The professional development, resource and support needs of rural and urban ICT teachers

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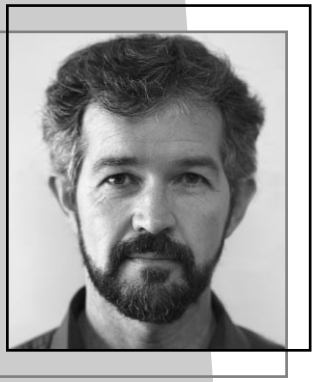

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ABSTRACT:

This paper presents findings from the SiMERR National Survey concerning the need priorities of secondary ICT teachers for professional development, resources and student learning experiences. The findings - drawn from a survey of 237 secondary ICT teachers across Australia - provide an opportunity to compare the needs of teachers working in metropolitan, provincial and remote schools. The study found that vacant ICT positions are difficult to fill and that the novel and dynamic nature of ICT requires teachers to have more extensive opportunities for on-the-job training, collegial collaboration and mentoring than is the case for teachers of more traditional subjects like science and mathematics. The study also found that ICT teachers are commonly required to manage and maintain ICT resources and to assist other staff to use ICT resources, while being allocated insufficient time in which to do these additional activities. The implications of these and other findings are discussed along with recommendations to help address the needs of ICT teachers in different parts of Australia.

INTRODUCTION

In 2005 the National Centre of Science, ICT and Mathematics Education for Rural and Regional Australia (SiMERR Australia) conducted a National Survey to identify and compare the professional needs of science, ICT and mathematics teachers in different parts of the country. The impetus for the survey, and for the establishment of SiMERR Australia the previous year, was the evidence that students in rural and regional Australia are not achieving to the same standards as those in metropolitan areas (MCEETYA, 2004a; Thomson, Cresswell & DeBortoli, 2004). Further, a number of studies have identified professional isolation as contributing to high turnover rates among teachers in rural schools (Herrington & Herrington, 2001; Roberts, 2005). Such issues are of concern to education authorities committed to ensuring equity of educational opportunity across the country (MCEETYA, 1999).

The SiMERR National Survey (Lyons, Cooksey, Panizzon, Parnell & Pegg, 2006) consisted of five survey instruments designed for primary teachers, secondary science, ICT and mathematics teachers, and parent/caregivers. This paper presents and discusses the principal findings from the Secondary ICT Teacher Survey, which explored the key issues of staffing, professional development needs, resource and support needs, and student learning opportunities. The paper identifies the overall need priorities in each of these areas, and explores differential levels of need among ICT teachers in different locations.

Overview of the literature

Demand and supply of secondary ICT teachers

Despite the lack of comprehensive national data, there have been indications from some states and territories that secondary ICT positions are becoming increasingly difficult to fill, particularly in rural areas (MCEETYA, 2004b). These indications are supported by supply and demand data collected by the Australian Secondary Principal's Association (See & Teasdale-Smith, 2004). One of the aims of the SiMERR National Survey was to provide more detailed school-based data on teacher turnover and the difficulty of filling ICT teacher vacancies.

ICT Professional Development

While there is no shortage of research on the ICT needs of teachers in general, there is little on the professional development needs of Australian ICT teachers. Moreover, little is known about how such needs might vary with geographic location. Nevertheless, there is some indication that teachers in rural and remote areas face greater difficulties in maintaining high standards of professional practice than do their urban colleagues. Herrington and Herrington (2001) reported that many rural teachers feel professionally isolated and unable to access opportunities to update skills, familiarise themselves with new syllabus or assessment requirements, or participate in professional discourse that benefits their students. The National Survey sought to identify the extent to which rural ICT teachers share these concerns.

