools relative to those in other locations. In a few cases, the belief that students in metropolitan schools achieved higher results, and are more achievement-oriented, influenced parents/caregivers to consider sending their child to a metropolitan school.

The influence of this belief is important in the context of educational orientations, in that parents/caregivers who value university admission results highly may be influenced to move their children from rural schools to metropolitan schools in order to maximise academic success.

9.6.4 Recommendation to address parent/caregiver concerns

20. It is recommended that the federal government publicly acknowledge the concerns of parents/caregivers in rural and regional areas outlined in this report. Furthermore, in addressing recommendations 1-19 education authorities should ensure that parent organizations are kept informed, and consulted about initiatives and strategies employed in response to the findings. It is clear from the findings that parents/caregivers in rural and regional areas are concerned about student outcomes in science, ICT and mathematics in rural schools, and it is critical that governments be seen to be addressing these concerns in a systematic and effective way.

9.7 CONCLUSION

In view of the scope of the recommendations and the substantial resources, both human and financial, being called for, it is critical that systems of monitoring and accountability be developed parallel to the recommended strategies in order to assess their effectiveness. The complexity involved in negotiating outcomes, setting timelines, deciding on funding strategies, monitoring achievement of outcomes involving teacher attraction and retention, changes in levels of unmet need, and most importantly, improvements in student achievement in science, ICT and mathematics clearly calls for a coordinated national approach. It is also apparent from the National Survey and earlier studies that the concerns identified are national concerns, related to issues extending beyond education. While this chapter has addressed recommendations to a range of education authorities, systems, associations and partners, the actions of these groups need to be coordinated in order to be effective on a national scale. The final chapter outlines a framework for this coordination.

CHAPTER TEN

RURAL EDUCATION: A FRAMEWORK FOR ACTION

10.1 INTRODUCTION

The extent of the inequities in access to fundamental elements of science, ICT and mathematics education revealed by the National Survey, in concert with the geographical divide in student achievement levels, underscore the most significant challenge currently facing education in Australia – equity of educational opportunity for all school students regardless of location.

The principle of equity, established by the *Adelaide Declaration on National Goals for Schooling* and highlighted in Chapter Two, emphasises our obligation towards socially just education, in which student outcomes are independent of geographic location. Clearly this is not the current situation.

It is recognised that efforts are being made by individual state/territory education authorities and other organisations to address various aspects of the problem (MCEETYA, 2005). Nevertheless, the authors assert that a nationally coordinated approach, involving these and other relevant stakeholders is required to address these issues in a holistic way. We therefore propose that the recommendations from this and similar reports be considered under the auspices of a National Rural School Education Strategy.

Principal Recommendation:

It is recommended that a whole-of-government approach to addressing the issues of rural and regional school education be developed and implemented in the form of a National Rural School Education Strategy. The aim of the strategy would be:

- To map a coordinated approach across all government and non-government education jurisdictions to addressing the disparities in rural and regional school education.
- To foster the development of strategic partnerships between stakeholders involved in rural and regional education
- To deliver a coordinated, collaboratively designed and research supported package of programs to address the needs of rural teachers and students, rather than a collection of separate initiatives.

The establishment of this National Strategy is the principal recommendation of this report. We believe that this approach would facilitate coordinated and collaborative efforts from governments and other agencies that address identified needs in a targeted and accountable way.

10.2 WHERE TO FROM HERE FOR RURAL EDUCATION?

Chapter Two identified some of the endemic problems facing rural and regional education and highlighted significant studies that provided guidance on directions but which have not received due recognition from those formulating policy. These reports have presented a fairly consistent picture of rural education: lower schooling outcomes, problematic teacher retention and a lack of access to professional development and resources. While differing in focus and offering fresh insights, the recommendations of the SiMERR National Survey are clearly in the spirit of these reports.

Through the process of conducting the National Survey and, in particular, the focus group interviews, the various research teams became keenly aware that principals, teachers and parents expect remedial action to be taken in response to the findings. We therefore feel obligated to do our best to ensure that this report leads to significant and effective action.

In all such endeavours there comes a point at which research must give way to action, and we believe that the time is now. The pertinent question, and the focus of this chapter, is ‘Where to from here for rural education?’ The following sections discuss the catalysts for a National Rural School Education Strategy, and outline the scope and aims of the Strategy.

10.3 CATALYSTS FOR A NATIONAL RURAL SCHOOL EDUCATION STRATEGY

There have been a number of recent catalysts for the idea of a coordinated national approach. These include a national summit on rural education convened by SiMERR Australia in 2005 and a framework for rural education initiated by MCEETYA in 2001. The outcomes of these initiatives, along with those of the National Survey, present a unique opportunity to achieve something significant for rural and regional education in general, and science, ICT and mathematics education in particular.

The SiMERR National Summit

In November 2005, the first SiMERR National Summit was held at the Australian Science and Mathematics School in Adelaide. It was attended by key academics involved with SiMERR Australia, executives from Australia’s leading education bodies (and in particular those concerned with science, ICT and mathematics) and senior representatives of federal, state and territory education jurisdictions. The purpose of the summit was to discuss the initial findings of the SiMERR National Survey, the underperformance of students in rural and regional Australia, and an agenda for further action.

The keynote presentations and workshop sessions focused on inequities in the educational provision for, and outcomes of, rural students compared with their metropolitan peers. Emerging from the summit were several themes, touched on in Chapter Two but worth restating here:

- Education authorities across Australia should be deeply concerned about the disparities in achievement between rural and metropolitan students in science, ICT and mathematics.
- Rural schools face barriers to providing quality education, such as distances to major centres, problematic staffing and difficulties establishing and maintaining infrastructure.
- Rural education is interlinked with other aspects of rural communities, such as fluctuating populations, economic influences, seasonal conditions and climate.
- The need for students in rural and remote areas to have access to quality education services within a reasonable distance from the family home.

Another strong theme emerging from the National Summit was the importance of addressing underlying issues, and doing so in a holistic way. Summit participants were in general agreement that potential solutions which considered these concerns in isolation from one another would not be successful. In addition, it was recognised that attempts to address inequities in the provision of quality education will not be effective unless broader economic and social issues are also considered. Broader issues of rural and regional development, infrastructure, health and social services are all related to, and affect, rural education. A coherent and coordinated approach across all of these areas is needed to address rural and regional education concerns in a sustainable way.

Summit participants were in general agreement that potential solutions considering these concerns in isolation from one another would not be successful. In addition, it was recognised that attempts to address inequities in the provision of quality education would not be effective unless broader economic and social issues are also considered. Broader issues of rural and regional development, infrastructure, health and social services are all related to, and impact on, rural education. A coherent and coordinated approach across all of these areas is needed to address rural and regional education concerns in a sustainable way.

MCEETYA Framework for Rural and Remote Education

In 2001, the MCEETYA Taskforce on Rural and Remote Education, Training, Employment and Children's Services produced a *National Framework for Rural and Remote Education* (MCEETYA Task Force, 2001). The Framework was the product of collaborative work undertaken in response to Recommendation 4.5 of the Human Rights and Equal Opportunity Commission (HREOC, 1999) National Inquiry into Rural and Remote Education, and was designed to:

- provide a framework for the development of nationally agreed policies and support services
- promote consistency in the delivery of high quality education services to rural and remote students and their families
- provide reference points and guidance for non-government providers of services and support for education in rural and remote areas
- facilitate partnership building between government and non-government providers of services and support related to the provision of education in regional, rural and remote locations.

These aims are clearly consistent with the resolve emerging from the National Summit, and encompass many of the recommendations of the National Survey. The framework offers the vision for rural education highlighted in Chapter Two, 'that, by age 18, each young person residing in rural and remote Australia will receive the education required to develop their full potential in the social, economic, political and cultural life of the nation' (MCEETYA, 2001).

The framework provided an underlying philosophical position, drawn from extensive research findings and arguing for the type of inter-governmental and inter-agency collaboration identified above. Despite an agreement that practical action follow to ensure 'improvement for children and students in rural and remote Australia in the quality of provision of education available to them and to which they are inherently entitled', little seems to have resulted from this initiative.

One reason for this may be that the National Framework for Rural and Remote Education was positioned as a supplementary framework rather than a priority area. According to MCEETYA (2001), the framework:

> … nests within the broader work of MCEETYA through its various taskforces and working groups. It will inform the work of taskforces that have a specific link to rural and remote issues. Used in conjunction with existing policies and practices, it will ensure that children and students in rural and remote Australia receive the quality of education provision to which they are inherently entitled.

The framework was not positioned to generate action, but to inform other MCEETYA Taskforces. As a consequence, rural and regional school education became a peripheral area for policy. The MCEETYA Taskforce on Rural and Remote Education, Training, Employment and Children's Services has since been disbanded, as has its successor, the Taskforce on Targeted Initiatives of National Significance, which also had responsibility for rural and remote education issues.

It is our belief that the proposed National Rural School Education Strategy should fulfill the mandate initiated by the original Taskforce and mapped by the Framework, while avoiding the same fate. The National Strategy would be the most effective mechanism whereby consensus views could be turned into coordinated and focused actions.

10.4 DEVELOPING A NATIONAL RURAL SCHOOL EDUCATION STRATEGY

While the *National Framework for Rural and Remote Education* established a sound blueprint, the National Rural Health Strategy provides a working model with greater potential for effective action. In many ways the rural education situation is similar to that faced by rural communities in terms of health services. Both need to deal with small population sizes, low population densities, and difficulties in achieving economies of scale in both infrastructure support and human resourcing. Furthermore, there is a similar relationship in terms of federal, state and territory responsibilities.

The National Survey findings of inequity of access in this study have marked similarities to those facing the health sector. One could even replace students with patients, teachers with medical practitioners, and schools with hospitals. While the comparison should not be pushed too far, it does mean that successful initiatives arising from the health sector might provide valuable insights into how to address rural and regional education issues. For example, rural health investigations have noted that approaches that work for health improvement for metropolitan areas, do not necessarily work in rural and regional areas. The implication is that problems in rural education might not be best served by a metro-centric mind-set.

To address health concerns in rural Australia, the Federal, State and Territory governments agreed that the best way forward was to develop an integrated national approach to rural health. In 2000 they established the Rural Health Strategy to improve access to health and aged-care services for rural and regional communities. Like the proposed National Rural School Education Strategy, the Rural Health Strategy emerged after many reports highlighting concerns about health in rural and regional areas.

There are many similarities between the actions taken under the auspices of the Rural Health Strategy and the recommendations of the SiMERR National Survey. Both advocate:

- a flexible approach which considers the wider rural and regional context
- measures to 'address the gap in outcomes between rural and urban Australians' (Department of Health and Aging (DoHA), 2004)
- 'programs to support the recruitment and retention of … professionals in rural areas' including bonded scholarships (DoHA, 2004)
- 'rural-based and rural-focused training for … professionals' (DoHA, 2004)
- 'programs to support existing service providers' (DoHA, 2004)
- increased access to 'services in hundreds of smaller rural communities' (DoHA, 2004).

Modeling the National Rural School Education Strategy along the lines of the Rural Health Strategy would be consistent with current government policy. Furthermore, the process of implementing elements of the education strategy would be informed by the experiences of those involved in the Rural Health Strategy, avoiding many of the obstacles and pitfalls faced by new programs. Significantly for rural communities, gains have already been made through actions flowing from the Rural Health Strategy. At the same time, the needs in health and education are not identical and care must be taken to develop a unique strategy relevant to, and designed for, education initiatives. Hence, it would be important to identify the contextual differences between health and education circumstances.

The National Rural School Education Strategy would be expected to address service delivery to rural and regional communities in a cost effective way, recognising that such communities have many differences and that this will require solutions tailored to the community and the context. It will also be important that the National Rural School Education builds on existing programs and services, and ensures appropriate linkages between stakeholders.

We consider the following to be initial steps in formulating the National Rural School Education Strategy:

1. Establishing a coordination mechanism, possibly an inter-governmental Taskforce under the Council of Australian Governments (COAG) or the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA).
2. Developing the details of the strategy with reference to the *National Framework for Rural and Remote Education* developed by MCEETYA, the findings and recommendations from the SiMERR National Survey, and other relevant studies.
3. Identifying roles, responsibilities and accountabilities associated with various aspects of the strategy.
4. Facilitating communication and strengthening collaboration between governments, agencies and communities.
5. Establishing an integrated research agenda to monitor the outcomes of the National Rural School Education Strategy with regard to students, teachers, schools and communities, and to guide its development using evidence-based research in rural and regional areas.

In order to achieve steps 1 to 4:

21. It is recommended that a National Rural School Education Taskforce be established by MCEETYA or COAG to coordinate the development of the National Rural School Education Strategy. The Taskforce would facilitate ongoing cooperation between federal and state/territory governments and other stakeholders, encourage active commitment to coordinate and jointly plan activities and initiatives aimed at achieving equitable access to education by teachers and students.

It is envisaged that the Taskforce be a dedicated national body, having an operational arm in DEST and given high level direction through COAG or MCEETYA. This would give the National Strategy unequivocal support from peak political bodies reporting to federal, state and territory governments and their instrumentalities. There should also be input from other relevant government departments, such as the Department of Transport and Regional Services, the Department of Employment and Workplace Relations, and the Department of Health and Ageing.

Research support for the activities of the National Strategy

Step 5 above is considered crucial for providing evidence-based support for the initiatives of the National Strategy and accountability in terms of monitoring outcomes. Therefore, as a final but critical recommendation:

22. It is recommended that a national rural education research network be established and funded over the life of the National Strategy. Consistent with the National Strategy, the research would need to be conducted though a body or bodies having a coordinated national focus, a presence at universities in each state and territory with strong links to local education agencies and organizations, and expertise in rural and regional education, particularly though not exclusively in science, ICT and mathematics education.

The Rural Education Research Network would have a strategic focus as well as a coordinating and initiating role. Members of the network would undertake high-quality research, synthesise research findings so they are made available through the network, add to our knowledge of how to teach in rural and regional areas, provide guidance to governments and other education authorities on policy, disseminate research and good practice through conferences, publications, media releases and network websites. The research network would also constitute a national forum for addressing issues in rural and regional education, including those relating to science, ICT and mathematics, and student diversity.

Participant universities should be located in regional areas, or where this is not possible, have a demonstrated commitment to rural education. Preferably, the universities should also be Centres of Excellence in rural and regional pre-service education. The Centres would build upon the significant infrastructure already in place in regional universities.

Possible domains of a National Rural School Education Strategy

Several of the recommendations in Chapter Nine, such as the establishment of an Association of Rural Educators and the Rural School Leadership Program, could be incorporated under the National Rural School Education Strategy. However, the scope of the Strategy could extend beyond these to consider broader domains relating rural to school education. The suggestions below show how different ideas that move beyond, but are inclusive of, the recommendations in Chapter Nine might cluster under a National Rural School Education Strategy. Actions for consideration might include the development of programs that:

- seek ways to integrate current initiatives so that they are more complementary and identify how recommendations from the SiMERR National Survey might be incorporated within the National Strategy
- help revitalise rural and regional schools. For example, schools may be given the option of restructuring their facilities to make them more viable and relevant to community needs, such as becoming multi-purpose centres
- encourage flexibility so that a wide range of services can be subsumed and supported under the strategy. Frequently schools in a rural area are the largest employer in the community and play an integral role in sustaining the local economy
- allow or encourage flexibility of rules and regulations at a local level to enable local responses to emerge. Linking recommendations with regional development may assist the development of customised strategic plans to improve the viability of each school

- develop a communication strategy that informs rural and regional communities of current and future rural education initiatives. Encourage work with key rural and regional groups/communities to identify and structure local priorities
- review regional access and undertake an audit to determine broad areas of need for different education facilities. It may be that adjustment grants for rural schools could create a more balanced system across institutions with additional flexible funding in more remote areas. Viability funding should recognise the higher day-to-day operating costs of education services in rural areas
- support the recruitment of more teachers to rural and regional centres, as recommended by this and other reports. Considerations could be given to scholarships or employer arrangements with regard to Higher Education Contribution Scheme (HECS) payments for students willing to teach in rural and regional areas
- develop positive long-term incentives to increase and strengthen the rural education workforce and especially to encourage teachers to remain in rural areas. At the same time, programs are needed to enhance the skills of rural teaching professionals, reduce professional isolation and encourage teachers into small communities
- create a senior teacher outreach program. The purpose is to enhance rural education and training for education professionals and to provide for rural leadership support and development
- address rural and regional issues concerning preschool and tertiary education
- link through Teaching Australia to various state/territory Teacher Institutes.

We recognise that there are tensions here in providing elaboration of our ideas with various degrees of detail. We have tried to highlight ideas and actions to explicate possibilities that a National Rural School Education Strategy would open up. However, in doing so we caution against getting caught up in details at this stage, and losing sight of the overall picture.

10.5 CONCLUSION

We believe that a National Rural School Education Strategy is the only viable and sustainable way for Australia to address rural and urban inequities in education. We are convinced that this initiative will help position all stakeholders to work together effectively to introduce local solutions that meet the needs of rural and regional communities in the provision of quality education across Australia.

Clearly, the long-term mission of the National Rural School Education Strategy is to improve the performance of students in rural and regional Australia. The driving forces for addressing this mission are government and non-government education authorities in the main, but also rural communities that will become involved because they recognise the needs of their students and teachers, and because they will have some ownership of actions and will see the positive results of these actions.

In this concluding chapter we have tried to highlight an important tension that has plagued past attempts to address educational inequities. It concerns the tendency to maintain ownership of the issues within education without establishing a broader role for rural and regional communities and other areas of government responsibility. Too often education is seen as the panacea for social ills. Australian society as a whole has a responsibility for, and a stake in, the education of students in rural and regional areas. While we believe that those responsible for coordinating and implementing the proposed National Rural School Education Strategy should be drawn primarily from education, it needs to be a truly national agenda.

Importantly, the ideas in this final chapter are not about working from a deficit model of teaching and learning in rural and regional Australia. Rather, the ideas and illustrative actions are offered as positive steps towards harnessing the strengths of rural and regional communities in meeting the challenges facing their schools, and ensuring equity of access for their students. The recommendations in this report, and in particular the proposal for a National Rural School Education Strategy, are aimed squarely at reducing the educational divide between rural and urban Australia, and therefore at creating a fairer and healthier Australia.

REFERENCES

Alloway, N., Gilbert, P., Gilbert, R., & Muspratt, S. (2004). *Factors impacting on student aspirations and expectations in regional Australia*. Canberra: Department of Education, science and Training.

Alston, M.M. & Kent, J. (2003). Educational access for Australia's rural young people: A case of social exclusion. *Australian Journal of Education*, *47* (1), 5–18.

Angus, M., Olney, H., Ainley, J., Caldwell, B., Burke, G., Selleck, R., & Spinks, J. (2004). *The sufficiency of resources for Australian primary schools*. Canberra: Department of Education, Science and Training.

Arnold, P. (2001). Review of contemporary issues for rural schools. *Education in Rural Australia*, *11* (1), 30–42.

Australian Education Union (1999). A submission to the Human Rights and Equal Opportunity Commission Inquiry into Rural and Remote Education.

Boylan, C. (2003). Putting rural into pre-service teacher education. Paper presented at the Joint Australian Association for Research in Education/New Zealand Association for Research in Education Conference, Auckland. Retrieved August 2005 from http://www.aare.edu.au/03pap/alpha.htm

Boylan, C. & McSwan, D. (1998). Long-staying rural teachers: Who are they? *Australian Journal of Education*, *42* (1), 1–12.

Boylan, C., Sinclair, R., Smith, I., Squires, D., Edwards, J., Jacob, A., O'Malley, D., & Nolan, B. (1993). Retaining teachers in rural schools: Satisfaction, commitment and lifestyles. In C. Boylan & M. Alston (Eds.) *Rural education issues: An Australian perspective*. Wagga Wagga, NSW: Society for the Provision of Education in Rural Australia (SPERA).

Canadian Teachers Federation (2000). *CTF survey of Canadian School Boards on supply/demand issues*. Canadian Teachers Federation Economic Services Bulletin, October.

Chaffey, G.W., Bailey, S.B., & Vine, K.W. (2003). Identifying high academic potential in Australian Aboriginal children using dynamic testing. *Australasian Journal of Gifted Education, 12* (1), 42–55.

Colangelo, N., Assouline, S. G., Baldus, C. M., & New, J. K. (2002). Gifted education in rural schools. In N. Colangelo & G. A. Davis (Eds.) *Handbook of gifted education* (2nd Edition) (pp. 572-581). Boston: Allyn and Bacon.

Collins, T. (1999). Attracting and retaining teachers in rural areas. Charleston, WV: ERIC Digest, Digest EDO-RC-99-7. Retrieved August 2005, from http://www.acclaim-math.org/docs/htmlpages/Attracting%20and%20Retaining%20Teachers.htm

Committee for the Review of Teaching and Teacher Education (2003a). *Australia's teachers: Australia's future — Advancing innovation, science, technology and mathematics*. Canberra: Commonwealth of Australia.