ICT resourcing and support

There is little existing literature on the challenges associated with teaching ICT courses to students in rural and remote areas of Australia. Previous studies tend to relate to access, infrastructure and technical support issues, and the data are localized or concern the ICT needs of teachers in general, rather than ICT teachers specifically. While some studies

(e.g., Human Rights and Equal Opportunity Commission [HREOC], 2000; Vinson, 2002) have reported that rural and remote schools lack the ICT resources and connectivity available in city schools, others (e.g. Cresswell & Underwood, 2004) report that student access to computers in rural and remote schools is satisfactory. Again, the views of secondary ICT teachers in these locations are unknown.

It is clear from the discussion above that there are gaps and inconsistencies in the literature, which in many cases relates to school education in general, rather than ICT education specifically. The need for up-to-date, nationwide data allowing comparisons between rural and urban circumstances provided both the motivation and framework for the SiMERR National Survey.

Research Design

The National Survey consisted of five questionnaire surveys designed for primary teachers, secondary science, ICT and mathematics teachers, and parents. This paper focuses on findings from the ICT Teacher Survey, which sought teachers' views on four issues within their schools: the availability of qualified ICT teachers, their material resource and support needs, their access to professional development, and the learning experiences available to their students.

Table 1. Breakdown of ICT respondents by MSGLC category

	Main MSGLC categories				
	Metropolitan Area	**Provincial City**	**Provincial Area**	**Remote Area**	
Criteria for classification	Major cities pop. ≥ 100 000	Cities with pop. 25 000 – 99 999	Pop. <25 000 and ARIA Plus score ≤ 5.92[3]	Pop. < 25 000 and ARIA Plus score < 5.92	**Total**
ICT respondents (%)	60 (25.3%)	47 (19.8%)	110 (46.4%)	20 (8.4%)	237 (100%)
All teacher respondents* (%)	580 (19.7%)	661 (22.5%)	1425 (48.5%)	274 (9.3%)	2940 (100%)

* From the four teacher surveys

Definitions of rural and urban

In order to compare the situations of ICT teachers across locations, schools were categorised according to the MCEETYA Schools Geographic Location Classification (MSGLC), which considers local population and accessibility to a range of facilities and services. The MSGLC has four main categories: Metropolitan Areas, Provincial Cities, Provincial Areas and Remote Areas (Jones, 2004). Table 1 includes details of the category criteria.

Selection and Sampling

ICT teacher surveys were distributed to all secondary and combined[1] schools in provincial and remote areas of Australia (n=1171), as well as a stratified random sample of 20% of metropolitan secondary schools (n=291). Teachers also had the option of completing surveys online. Useable responses were received from 237 ICT teachers in 190 schools, giving a school response rate of 15% from secondary schools and 10% from combined schools[2]. About 46% of respondents were female, and 65% were older than 40 years. Approximately half were ICT coordinators or heads of department, about 5% were Principals or Deputy/Assistant Principals and 45% were non-executive ICT teachers. Table 1 shows a breakdown of responding teachers by MSGLC category.

Data Analysis

A number of analytical strategies were used, depending on the research questions and the characteristics of data sets. Categorical data were explored through frequency analyses, cross-tabulations and chi-squared significance tests. In order to minimise false claims of significance, the conventionally accepted .05 level of significance was reset to the much stricter level of .001. Statistical tests achieving a level of significance of .01 were identified as suggestive and worthy of further exploration.

Rating ICT teachers' 'unmet needs'

Respondents were asked to rate both the importance and availability of a range of Likert scale items relating to professional development opportunities, resources and student learning experiences in their locations. The 'Importance' scales ranged from 1 (Not at all Important) to 5 (Extremely Important) and the 'Availability' scales ranged from 1 (Never Available) to 4 (Always Available). The importance and availability ratings

[1] Schools combining primary and secondary departments.
[2] The actual school response rate is undoubtedly higher as some of the invited schools had no designated ICT teachers.
[3] The Provincial Area and Remote Area categories of the MSGLC are based on 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 (Jones, 2004).

were then combined to produce 'Unmet Need' scores, where higher values indicated a greater unmet need for the resource or opportunity.