Committee for the Review of Teaching and Teacher Education (2003b). *Australia's teachers: Australia's future — Advancing innovation, science, technology and mathematics*. *Agenda for Action.* Canberra: Commonwealth of Australia.

Committee on Science, Engineering, and Public Policy (2005). *Rising above the gathering storm: Energizing and employing America for a brighter economic future.* Washington DC: National Academies Press.

Cooksey, R. (1997). *Statistics for behavioural and social research: A descriptive handbook.* Armidale: University of New England.

Cooper, S. & Hatton, E. (2003). Designing an innovative regional teacher preparation program: Reflections on early phases. Paper presented at the New Zealand and Australian Association for Research in Education Joint Conference, Auckland, November.

Cresswell, J. & Underwood, C. (2004). *Location, location, location: Implications of geographic situation on Australian student performance in PISA 2000*. ACER Research Monograph No 58. Camberwell, VIC: ACER.

Daly, A.E. (2005). *Bridging the digital divide: The role of community online access centres in Indigenous communities*. Canberra, ACT: Centre for Aboriginal Economic Policy Research, ANU.

Dellitt, J. (1998). *Following the ridges: Learning with information technology west of the Great Dividing Range*. EdNA Online. Retrieved August 2005 from http://www.edna.edu.au/edna/go/pid/337

Department of Education, science and Training (DEST) (2001). *Executive summary. Teachers in Australian Schools: A Report from the 1999 National Survey*. Canberra: Australian College of Education. Retrieved September 2005, from http://www.dest.gov.au/sectors/school_education/publications_resources/other_publications/teachers_in_australian_schools.htm

Department of Health and Aging (2004). *Health Fact Sheet 4: A continuing commitment to rural, regional and remote Australians*. Retrieved March 2005, from http://www.health.gov.au/internet/wcms/publishing.nsf/Content/health-budget2004-hbudget-hfact4.htm

Dillman, D. A. (2000). *Mail and Internet surveys*: *The tailored design method*. New York: John Wiley & Sons.

Elliott, A. (2002). *Response to Federal review of teaching and teacher education: Submission number RTTE 96*. Retrieved October 2005, from http://www.dest.gov.au/sectors/school_education/policy_initiatives_reviews/reviews/teaching_teacher_education/documents/rtte96_pdf.htm

Federation of Australian Scientific and Technological Societies (2002). Australian science: *Investing in the future*. Retrieved August 2005 from www.fasts.org/Fsite/Policy/FASTS_Policy2002_final.pdf

Gibson, I.W. (1994a). Preparing teachers for rural education settings in Australia: Issues of policy, practice and quality. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA, April.

Gibson, I.W. (1994b). Policy, practice and need in the professional preparation of teachers for rural teaching. *Journal of Research in a Rural Education*, *10* (1), 68–77.

Glaser, B. & Strauss, A. (1967). *The discovery of grounded theory*. Chicago IL: Aldine.

Goodrum, D., Hackling, M., & Rennie, L. (2001). *The status and quality of teaching and learning of science in Australian schools. Research report for DETYA*. Canberra, ACT: Commonwealth of Australia.

Goodwin, P. & Wright, G. (2004). *Decision analysis for management judgment*. 2nd ed. West Sussex, UK: John Wiley & Sons.

Grimmett, P. & Echols, F. (2001). *Teacher and administrator shortages in changing times: Avoiding the dilemma of saving the train from hijackers to find there's no train left!* Proceedings of the 2001 Pan-Canadian Education Research Agenda Symposium — Teacher education/educator training: Current trends and future directions, Quebec City, May. Retrieved October 2005, from http://www.cmec.ca/stats/pcera/symposium2001/grimmett.o.en.pdf

Gross, M.U.M., MacLeod, B., Bailey, S., Chaffey, G., Merrick, C., & Targett, R. (2005). *Gifted and talented education: Professional development package for teachers*. Canberra: Department of Education, Science and Training & Gifted Education Research Resource and Information Centre (GERRIC), UNSW.

Halsey, J. (2005). *Submission to the inquiry into teacher education*. Rural Education Forum Australia. Retrieved October 2005, from http://www.aph.gov.au/house/committee/evt/teachereduc/subs/sub045.pdf

Hammer, P.C. (2001). *Joining rural development theory and rural education practice*. Charleston, WV: AEL

Harris, K., Jensz, F., & Baldwin, G. (2005). *Who's teaching science? Meeting the demand for qualified science teachers in Australian secondary schools. Report prepared for Australian Council of Deans of science by the Centre for the Study of Higher Education*. Melbourne, VIC: University of Melbourne.

Herrington, A. & Herrington, J. (2001). Web-based strategies for professional induction in rural, regional and remote areas. Retrieved August 2005, from http://www.aare.edu.au/01pap/her01711.htm

Hicks, J.L. (2002). Distance education in rural schools. *United States Distance Learning Association Journal*, *16* (3). Retrieved August 2005 from http://www.usdla.org/html/journal/MAR02_Issue/archives.html

Higgins, A. (1993). *Rural differences: A challenge for beginning teachers*. Townsville, QLD: Rural Education Research and Development Centre, James Cook University.

Hugo, G. (2000). What is happening in rural and regional populations? Paper presented at the First National Conference on the Future of Australia's Country Towns, Bendigo Vic. 28th-30th June. Retrieved November 2005 from www.regional.org.au/au/countrytowns/keynote/index.htm#P-1_0

Human Rights and Equal Opportunity Commission (HREOC) (1999). *Bush talks*. Sydney: Commonwealth of Australia. Retrieved August 2005 from http://www.hreoc.gov.au/human_rights/rural_australians/bushtalks/index.html

Human Rights and Equal Opportunity Commission (HREOC) (2000). *'Education access': National inquiry into rural and remote education*. Sydney: Commonwealth of Australia.

Isolated Children's Parents' Association (ICPA) (1999). Submission to the National Inquiry into Rural and Remote Education.

James, R., Wyn, J., Baldwin, G., Hepworth, G., McInnis, C., & Stephanou, A. (1999). *Rural and isolated students and their higher education choices: A re-examination of student location, socioeconomic background, and educational advantage and disadvantage*. Canberra: Australian Government Publishing Service.

Jones, R. (2000). Development of a common definition of, and approach to data collection on the geographic location of students to be used for nationally comparable reporting of outcomes of schooling. Report prepared for the MCEETYA National Education Performance Monitoring Taskforce, unpublished. Retrieved December 2004 from www.mceetya.edu.au/mceetya/default.asp?id=11976

Jones, R. (2002). *Education participation and outcomes by geographic location*. Camberwell, VIC: ACER.

Jones, R. (2004). *Geolocation Questions and Coding Index*. A technical report submitted to the MCEETYA Performance Measurement and Reporting Taskforce. Retrieved July 2005 from www.mceetya.edu.au/mceetya/default.asp?id=11968

Kanfer, R. (1994). Motivation theory and industrial and organizational psychology. In M. Dunnette and L. Hough, Eds. *Handbook of industrial and organizational psychology*. 2nd ed. Volume 1. pp. 75-170.

Kenyon, P., Sercombe, H., Black, A., & Lhuede, D. (2001). *Creating better educational and employment opportunities for rural young people: A report to the National Youth Affairs Research Scheme*. Hobart: Australian Clearinghouse for Youth Studies.

Kilpatrick, S., Johns, S., Mulford, B., Falk, I., & Prescott, L. (2002). *More than an education: Leadership for rural school-community partnerships.* Barton, ACT: Rural Industries Research and Development Corporation.

Lamb, S., Dwyer, P., & Wyn, J. (2000). *Non-completion of school in Australia: The changing patterns of participants and outcomes*. LSAY Research Report No. 16. Melbourne: ACER. Retrieved October 2005, from http://www.acer.edu.au/research/projects/lsay/research.html

Lang, T. R., Raver, R. A., White, J. A., Hogarty, K. Y., Kromrey, J. D. (2000). Survey data collection strategies: Response differences between Web-based and paper-based methods. Paper presented at the Annual Meeting of the Florida Educational Research Association, 8 - 10 November, Tallahassee FL. Retrieved December 2004, from www.coedu.usf.edu/IT/Research/survey.htm

Lester, J. (2000). *Evaluative research into the Office of the Board of Studies' Aboriginal Careers Aspiration Program for Aboriginal students in NSW high schools.* Newcastle: University of Newcastle Umulliko Indigenous Higher Education Research Centre. Retrieved October 2005, from http://www.boardofstudies.nsw.edu.au/aboriginal_research/#ACAP_a

Maykut, S. & Morehouse, R. (1994). *Beginning qualitative research: A philosophical and practical guide*. London: Falmer Press.

MCEETYA (1999). *The Adelaide declaration on national goals for schooling in the twenty-first century*. Retrieved September 2005, from http://www.mceetya.edu.au/nationalgoals/natgoals.htm

MCEETYA (2001). Information statement from the12th MCEETYA meeting, 26-27 July, in Melbourne. Retrieved April 2006, from http://www.mceetya.edu.au/mceetya/default.asp?id=11558

MCEETYA (2003). *Demand and supply of primary and secondary school teachers in Australia*. Retrieved September 2005, from http://www.mceetya.edu.au/public/demand.htm

MCEETYA (2005). *Demand and supply of primary and secondary school teachers in Australia*. Retrieved April 2006, from www.mceetya.edu.au/mceetya/default.asp?id=11582

MCEETYA (2006). *National report on schooling in Australia.* Retrieved April 2006, from http://www.mceetya.edu.au/mceetya/default.asp?id=13342

MCEETYA Task Force on Rural and Remote Education, Training, Employment and Children's Services (2001). *National framework for rural and remote education*. Retrieved August 2005, from www.mceetya.edu.au/pdf/rural.pdf

Mertler, Craig A. (2003). Patterns of response and non-response from teachers to traditional and web surveys. *Practical Assessment, Research and Evaluation*, 8*(22).* Retrieved June 18, 2005 from http://PAREonline.net/getvn.asp?v=8&n=22 .

Millwater, J. (1996). Towards purposeful partnerships: An internship. In A. Yarrow, J. Millwater, S. De Vries, & D. Creedy (Eds.) *Practical experiences in professional education: Research monograph, No. 1*. Brisbane: QUT Publications.

Ministry of Education (2002). *Monitoring teacher supply: Survey of staffing in New Zealand schools at the beginning of the 2002 school year*. Retrieved October 2005, from http://www.minedu.govt.nz/print_doc.cfm?layout=document&documentid= 6913&indexid=5874&indexparentid=5871&fromprint=y

Porter, S. (2004). Raising response rates: What works? *New directions for institutional research,* vol.121. Retrieved June 2005 from www.atn.edu.au/docs/Raising%20Response%20Rates.pdf

Preston, B. (1999). The impact of boarding school policies and practices on the provision and quality of schooling in rural and remote Australia. Submission to the National Inquiry into Rural and Remote Education.