Principal components analysis

In addition to rating individual items, the National Survey sought to identify general categories of need. To achieve this, principal components analyses were conducted on each set of items to identify subsets of items that measured a common sub-theme, or component. Each component was labelled in a way that summarised the general theme running through the items comprising it. Once the appropriate number of components was identified in each analysis, respondents were given a score on each component, and subsequent MANCOVAs then focused on the component scores.

Multivariate analysis of covariance (MANCOVA)

After identifying the principal components for a particular set of rating items, MANCOVAs were conducted to compare the component scores across MSGLC categories. The MANCOVAs controlled for the effects of school size and socio-economic background of the school location, thus minimising any confounding effects of these variables.

Profile plot figures shown in this paper illustrate statistical relationships at both the coarse component level and the fine item level. First, where principal components vary significantly or suggestively with school location, the component title at the top of the figure is shaded (dark for significant [p<.001] light for suggestive [p<.01]). Second, the actual items contributing to a component are listed along the X axis of a profile plot figure, with the mean scores of ICT teachers from the four MCEETYA categories indicated by four distinct lines. Thus readers are able to see which items contributed most to significant differences in ratings across locations.

RESULTS

Staffing Issues

Demand and supply of ICT teachers

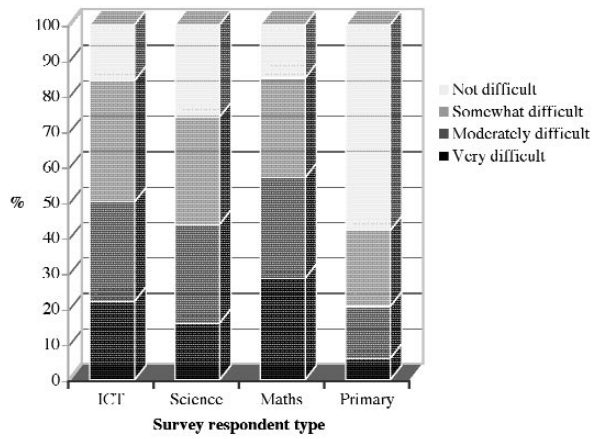
Respondents were asked to rate the difficulty of filling vacant ICT teaching positions in their schools on a four point scale ('not difficult', 'somewhat difficult', 'moderately difficult' and 'very difficult'). Figure 1 shows that about 50% of ICT respondents indicated that it was moderately or very difficult to fill vacant ICT teaching positions in their schools. The figure shows that ICT teachers and mathematics teachers were more inclined to consider it 'very difficult' for their schools to fill vacancies in their subject areas than were science or primary teachers. About 22% of ICT respondents considered it 'very difficult' to fill vacant teaching positions in their subject area.

The reported difficulty of filling vacant science, mathematics and primary positions increased significantly with remoteness of school location. While a similar pattern was found among ICT responses, the differences were not significant.

Qualifications of ICT teachers

Of the 237 ICT respondents, 58 (24%) indicated that they were not formally qualified to teach secondary ICT courses. By comparison, only 2% of science respondents and 8% of mathematics respondents indicated they were not formally qualified to teach their respective subjects. Furthermore, of the respondents who had taught senior ICT courses over the last three years, about 32% were not formally qualified to do so. The qualification levels of ICT respondents did not vary significantly with geographic location.

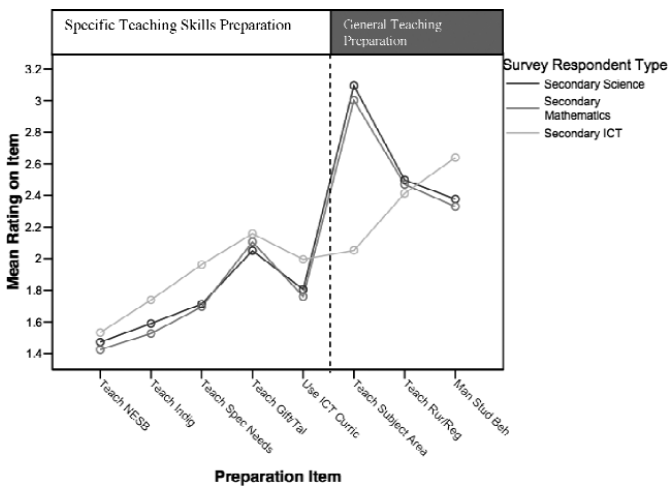
Figure 1. Difficulty of filling vacant teaching positions reported by respondents of different survey types (n=2940)