Richer, K., Godfrey, J., Partington, G., Harslett, M., & Harrison, B. (1998). Attitudes of Aboriginal students to further education: An overview of a questionnaire survey. Paper presented at the Annual Conference of the Australian Association for Research in Education, Adelaide, November/December. Retrieved October 2005, from http://www.aare.edu.au/98pap/ric98095.htm

Roberts, P. (2005). *Staffing an empty schoolhouse: Attracting and retaining teachers in rural, remote and isolated communities*. Sydney: NSW Teachers Federation.

Roblyer, M.D. (1999). Is choice important in distance learning? A study of student motives for taking Internet-based courses at the high school and community college levels. *Journal of Research on Computing in Education*, *32* (1), 157–171.

Ross, A. & Hutchings, M. (2003). *Attracting, developing and retaining effective teachers in the United Kingdom of Great Britain and Northern Ireland: OECD country background report*. London: Institute of Policy Studies in Education, London Metropolitan University.

Russell, G., Finger, G. & Russell, N. (2000). Information technology skills of Australian teachers: Implications for teacher education. *Journal of Information Technology for Teacher Education, 9(*2),149-166

Schneider, S. J., Cantor, D., Malakhoff, L., Arieira, C., Segel, P., Nguyen, K.-L., Guarino Tancreto, J. (2005). Telephone, Internet, and paper data collection modes for the Census 2000 Short Form. *Journal of Official Statistics*, *21*(1), 89-101.

Skilbeck, M. & Connell, H. (2003). *Attracting, developing and retaining effective teachers: Australian background report*. Canberra: Commonwealth of Australia.

Smither, J.W., Walker, A.G., & Yap, K.T. (2004). An examination of the equivalence of web-based vs paper-and-pencil upward feedback ratings: Rater- and ratee-level analyses. *Educational and Psychological Measurement, 64* (1), 40-61.

Spierings, J. (2001). Regional and local government initiatives to support youth pathways: Lessons from innovative communities. Paper presented to the Australian Council for Educational Research Conference, 'Understanding youth pathways', Melbourne, October. Retrieved October 2005, from http://www.dsf.org.au/papers/84.htm

Squires, D. (2003). Responding to isolation and educational disadvantage. *Education in Rural Australia*, *13* (1), 24–40.

Tabachnick, B.G., & Fidell, L.S. (2001). *Using multivariate statistics,* 4th ed. Boston: Allyn & Bacon.

Thomson, S., Cresswell, J., & De Bortoli, L. (2004). *Facing the future: A focus on mathematical literacy among Australian 15-year-old students in PISA*. Camberwell, VIC: ACER.

Vinson, A. (2002). *Inquiry into public education in New South Wales Second Report September 2002*. Retrieved August 2005, from www.pub-edinquiry.org/reports/final_reports/03/

Watson, A.J. & Hatton, N.G. (1995). Staffing of schools: Quality and equality. Paper presented at AARE Annual Conference. Hobart. November.

Yarrow, A., Ballantyne, R., Hansford, B., Herschell, P., & Millwater, J. (1998). Teaching in rural and remote schools: A literature review. *Teaching and Teacher Education*, *15*, 1–13.

Yun, G.W. & Trumbo, C.W. (2000). Comparative response to a survey executed by post, E-mail, and web form. *Journal of Computer-Mediated Communication*. 6 (1). Retrieved June 19, 2005 from www.ascusc.org/jcmc/vol6/issue1/abstracts.html

APPENDICES 3.1 – 3.2

APPENDIX 3.1 – Example of a Teacher Survey Questionnaire (Science)

The SiMERR National Secondary Science Teacher Survey

Survey Code

Please fill in circles like this: ● **Please use a pencil or black/blue pen**

Section A: Teacher Profile

1. What is your age?

Under 25	25-30	31-35	36-40	41-45	46-50	51-55	Over 55
○	○	○	○	○	○	○	○

2. What is your sex? Male ○ Female ○

3. The school system in which you teach is:

Government	Catholic systemic	Independent
○	○	○

4. What position do you hold on the staff?
   - ○ Principal
   - ○ Deputy Principal/Assistant Principal
   - ○ Subject Coordinator/Head of Department
   - ○ Classroom Teacher

5. On what basis are you employed?
   - ○ Full time permanent
   - ○ Part time permanent
   - ○ Casual/relief teacher
   - ○ Temporary/short term contract

6. Which **best** describes your highest academic qualification?
   - ○ 2 year Teacher Certificate or similar
   - ○ 3 year Diploma in Teaching or similar
   - ○ 3 or 4 year Bachelor degree without teacher education
   - ○ 3 or 4 year Bachelor of Education degree
   - ○ 3 or 4 year Bachelor degree and postgraduate teaching diploma or similar
   - ○ 3 or 4 year Bachelor degree and 2 or 3 year undergraduate diploma or similar
   - ○ Postgraduate degree and diploma/postgraduate teaching diploma
   - ○ Postgraduate degree without teacher education
   - ○ Other (please specify) ______________________

7. How many years have you been teaching science? (include casual and temporary employment)

Less than 1 year	1-3 years	4-7 years	8-12 years	13-25 years	More than 25 years
○	○	○	○	○	○

The SiMERR National Secondary Science Teacher Survey 1

8. How long have you been teaching at this school?

Less than 1 year	1-3 years	4-7 years	8-12 years	13-25 years	More than 25 years
○	○	○	○	○	○

9. Where was the school in which you did **most** of your high school study?

Metropolitan centre (pop. > 100 000)	Provincial city (50 000 - 99 999)	Regional centre (25 000 - 49 999)	Rural centre (10 000 - 24 999)	Small rural centre (< 10 000)
○	○	○	○	○

10. Where did you **live** while undertaking your initial teacher education?

Metropolitan centre (pop. > 100 000)	Provincial city (50 000 - 99 999)	Regional centre (25 000 - 49 999)	Rural centre (10 000 - 24 999)	Small rural centre (< 10 000)
○	○	○	○	○

11. How well do you feel your teacher education prepared you for:

	Not at all prepared	Somewhat prepared	Moderately prepared	Well prepared	Extremely well prepared
(a) teaching science	○	○	○	○	○
(b) teaching in rural and regional schools	○	○	○	○	○
(c) managing student behaviour	○	○	○	○	○
(d) teaching Indigenous students	○	○	○	○	○
(e) teaching Non English Speaking Background (NESB) students	○	○	○	○	○
(f) teaching gifted and talented students	○	○	○	○	○
(g) teaching special needs students	○	○	○	○	○
(h) using ICT across the curriculum	○	○	○	○	○

12. Which science courses are you **formally qualified** to teach? (you may indicate more than one)

Junior science	Senior physics	Senior chemistry	Senior biology	Senior multi-strand	Other (please specify)	None
○	○	○	○	○	○ ____________	○

13. Which science courses have you **actually taught** in the last three years? (you may indicate more than one)

Junior science	Senior physics	Senior chemistry	Senior biology	Senior multi-strand	Other (please specify)
○	○	○	○	○	○ ____________

Comments.

The SiMERR National Secondary Science Teacher Survey 2

If you have ever taught in a rural or regional centre (population less than 50 000), complete the next 3 questions. For other teachers the survey continues at Question 17 on page 4.

14. How influential were the following on your **initial** decision to teach in a rural or regional school?

	Not influential	Somewhat influential	Very influential	Extremely influential
Education authority placement	○	○	○	○
Previously lived in the same or similar location	○	○	○	○
Family connections in the location	○	○	○	○
Rural or remote area allowance	○	○	○	○
Rent subsidy	○	○	○	○
Affordable housing	○	○	○	○
Lifestyle change	○	○	○	○
Promotion	○	○	○	○
Bond/contract with educational provider	○	○	○	○
Spouse's/partner's employment situation	○	○	○	○
Job availability	○	○	○	○
Other ______________	○	○	○	○

Comments.

15. How influential are the following on your decision to **continue** teaching in a rural or regional school?

	Not influential	Somewhat influential	Very influential	Extremely influential
Smaller class sizes	○	○	○	○
Opportunity for promotion	○	○	○	○
Opportunity to work with Indigenous students	○	○	○	○
Enjoyment of lifestyle	○	○	○	○
Family connections in the location	○	○	○	○
Rural or remote area allowance	○	○	○	○
Subsidisation of rent	○	○	○	○
Affordability of housing	○	○	○	○
Community spirit	○	○	○	○
Expense of moving to the city	○	○	○	○
Spouse's/partner's employment situation	○	○	○	○
Other ______________	○	○	○	○

Comments.

The SiMERR National Secondary Science Teacher Survey 3

If you moved from a school in a rural or regional centre to a metropolitan centre (population greater than 50 000) answer question 16. For other teachers the survey continues at Question 17 below.

16. If you left a rural or regional school for a metropolitan school, how influential were the following?

	Not influential	Somewhat influential	Very influential	Extremely influential
Opportunity for promotion	○	○	○	○
Educational opportunities for your own children	○	○	○	○
Sense of professional isolation	○	○	○	○
Sense of social isolation	○	○	○	○
Reduced cost of travelling	○	○	○	○
Problems within the school	○	○	○	○
Problems in the community	○	○	○	○
Spouse's/partner's employment situation	○	○	○	○
Education authority placement	○	○	○	○
Limited essential services	○	○	○	○
Other ______________	○	○	○	○

Comments.

The two questions below are for teachers who have *not* taught in a rural or regional school at some point in their careers. For other teachers the survey continues at Section B on page 5.

17. How influential would the following be in motivating you to take up a position in a rural or regional school?

	Not influential	Somewhat influential	Very influential	Extremely influential
Improved opportunities for promotion	○	○	○	○
Smaller class sizes	○	○	○	○
Opportunity to work with Indigenous students	○	○	○	○
Rural or remote area allowance (e.g. $5000 p.a.)	○	○	○	○
Subsidisation of housing (e.g. 50% rent subsidy)	○	○	○	○
Affordability of housing	○	○	○	○
Smaller school staff	○	○	○	○
More holidays (e.g. 1 week p.a.)	○	○	○	○
Travel subsidy	○	○	○	○
Preference for future transfers	○	○	○	○
Other ______________	○	○	○	○

18. If you are presently teaching in a metropolitan area school, is there a compelling reason why you would not teach in a rural or regional school?