Preparation for teaching ICT courses

ICT, science and mathematics teachers were asked to reflect on how well their pre-service education had prepared them for various aspects of their careers. Figure 2 shows that while science and mathematics teachers felt they were well prepared for teaching in their subject areas, this was not the general impression among ICT teachers. This is understandable given the relatively novel and dynamic nature of ICT education, although it strongly implies that ongoing professional development in subject content knowledge is more pertinent for ICT teachers than for those in more established subjects. The finding is consistent with the lower proportions of formally qualified ICT teachers identified above, as well as the relatively high need for collaborative professional development expressed by ICT teachers (see Table 2).

Figure 2. 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] (See Appendix, Table A1 for item names in full). Dark shading indicates significant differences (p < .001) on a component.



Professional development needs of ICT teachers

The surveys presented ICT teachers with a set of items concerning professional development opportunities and support mechanisms. 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 'unmet need' rating. Table 2 shows that the most pressing professional development needs of ICT teachers 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 and opportunities for mentoring new staff. 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 2. Average 'unmet 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).

PROFESSIONAL DEVELOPMENT ITEMS	Mean	s.d.	Valid N
Release from face-to-face teaching for collaborative activities	10.79	4.00	225
Professional development for teaching 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 for 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 for 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 for 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

It is noteworthy that ICT respondents expressed a greater unmet need for support personnel than for hardware, software or for well-equipped learning spaces.

A principal components analysis clustered these items into three substantive components: Professional Development for Teaching to Targeted Groups, General Personal Professional Development and Professional Relationships Development. Overall, the highest need was indicated for the last of these components, signifying that on-the-job training is a high priority for ICT teachers, especially the need for collaboration with other ICT teachers and for mentoring new staff. This finding is consistent with the acknowledgement by respondents that they lacked relevant pre-service training in what is a very dynamic field. It is also consistent with the fact that in any given school there are generally fewer ICT teachers than mathematics or science teachers, and therefore less collegial support. The response below from a Queensland ICT teacher 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)

While the data showed a tendency for professional development needs to increase with remoteness, the pattern was not significant for ICT teachers. This finding suggests that remoteness may be less of an issue for ICT teachers than is the case for primary and science teachers, where the location differences were significant. However, it may also be due to the smaller sample size of ICT respondents.

Material resource and support needs of ICT teachers

ICT teachers were asked to rate the importance and availability of a set of items relating to resources, such as textbooks, computers and software, along with support personnel for maintenance or to help cater for student diversity. Table 3 summarises the average ratings for these items. The areas of greatest unmet need included skilled assistants to help integrate ICT in the classroom, skilled ICT management personnel, suitable learning support assistants, 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.