The SiMERR National Secondary Science Teacher Survey 4

Section B: School Profile

You might need to liaise with your Principal or School Administration Staff to answer accurately some of the questions in this section.

1. The average daily attendance rate in your school is:

Less than 50%	51-60%	61-70%	71-80%	81-90%	91-100%
O	O	O	O	O	O

2. The percentage of teachers who leave the school each year is:

0-10%	11-20%	21-30%	31-50%	Greater than 50%
O	O	O	O	O

3. How difficult is it to fill vacant science teaching positions at your school?

Not difficult	Somewhat difficult	Moderately difficult	Very difficult
O	O	O	O

4. Are some science courses at your school being taught in composite classes (e.g. years 11 and 12 physics taught in the same classroom) in order to have sufficient numbers?
   O No
   O Yes Please identify: ______________________________

5. How many students are there in a typical junior science class?

<10	11-15	16-20	21-25	26-30	>30
O	O	O	O	O	O

6. What percentage of students in your school have Indigenous backgrounds?

0%	1-20%	21-40%	41-60%	61-80%	80-100%
O	O	O	O	O	O

7. Are you required to teach a subject(s) for which you are not formally qualified?
   O No
   O Yes Please identify: ______________________________

Please comment on how your school context affects teaching and learning.

Section C: Science Department

In the following section, please rate each item according to:

(a) its *importance* for teaching and learning science at your school, and

(a) its *availability* at your school

A. MATERIAL RESOURCES AND SUPPORT PERSONNEL THAT ENHANCE SCIENCE TEACHING AND LEARNING	Importance					Availability			
	Not at all important	Somewhat important	Important	Very important	Extremely important	Never available	Seldom available	Usually available	Always available
1. Well equipped science laboratories	O	O	O	O	O	O	O	O	O
2. Sufficient laboratory consumables	O	O	O	O	O	O	O	O	O
3. Suitable AV equipment	O	O	O	O	O	O	O	O	O
4. Class sets of suitable texts	O	O	O	O	O	O	O	O	O
5. Worksheets for classroom teaching	O	O	O	O	O	O	O	O	O
6. Suitable library resources (e.g. magazines, books) for teaching and learning science	O	O	O	O	O	O	O	O	O
7. Classroom resources suitable for teaching science to:									
(a) Indigenous students	O	O	O	O	O	O	O	O	O
(a) NESB students	O	O	O	O	O	O	O	O	O
(a) gifted and talented students	O	O	O	O	O	O	O	O	O
(a) special needs students	O	O	O	O	O	O	O	O	O
8. Effective maintenance and repair of teaching equipment	O	O	O	O	O	O	O	O	O
9. Suitable laboratory assistant(s)	O	O	O	O	O	O	O	O	O
10. Suitable learning support assistant(s)	O	O	O	O	O	O	O	O	O
11. Suitable Indigenous Education Assistants	O	O	O	O	O	O	O	O	O
12. Suitably skilled ICT support staff	O	O	O	O	O	O	O	O	O

A. MATERIAL RESOURCES AND SUPPORT PERSONNEL THAT ENHANCE SCIENCE TEACHING AND LEARNING (continued)	Importance					Availability			
	Not at all important	Somewhat important	Important	Very important	Extremely important	Never available	Seldom available	Usually available	Always available
13. Suitably skilled personnel to assist in integrating ICT in your classroom	O	O	O	O	O	O	O	O	O
14. Suitable computer resources for teachers use	O	O	O	O	O	O	O	O	O
15. Appropriate number of computers for student use	O	O	O	O	O	O	O	O	O
16. Other computing hardware for teaching and learning science	O	O	O	O	O	O	O	O	O
17. A fast, reliable Internet connection	O	O	O	O	O	O	O	O	O
18. Access to a wide range of Internet science resources	O	O	O	O	O	O	O	O	O
19. Suitable software for teaching and learning science	O	O	O	O	O	O	O	O	O

Please comment on material resources and support personnel for science teaching and learning at your school.

Please comment on the type of Internet connections, quality of connection and any other issues that you may have with ICT in your school.

B. OPPORTUNITIES FOR PROFESSIONAL INTERACTION AND DEVELOPMENT	Importance					Availability			
	Not at all important	Somewhat important	Important	Very important	Extremely important	Never available	Seldom available	Usually available	Always available
1. Collaboration between science teachers in your school (e.g. sharing resources, ideas, content knowledge)	O	O	O	O	O	O	O	O	O
2. Collaboration with science teachers in other schools	O	O	O	O	O	O	O	O	O
3. Opportunities for mentoring new staff	O	O	O	O	O	O	O	O	O
4. Release from face-to-face teaching for in-school collaborative activities (e.g. programming)	O	O	O	O	O	O	O	O	O
5. Opportunities to attend external in-services or conferences related to teaching and learning science	O	O	O	O	O	O	O	O	O
6. Financial support for attendance at external in-services or conferences	O	O	O	O	O	O	O	O	O
7. Effective communication between education authorities and teachers	O	O	O	O	O	O	O	O	O
8. Involvement in region or state-wide syllabus development, or research projects (e.g. assessment)	O	O	O	O	O	O	O	O	O
9. Opportunity to mark/moderate external science assessments	O	O	O	O	O	O	O	O	O
10. Workshops to develop your ICT skills	O	O	O	O	O	O	O	O	O
11. Professional development opportunities to help you teach science to:									
(a) Indigenous students	O	O	O	O	O	O	O	O	O
(b) NESB students	O	O	O	O	O	O	O	O	O
(c) gifted and talented students	O	O	O	O	O	O	O	O	O
(d) special needs students	O	O	O	O	O	O	O	O	O

Please comment further on your professional interaction and development.

In the following section, please rate each item according to:

(a) its *importance* for teaching and learning science at your school, and

(b) its *availability* at your school

C. TEACHING AND LEARNING SCIENCE	Importance					Availability			
	Not at all important	Somewhat important	Important	Very important	Extremely important	Never available	Seldom available	Usually available	Always available
1. Opportunities for students to visit science related educational sites (e.g. museums, zoos, science centres, industry etc.)	O	O	O	O	O	O	O	O	O
2. Student participation in external science competitions and activities	O	O	O	O	O	O	O	O	O
3. Teachers qualified to teach the science courses offered in your school	O	O	O	O	O	O	O	O	O
4. Having the full range of senior science courses available in your school	O	O	O	O	O	O	O	O	O
5. Having the total indicative hours allocated to face-to-face teaching	O	O	O	O	O	O	O	O	O
6. Alternative or extension activities in science teaching programmes for:									
(a) Indigenous students	O	O	O	O	O	O	O	O	O
(b) NESB students	O	O	O	O	O	O	O	O	O
(c) gifted and talented students	O	O	O	O	O	O	O	O	O
(d) special needs students	O	O	O	O	O	O	O	O	O

Please comment on the attitudes of students in your school to learning science.

The SiMERR National Secondary Science Teacher Survey 9

Section D: Your Reflections

1. What do you consider to be the greatest strengths of your school/department in terms of helping students achieve in science?

2. What do you consider to be the greatest obstacles to student learning in science in your school?

3. What practices or programmes does your school implement to improve student learning in science?

4. If you could make one recommendation to school systems that you believe would improve student outcomes in science in your school, what would you recommend?

☺ Thank you for taking the time to complete this important survey

The SiMERR National Secondary Science Teacher Survey 10

APPENDIX 3.2 –Parent/Caregiver Questionnaire

The SiMERR National Parent/Caregiver Survey

Survey Code

Please fill in circles like this: ● **Please use a pencil or black/blue pen**

Section A: About You and Your Child

- **Please write your comments about your *eldest* child at this school.**
- **If you have children at more than one school, you may complete a separate form for each school. Additional forms are available from the School Principal or on the SiMERR website www.simerr.une.edu.au/.**

1. What is your sex? Male O Female O

2. How many children do you have attending this school?

1	2	3	4	more than 4
O	O	O	O	O

3. Your **eldest** child at this school is in:

kindergarten or lower primary	upper primary	junior secondary	senior secondary
O	O	O	O

4. Your child is a:

day student	boarding student	distance education student only
O	O	O

5. If your child is a day student, how long does it take him/her to travel to this school?

less than half an hour	between half an hour and one hour	between one and two hours	more than two hours
O	O	O	O

6. How important is it to you that your child:

	Not at all important	Somewhat important	Important	Very important	Extremely important
Completes Year 10	O	O	O	O	O
Completes Year 12	O	O	O	O	O
Completes a TAFE course	O	O	O	O	O
Completes a university degree	O	O	O	O	O

Section B: Teaching and Learning Science, Mathematics and ICT

For the following questions, please indicate how strongly you agree or disagree with each statement.

	Strongly disagree	Disagree	Agree	Strongly agree
1. There is a good relationship between teachers in this school and parents/caregivers	O	O	O	O
2. There is a good relationship between teachers in this school and the wider community	O	O	O	O
Question 3 refers to primary schools only.				
3. This school is able to attract and keep suitably qualified primary teachers	O	O	O	O
Question 4 refers to secondary schools only.				
4. This school is able to attract and keep suitably qualified teachers of:				
(a) science	O	O	O	O
(b) mathematics	O	O	O	O
(c) Information and Communication Technology (ICT)	O	O	O	O
5. Teachers in this school encourage students to achieve to their potential in:				
(a) science	O	O	O	O
(b) mathematics	O	O	O	O
(c) ICT (secondary only)	O	O	O	O
6. Students achieve to a high standard in:				
(a) science	O	O	O	O
(b) mathematics	O	O	O	O
(c) ICT (secondary only)	O	O	O	O
7. My child's teachers care if my child is not doing as well as he/she can in:				
((a) science	O	O	O	O
(b) mathematics	O	O	O	O
(c) ICT (secondary only)	O	O	O	O
8. My child's teachers are enthusiastic in their approaches to teaching:				
(a) science	O	O	O	O
(b) mathematics	O	O	O	O
(c) ICT (secondary only)	O	O	O	O

For the next 3 questions, please indicate:
(a) how **important** you think the following resources are, and
(b) how **available** you think these resources are in this school

	Importance					Availability			
	Not at all important	Somewhat important	Important	Very important	Extremely important	Never available	Seldom available	Usually available	Always available
9. Suitable textbooks or workbooks for learning:									
(a) science	O	O	O	O	O	O	O	O	O
(b) mathematics	O	O	O	O	O	O	O	O	O
(c) ICT (secondary only)	O	O	O	O	O	O	O	O	O
10. Suitable computing resources	O	O	O	O	O	O	O	O	O
11. Support teachers for:									
(a) Indigenous students	O	O	O	O	O	O	O	O	O
(b) Non English Speaking Background students	O	O	O	O	O	O	O	O	O
(c) special needs students	O	O	O	O	O	O	O	O	O

Section C: Your Ideas and Concerns

1. What do you consider to be the greatest strengths of this school in terms of helping your child to achieve his/her potential in science, mathematics or ICT?

2. What do you consider to be the greatest obstacles to improving your child's learning in science, mathematics or ICT?

3. Are there any initiatives that have been successful in improving your child's learning in science, mathematics or ICT? If so, please describe these initiatives.

4. If you could make one recommendation to school systems that you believe would improve student learning in science, mathematics or ICT, what would you recommend?

5. Other comments about science, mathematics and ICT education at this school.

☺ Thank you for taking the time to complete this important survey.

APPENDICES 4.1 - 7.4

Appendices 4.1 - 7.4 summarise the results of principal components analyses of various collections of thematically-related common items from the national primary and secondary school staff surveys. Each summary reports pattern coefficients for relating items on components (only substantive values, greater than .30, are shown) as well as the correlations between components. Items are considered to define that component on which they 'load' the highest (meaning the component with the highest pattern coefficient for an item). The number of components, for each analysis, was determined by the 'eigenvalue greater than 1.0' rule coupled with component interpretability. Items are taken to define the component on which they 'load' the highest (i.e., on which they have the highest pattern coefficient, shown in boldface type).

APPENDIX 4.1 PRINCIPAL COMPONENTS ANALYSIS OF THE ITEMS RELATING TO TEACHERS' INITIAL DECISIONS TO TEACH IN A RURAL OR REGIONAL SCHOOL (REFERS TO TABLE 4.8)

In Table A4.1, the first component was straightforwardly interpretable as grouping together items dealing with Financial and Advancement Incentives that might have attracted staff to teach in a regional or rural school. The second component was clearly defined by items dealing with family-related considerations (Family Links). The third component grouped together items dealing with job or career-related requirements (Job/Career Requirements). Interestingly, the lifestyle change item loaded negatively on the third component. This meant that the influence of lifestyle change was inversely related to the other items in the component; that is, when placement, bond/contract or job availability considerations were influential, lifestyle change tended not to be influential at the same time. The lifestyle change item was reverse-scored prior to combining it with the other items in the component to produce the Job/Career Requirement component score.

Table A4.1. Principal components analysis of 'Initial Decision' items

Pattern Matrix

	Component		
	Financial & Advancement Incentives	**Family Links**	**Job/Career Requirements**
Initial decision_rent_subsidy	**.86**		
Initial decision_afford_house	**.77**		
Initial decision_allowance	**.77**		
Initial decision_promo	**.40**		
Initial decision_fam_connect		**.87**	
Initial decision_prev_lived		**.80**	
Initial decision_spouse_sit		**.51**	
Initial decision_placement			**.75**
Initial decision_contract			**.71**
Initial decision_lifestyle_chng	.40		**-.48**
Initial decision_job_avail			**.33**

Component Correlation Matrix

Component	1	2	3
1 Financial & Advancement Incentives	1.00	-.01	-.01
2 Family Links	-.01	1.00	-.10
3 Job/Career Requirements	-.01	-.10	1.00

APPENDIX 4.2 Principal components analysis of the items relating to teachers' decisions to continue teaching in a rural or regional school (refers to Table 4.10)

In Table A4.2, the first component was clearly interpretable as grouping together items relating to the costs of living in a rural or regional area, along with the costs of moving back to the city (Living Costs). The second component was straightforwardly defined by three items dealing with work-related factors (Work Context). The third component grouped together two items dealing with the Lifestyle associated with living in a rural or regional area. Finally, the fourth component grouped together items related to family considerations in continuing to teach in a rural or regional area (Family).

Table A4.2. Principal components analysis of the 'Decision to continue teaching in a rural or regional school' items

Pattern Matrix

	Component			
	Living Costs	**Work Context**	**Lifestyle**	**Family**
Decision to continue_afford_house	**.86**			
Decision to continue_exp_mov_city	**.76**			
Decision to continue_rent_subsidy	**.66**			
Decision to continue_allowance	**.54**	.32	-.31	
Decision to continue_small_class		**.71**		
Decision to continue_promo_opp		**.69**		
Decision to continue_work_indig		**.68**		
Decision to continue_enj_lifestyle			**.84**	
Decision to continue_commun_spirit			**.76**	
Decision to continue_fam_connect				**.83**
Decision to continue_spouse_sit				**.81**

Component Correlation Matrix

Component	1	2	3	4
1 Living Costs	1.00	.47	-.04	.05
2 Work Context	.47	1.00	-.11	-.03
3 Lifestyle	-.04	-.11	1.00	.24
4 Family	.05	-.03	.24	1.00

APPENDIX 4.3 Principal components analysis of the items relating to 'Decisions to leave a rural or regional school for a metropolitan school' (refers to Table 4.12)

In Table A4.3, the first component was generally defined by a group of items related to the respondents' work and professional context, including considerations related to isolation, job changes and costs (Work and Professional Context). The second component grouped together items dealing with Problems in the school or community as being reasons for leaving a rural or regional school for a metropolitan school. Finally, the third component grouped together items dealing with changes in the respondent's family situation, including pursuing better educational opportunities for the respondent's own children (Family Situation).

Table A4.3 Principal components analysis of 'Decision to leave' items

Pattern Matrix

	Component		
	Work & Professional Context	**Problems**	**Family Situation**
Decision to leave_social_isolat	**.82**		
Decision to leave_prof_isolat	**.77**		
Decision to leave_limit_serv	**.73**		
Decision to leave_cost_travel	**.70**		
Decision to leave_placement	**.35**		
Decision to leave_promo	**.29**		.21
Decision to leave_probs_school		**.95**	
Decision to leave_probs_commun		**.92**	
Decision to leave_spouse_sit			**.81**
Decision to leave_ed_opps_child	.24		**.68**

Component Correlation Matrix

Component	1	2	3
1 Work & Professional Context	1.00	.46	.15
2 Problems	.46	1.00	.15
3 Family Situation	.15	.15	1.00

APPENDIX 4.4 Principal components analysis of the items relating to 'Motivation for moving from a metropolitan school to a rural or regional school (refers to Table 4.14)

In Table A4.4, the first component was generally defined by items relating to Financial and Advancement Incentives which might attract respondents to take up a position in a rural or regional school sometime in the future. The second component grouped together items relating to potentially desirable working conditions in rural or regional schools (Work Conditions).

Table A4.4. Principal components analysis of the items dealing with potential motivating factors for taking up a rural or regional position

Pattern Matrix

	Component	
	Financial & Advancement Incentives	**Work Conditions**
Motivation to move_rent_subsidy	**.96**	
Motivation to move_trav_subsidy	**.92**	
Motivation to move_allowance	**.91**	
Motivation to move_future_trans	**.87**	
Motivation to move_holidays	**.83**	
Motivation to move_afford_house	**.78**	
Motivation to move_promo	**.46**	
Motivation to move_indig_stud		**.93**
Motivation to move_small_staff		**.59**
Motivation to move_small_class	.40	**.50**

Component Correlation Matrix

Component	1	2
1 Financial & Advancement Incentives	1.00	.60
2 Work Conditions	.60	1.00

APPENDIX 4.5 Principal components analysis of the primary teacher preparation items (refers to Table 4.16)

In Table A4.5, the first component clearly groups together those items dealing with specific types of teaching or specific curriculum-based activities, hence the label: Specific Teaching Skills Preparation. The second component groups together those items dealing with more general preparation to teach in the science and mathematics subject areas, teach in rural or regional schools and manage student behaviour (General Teaching Preparation).

Table A4.5. Two correlated components summarising the primary teacher education preparation items

Pattern Matrix

	Component	
	Specific Teaching Skills Preparation	**General Teaching Preparation**
Primary prep._tch_NESB	**.85**	
Primary prep._tch_indig_stud	**.76**	
Primary prep._use_ICT_curric	**.75**	
Primary prep._tch_spec_need	**.75**	
Primary prep._tch_gift_tal	**.62**	
Primary prep._tch_sci		**.85**
Primary prep._tch_math		**.85**
Primary prep._tch_rur_reg		**.73**
Primary prep._man_stud_beh	.32	**.50**

Component Correlation Matrix

Component	1	2
1 Specific Teaching Skills Preparation	1.00	.53
2 General Teaching Preparation	.53	1.00

APPENDIX 4.6 Principal components analysis of the secondary teacher preparation items (refers to Table 4.18)

In Table A4.6, the first component clearly groups together those items dealing with specific types of teaching or specific curriculum-based activities, hence the label: Specific Teaching Skills Preparation. The second component groups together those items dealing with more general preparation to teach in the subject area, teach in rural or regional schools and manage student behaviour (General Teaching Preparation).

Table A4.6. Two correlated components summarising the secondary teacher education preparation items

Pattern Matrix

	Component	
	Specific Teaching Skills Preparation	**General Teaching Preparation**
Secondary_prep_tch_NESB	**.86**	
Secondary_prep_tch_spec_need	**.82**	
Secondary_prep_tch_indig_stud	**.81**	
Secondary_prep_tch_gift_tal	**.62**	
Secondary_use_ICT_curric	**.60**	
Secondary_prep_tch_subj_area		**.90**
Secondary_prep_tch_rur_reg		**.80**
Secondary_prep_man_stud_beh		**.53**

Component Correlation Matrix

Component	1	2
1 Specific Teaching Skills Preparation	1.00	.51
2 General Teaching Preparation	.51	1.00

APPENDIX 5.1 Principal components analysis of the professional development 'need' items for primary respondents (refers to Table 5.2)

In Table A5.1, the first component was straightforwardly defined by 'needs' dealing with classroom resources suitable for teaching primary to students from various targeted groups (Development for Teaching to Targeted Groups). The second component was clearly interpretable as grouping together 'needs' dealing with various aspects of in-service and conference activities and support teachers (In-Service Development). The third component grouped together 'needs' dealing with more general Personal Professional Development, including involvement in syllabus development in both science and mathematics. The last component comprised items dealing with the development of professional relationships, including mentoring and collaborating with colleagues (Professional Relationships Development).

Table A5.1. Principal components analysis of primary respondents' 'need' scores for the Opportunities for Professional Interaction and Development items

Pattern Matrix

	Component			
	Development for Teaching to Targeted Groups	**In-Service Development**	**General Personal Professional Development**	**Professional Relationships Development**
Primary PD_teach_NESB	**.94**			
Primary PD _teach_indig	**.92**			
Primary PD _teach_spec_need	**.85**			
Primary PD _teach_gift_tal	**.84**			
Primary PD _attend_in_serv_math		**.96**		
Primary PD _attend_in_serv_sci		**.94**		
Primary PD _$_supp_in_serv		**.81**		
Primary PD _inv_syl_res_math			**1.02**	
Primary PD _inv_syl_res_sci			**.99**	
Primary PD _commun_auth			**.41**	
Primary PD _devel_ICT_sk			**.39**	
Primary PD _coll_tch_sch				**.92**
Primary PD _rel_f_to_f_tch				**.77**
Primary PD _mentor_new_st				**.77**

Component Correlation Matrix

Component	1	2	3	4
1 Development for Teaching to Targeted Groups	1.00	.53	.58	.47
2 In-Service Development	.53	1.00	.56	.59
3 General Personal Professional Development	.58	.56	1.00	.50
4 Professional Relationships Development	.47	.59	.50	1.00

APPENDIX 5.2 Principal components analysis of the professional development 'need' items for secondary science respondents (refers to Table 5.4)

In Table A5.2, the first component was clearly interpretable as grouping together 'needs' dealing with various aspects of General Personal Professional Development for teachers, including in-service provision, teaching relief, skill development and involvement in professional activities beyond the school. The second component was straightforwardly defined by 'needs' dealing with classroom resources suitable for teaching science to students from various targeted groups (Development for Teaching to Targeted Groups). Finally, the third component grouped together 'needs' dealing with the development of professional relationships (Professional Relationships Development), including mentoring and collaborating with colleagues.

Table A5.2. Principal components analysis of science respondents' 'need' scores for the Opportunities for Professional Interaction and Development items

Pattern Matrix

	Component		
	General Personal Professional Development	**Development for Teaching to Targeted Groups**	**Professional Relationships Development**
Science_$_supp_in_serv	**.89**		
Science_attend_in_serv	**.82**		
Science_inv_syl_res	**.77**		
Science_commun_auth	**.74**		
Science_devel_ICT_sk	**.53**		
Science_rel_f_to_f_tch	**.48**		.34
Science_mark_ext_ass	**.40**	.33	
Sciencea_teach_indig		**.91**	
Science_teach_NESB		**.88**	
Science_tch_spec_ne		**.84**	
Science_tch_gift_tal		**.81**	
Science_coll_tch_sch			**.94**
Science_mentor_new_st			**.72**
Science_coll_tch_oth			**.56**

Component Correlation Matrix

Component	1	2	3
1 General Personal Prof Development	1.00	.56	.54
2 Development Teaching Targeted Groups	.56	1.00	.42
3 Professional Relationships Development	.54	.42	1.00

APPENDIX 5.3 Principal components analysis of the professional development 'need' items for secondary ICT respondents (refers to Table 5.6)

In Table A5.3, the first component was clearly interpretable as grouping together 'needs' dealing with various aspects of General Personal Professional Development for teachers, including in-service provision, teaching relief, skill development and involvement in professional activities beyond the school. The second component was straightforwardly defined by 'needs' dealing classroom resources suitable for teaching ICT to students from various targeted groups (Development for Teaching to Targeted Groups). Finally, the third component grouped together 'needs' dealing with the development of professional relationships (Professional Relationships Development), including mentoring and collaborating with colleagues.

Table A5.3. Principal components analysis of ICT respondents' 'need' scores for the Opportunities for Professional Interaction and Development items

Pattern Matrix

	Component		
	Development for Teaching to Targeted Groups	**General Personal Professional Development**	**Professional Relationships Development**
ICT_teach_indig	**.93**		
ICT_teach_NESB	**.87**		
ICT_tch_spec_ne	**.86**		
ICT_tch_gift_tal	**.79**		
ICT_mark_ext_ass		**.91**	-.31
ICT_inv_syl_res		**.81**	
ICT_$_supp_in_serv		**.69**	
ICT_attend_in_serv		**.68**	.32
ICT_commun_auth		**.36**	
ICT_coll_tch_sch			**.91**
ICT_coll_tch_oth			**.82**
ICT_rel_f_to_f_tch		.47	**.56**
ICT_mentor_new_st			**.53**

Component Correlation Matrix

Component	1	2	3
1 Development for Teaching Targeted Groups	1.00	.55	.48
2 Gen Personal Professional Development	.55	1.00	.57
3 Development of Professional Relationships	.48	.57	1.00

APPENDIX 5.4 Principal components analysis of the professional development 'need' items for secondary mathematics respondents (refers to Table 5.8)

In Table A5.4, the first component was clearly interpretable as grouping together 'needs' dealing with various aspects of subject-specific Mathematics Teaching Professional Development. The second component was defined by items focusing on more general aspects of professional development; hence the label, General Professional Development. The third component was straightforwardly defined by 'needs' dealing classroom resources suitable for teaching mathematics to students from various targeted groups (Development for Teaching to Targeted Groups). Finally, the fourth component grouped together 'needs' dealing with the development of professional relationships (Professional Relationships Development), including mentoring and collaborating with colleagues.

Table A5.4. Principal components analysis of mathematics respondents' 'need' scores for the Opportunities for Professional Interaction and Development items

Pattern Matrix

	Component			
	Mathematics Teaching Professional Development	**General Professional Development**	**Development for Teaching Targeted Groups**	**Professional Relationships Development**
Math_tch_hi_order	**.86**			
Math_alt_tch_meth	**.83**			
Math_stand_tch	**.83**			
Math_group_teach	**.81**			
Math_int_tech_less	**.79**			
Math_class_mgmt	**.70**			
Math_graph_calc	**.65**			
Math_attend_in_serv		**.95**		
Math_$_supp_in_serv		**.94**		
Math_inv_syl_res		**.68**		
Math_commun_auth		**.60**		
Math_rel_f_to_f_tch		**.56**		
Math_mark_ext_ass		**.52**		
Math_devel_ICT_sk	.31	**.47**		
Math_teach_NESB			**1.02**	
Math_teach_indig			**.91**	
Math_tch_spec_ne	.33		**.63**	
Math_tch_gift_tal	.38		**.50**	
Math_coll_tch_sch				**.94**
Math_coll_tch_oth				**.67**
Math_mentor_new_st				**.65**
Math_obs_coll				**.56**

Component Correlation Matrix

Component	1	2	3	4
1 Math Teaching Professional Development	1.00	.59	.57	.47
2 General Professional Development	.59	1.00	.47	.57
3 Development for Teaching Targeted Groups	.57	.47	1.00	.34
4 Professional Relationships Development	.47	.57	.34	1.00

APPENDIX 6.1 Principal components analysis of the material resources and support personnel 'need' items for primary respondents (refers to Table 6.2)

In Table A6.1, the first component was clearly interpretable as grouping together 'needs' dealing with various aspects of ICT Resources and Support, including not only physical resources but also personnel support of specific types (particularly ICT-related). The second component clearly comprised items linked to teaching resources in general as well as specific to the teaching of science and mathematics (Teaching Resources). The third component was defined by 'needs' dealing with classroom resources suitable for teaching primary to students from various targeted groups (Teaching Resources for Targeted Groups). This component also included the 'need' dealing with Indigenous education assistants (item 'Primary_ICT _supp') as well as learning support assistants (item 'Primary_supp_asst'). Finally, the fourth component grouped together 'needs' dealing with worksheets for teaching science and for teaching mathematics.

Table A6.1. Principal components analysis of primary respondents' 'need' scores for the Material Resources and Support Personnel that Enhance Primary Teaching and Learning items

Pattern Matrix

	Component			
	ICT Resources & Support	**Teaching Resources**	**Resources for Teaching Targeted Groups**	**Worksheet Resources**
Primary_internet_res	**.82**			
Primary_internet_con	**.81**			
Primary_comp_hard	**.79**			
Primary_comp_teach	**.75**			
Primary_comp_stud	**.74**			
Primary_ICT_supp	**.68**			
Primary_asst_ICT_cl	**.67**			
Primary_soft_TL	**.62**			
Primary_consum_math		**.86**		
Primary_equip_tch_sci		**.85**		
Primary_consum_sci		**.85**		
Primary_equip_tch_math		**.76**		
Primary_suit_lib_sci		**.55**		
Primary_suit_lib_math		**.54**		
Primary_main_rep		**.42**		
Primary_AV_equip	.36	**.41**		
Primary_indig			**.94**	
Primary_NESB			**.92**	
Primary_spec_need			**.79**	
Primary_gift_tal			**.73**	
Primary_ind_ed_asst			**.67**	
Primary_supp_asst			**.35**	
Primary_worksheets_math				**.91**
Primary_worksheets_sci				**.88**

Component Correlation Matrix

Component	1	2	3	4
1 ICT Resources & Support	1.00	.55	.48	.24
2 Teaching Resources	.55	1.00	.56	.33
3 Resources for Teaching Targeted Groups	.48	.56	1.00	.24
4 Worksheet Resources	.24	.33	.24	1.00

APPENDIX 6.2 Principal components analysis of the material resources and support personnel 'need' items for secondary science respondents (refers to Table 6.4)

In Table A6.2, the first component was clearly interpretable as grouping together 'needs' dealing with various aspects of ICT Resources. As the 'need' dealing with an assistant to help with integration of ICT in the classroom (item 'Science_asst_ICT_cl') loaded marginally higher on this first component, it was considered to define that component (the table shows the loadings as equal due to rounding error). The second component was clearly defined by 'needs' dealing with classroom resources suitable for teaching science to students from various targeted groups (Teaching Resources for Targeted Groups). This component also included the 'need' dealing with Indigenous education assistants (item 'Science_ind_ed _asst'). The third component grouped together 'needs' dealing with various aspects of more General Teaching Resources, including worksheets, equipment, books, consumables and laboratories. Finally, the fourth component grouped together 'needs' dealing with various aspects of more General Teaching Support, including assistants of various kinds as well as maintenance and repair of teaching equipment.

Table A6.2. Principal components analysis of science respondents' 'need' scores for the Material Resources and Support Personnel that Enhance Science Teaching and Learning items

Pattern Matrix

	Component			
	ICT Resources	Teaching Resources for Targeted Groups	General Teaching Resources	General Teaching Support
Science_internet_res	**.92**			
Science_internet_conn	**.88**			
Science_comp_stud	**.81**			
Science_comp_teach	**.73**			
Science_soft_sci_TL	**.70**			
Science_comp_hard	**.69**			
Science_asst_ICT_cl	**.47**			.47
Science_NESB		**.97**		
Science_indig		**.90**		
Science_spec_need		**.76**		
Science_gift_tal		**.65**		
Science_ind_ed_asst		**.49**		
Science_worksheets			**.72**	
Science_suit_texts			**.62**	
Science_lab_consum			**.59**	.40
Science_AV_equip			**.53**	
Science_sci_lab			**.50**	
Science_suit_lib			**.49**	
Science_lab_asst				**.90**
Science_supp_asst				**.60**
Science_main_rep				**.57**
Science_ICT_supp				**.54**

Component Correlation Matrix

Component	1	2	3	4
1 ICT Resources	1.00	.49	.49	.60
2 Teaching Resources Targeted Groups	.49	1.00	.39	.52
3 General Teaching Resources	.49	.39	1.00	.45
4 General Teaching Support	.60	.52	.45	1.00

APPENDIX 6.3 Principal components analysis of the material resources and support personnel 'need' items for secondary ICT respondents (refers to Table 6.6)

Table A6.3 shows that the first component was clearly interpretable as grouping together 'needs' dealing with various aspects of physical ICT Resources. The second component was evidently defined by 'needs' dealing with classroom resources suitable for teaching ICT to students from various targeted groups (Resources for Teaching to Targeted Groups). This component also included the 'need' dealing with Indigenous education assistants (ICT_ind_ed_asst). The third component grouped together 'needs' dealing with various aspects of more specific ICT Teaching Resources and Support, including the 'need' for skilled ICT resource management personnel. Finally, the fourth component grouped together 'needs' dealing with various aspects of more General Teaching Resources, including textbooks, worksheets and library.

Table A6.3. Principal components analysis of ICT respondents' 'need' scores for the Material Resources and Support Personnel items

Pattern Matrix

	Component			
	ICT Resources	**Resources for Teaching to Targeted Groups**	**ICT Teaching Resources & Support**	**General Teaching Resources**
ICT_ICT_space	**.87**			
ICT_comp_stud	**.87**			
ICT_internet_con	**.67**			
ICT_comp_hard	**.65**			
ICT_AV_equip	**.61**			.33
ICT_ICT_res_tch	**.59**			.31
ICT_soft_ICT_TL	**.58**			
ICT_indig		**.95**		
ICT_NESB		**.93**		
ICT_spec_need		**.87**		
ICT_gift_tal		**.78**		
ICT_ind_ed_asst		**.58**		
ICT_ICT_res_mgmt			**.88**	
ICT_asst_ICT_curr			**.88**	
ICT_main_rep	.39		**.54**	
ICT_supp_asst			**.44**	
ICT_worksheets				**.83**
ICT_suit_texts				**.83**
ICT_suit_lib				**.76**

Component Correlation Matrix

Component	1	2	3	4
1 ICT Resources	1.00	.44	.47	.39
2 Resources for Teaching to Targeted Groups	.44	1.00	.41	.43
3 ICT Teaching Resources & Support	.47	.41	1.00	.31
4 General Teaching Resources	.39	.43	.31	1.00

APPENDIX 6.4 Principal components analysis of the material resources and support personnel 'need' items for secondary mathematics respondents (refers to Table 6.9)

Table A6.4 shows that the first component was clearly interpretable as grouping together 'needs' dealing with various aspects of ICT Resources and Support. The second component grouped together 'needs' dealing with various aspects of Mathematical Teaching Resources and Support. The third component was evidently defined by 'needs' dealing with classroom resources suitable for teaching mathematics to students from various targeted groups (Resources for Teaching to Targeted Groups). This component also included the 'need' dealing with Indigenous education assistants.

Table A6.4. Principal components analysis of mathematics respondents' 'need' scores for the Material Resources and Support Personnel

Pattern Matrix

	Component		
	ICT Resources & Support	**Mathematics Teaching Resources & Support**	**Resources for Teaching Targeted Groups**
Math_comp_stud	**.83**		
Math_ICT_supp	**.77**		
Math_comp_teach	**.76**		
Math_internet_con	**.75**		
Math_comp_hard	**.74**		
Math_asst_ICT_cl	**.73**		
Math_internet_res	**.73**		
Math_soft_math_TL	**.67**		
Math_supp_asst	**.38**		.31
Math_graph_calc		**.75**	
Math_AV_equip		**.73**	
Math_mat_math		**.72**	
Math_suff_equip		**.72**	
Math_suit_lib		**.70**	
Math_stud_acc_calc		**.63**	
Math_worksheets		**.57**	
Math_suit_texts		**.49**	
Math_main_rep		**.42**	
Math_NESB			**.93**
Math_indig			**.89**
Math_ind_ed_asst			**.72**
Math_spec_need			**.65**
Math_gift_tal		.32	**.57**

Component Correlation Matrix

Component	1	2	3
1 ICT Resources & Support	1.00	.56	.47
2 Math Teaching Resources & Support	.56	1.00	.50
3 Resources for Teaching Targeted Groups	.47	.50	1.00

APPENDIX 7.1 Principal components analysis of the Student Learning Experience 'need' items for primary respondents (refers to Table 7.2)

In Table A7.1, the first component was clearly defined by 'needs' dealing alternative or extension activities in science and mathematics teaching programs for students from various targeted groups (Alternative/Extension Activities for Targeted Groups). The second component grouped together 'needs' dealing with student participation in external competitions and activities in the areas of science, mathematics and ICT. Finally, the third component grouped together 'needs' dealing with the time allocated by the school to fulfil the teaching requirements of the science and mathematics syllabi.

Table A7.1. Principal components analysis of primary respondents' 'need' scores for Student Learning Experience items

Pattern Matrix

	Component		
	Alternative/ Extension Activities for Targeted Groups	**External Competitions & Activities for Students**	**Time Allocated to Teach Syllabus Requirements**
Primary_exten_NESB	**.90**		
Primary_exten_indig	**.89**		
Primary_exten_spec_need	**.88**		
Primary_exten_gift_tal	**.88**		
Primary_visit_ed_sites	**.35**		
Primary_stud_ext_act_sci		**.97**	
Primary_stud_ext_act_math		**.97**	
Primary_stud_ext_act_ICT		**.92**	
Primary_hrs_alloc_math_syl			**.96**
Primary_hrs_alloc_sci_syl			**.93**

Component Correlation Matrix

Component	1	2	3
1 Alt/Extension Activities for Targeted Groups	1.00	.39	.37
2 External Competitions & Activities	.39	1.00	.24
3 Time Allocated to Teach Syllabus Requirements	.37	.24	1.00

APPENDIX 7.2 Principal components analysis of the Student Learning Experience 'need' items for secondary science respondents (refers to Table 7.4)

In Table A7.2, the first component was clearly defined by 'needs' dealing alternative or extension activities in science teaching programs for students from various targeted groups (Alternative/Extension Activities for Targeted Groups). The second component grouped together 'needs' dealing with various aspects of the general Teaching Context in the School, including teaching hours allocation, range of course offerings and having qualified teachers. Finally, the third component grouped together 'needs' dealing with external activity learning opportunities for students (Student Learning Opportunities), including site visits and external competitions and activities.

Table A7.2. Principal components analysis of science respondents' 'need' scores for Student Learning Experience items

Pattern Matrix

	Component		
	Alternative/ Extension Activities for Targeted Groups	**Teaching Context in School**	**Student Learning Opportunities**
Science_exten_NESB	**.94**		
Science_exten_indig	**.89**		
Science_exten_spec_ne	**.81**		
Science_exten_gift_tal	**.78**		
Science_tch_alloc_hrs		**.76**	
Science_full_crse_range		**.75**	
Science_qual_teach		**.71**	
Science_stud_ext_act			**.91**
Science_visit_ed_sites			**.73**

Component Correlation Matrix

Component	1	2	3
1 Alt/Extension Activities Targeted Groups	1.00	.36	.39
2 Teaching Context in the School	.36	1.00	.30
3 Student Learning Opportunities	.39	.30	1.00

APPENDIX 7.3 Principal components analysis of the Student Learning Experience 'need' items for secondary ICT respondents (refers to Table 7.6)

In Table A7.3, the first component was clearly defined by 'needs' dealing alternative or extension activities in ICT teaching programs for students from various targeted groups (Alternative/Extension Activities for Targeted Groups). The second component grouped together 'needs' dealing with various aspects of the general Teaching Context in the School, including teaching hours allocation, range of course offerings and having qualified teachers. Finally, the third component grouped together 'needs' dealing with external activity learning opportunities for students (Student Learning Opportunities), including site visits and external competitions and activities.

Table A7.3. Principal components analysis of ICT respondents' 'need' scores for Student Learning Experience items

Pattern Matrix

	Component		
	Alternative/ Extension Activities for Targeted Groups	**Teaching Context in School**	**Student Learning Opportunities**
ICT_exten_indig	**.95**		
ICT_exten_NESB	**.94**		
ICT_exten_spec_ne	**.85**		
ICT_exten_gift_tal	**.75**		
ICT_tch_alloc_hrs		**.76**	-.38
ICT_full_crse_range		**.71**	.34
ICT_qual_teach		**.71**	
ICT_stud_ext_act			**.83**
ICT_visit_ed_sites			**.67**

Component Correlation Matrix

Component	1	2	3
1 A/t/Extension Activities for Targeted Groups	1.00	.49	.49
2 Teaching Context in School	.49	1.00	.35
3 Student Learning Opportunities	.49	.35	1.00

APPENDIX 7.4 Principal components analysis of the Student Learning Experience 'need' items for secondary mathematics respondents (refers to Table 7.8)

In Table A7.4, the first component was clearly defined by 'needs' dealing alternative or extension activities in mathematics teaching programs for students from various targeted groups (Alternative/Extension Activities for Targeted Groups). The second component grouped together 'needs' dealing with various aspects of the general Teaching Context in the School, including teaching hours allocation, range of course offerings and having qualified teachers. Finally, the third component grouped together 'needs' dealing with external activity learning opportunities for students (Student Learning Opportunities), including site visits and external competitions and activities.

Table A7.4. Principal components analysis of mathematics respondents' 'need' scores for Student Learning Experience items

Pattern Matrix

	Component		
	Alternative/ Extension Activities for Targeted Groups	**Teaching Context in the School**	**Student Learning Opportunities**
Math_exten_NESB	**.93**		
Math_exten_indig	**.85**		
Math_exten_spec_ne	**.79**		
Math_exten_gift_tal	**.67**		
Math_tch_alloc_hrs		**.79**	
Math_full_crse_range		**.71**	
Math_qual_teach		**.57**	
Math_stud_ext_act			**.89**
Math_visit_ed_sites			**.68**

Component Correlation Matrix

Component	1	2	3
1 Alt/Extension Activities for Targeted Groups	1.00	.31	.40
2 Teaching Context in the School	.31	1.00	.34
3 Student Learning Opportunities	.40	.34	1.00