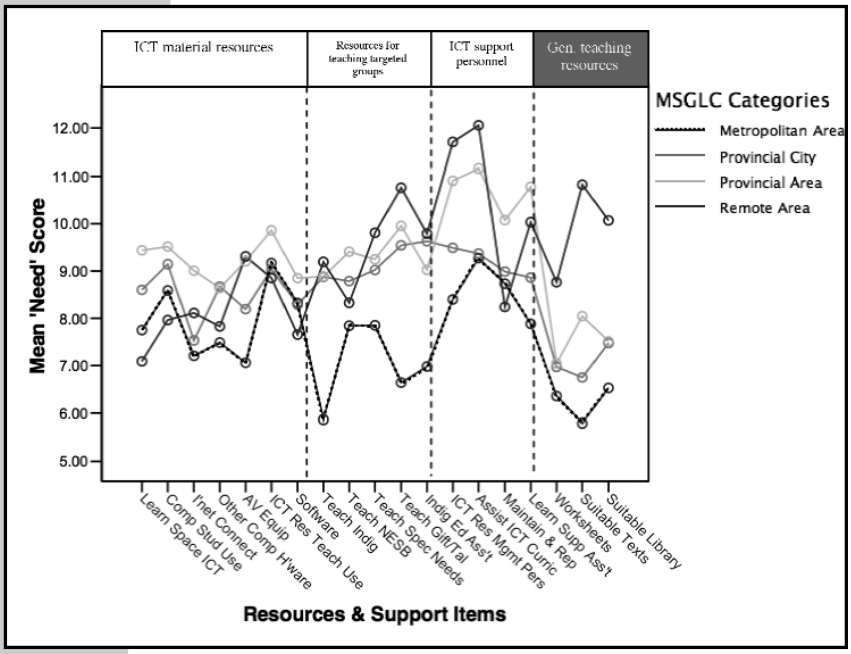
Table 3. Average 'unmet need' scores, standard deviations and valid N for ICT respondents' ratings of the Material Resources and Support Personnel items (items are listed in descending order of mean 'need' score)

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

It is noteworthy that ICT respondents expressed a greater unmet need for support personnel than for hardware, software or for well-equipped learning spaces.

Variation with geographic location

Analysis of the material resources and support personnel items produced four substantial components: ICT Resources, Resources for Teaching to Targeted Groups, ICT Support Personnel, and General Teaching Resources. Figure 3 shows that the need for General Teaching Resources increased significantly with accessibility and remoteness of location (see Table A2 in the Appendix for mean ratings and their associated standard errors on these components across the four MSGLC categories).



Of particular interest is the contrast between the relatively lower needs of remote ICT teachers for material resources, and their high need for support personnel. This suggests that although education authorities have had some success in providing hardware to remote schools, there are insufficient personnel to properly maintain and support this hardware.

Figure 3. Profile plot of mean 'need' scores of ICT respondents for the Material Resources and Support Personnel components, compared by MSGLC categories. [Dark shading indicates significant differences ($p < .001$) on a component. The full names of items are in Table 3.]

Although differences across location on the ICT Support Personnel component were not significant overall, Figure 3 shows the higher 'needs' rating given to the contributing item 'ICT Resource Management Personnel' 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 locations. 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.)

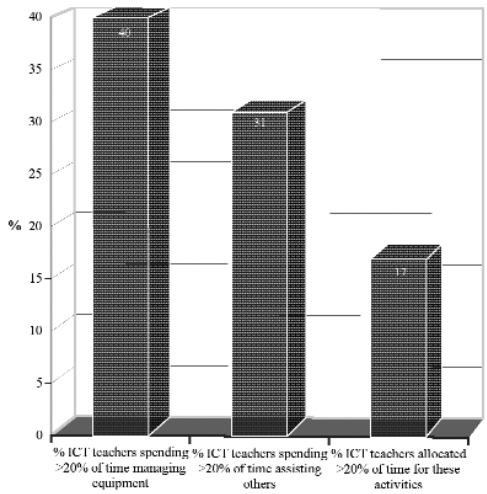
> We have one technician to manage a huge number of schools – work that needs to be done is left for months as this person also looks after admin. computers. (ICT teacher, Provincial Area, Qld)

> This is a joke!!!! I spend almost all of my time providing the resources listed above [Resource and support 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)

Time allocation for ICT resource management and support

ICT teachers were asked to indicate the proportion of their time spent managing and maintaining ICT resources, and assisting other staff to use ICT resources. They were then asked to estimate the amount of time officially allocated to them for these activities. Responses to all three items were recoded into two categories: 20% or less of their time spent on/allocated to a specific issue, and greater than 20% of their time spent on/allocated to that issue. Figure 4 shows that overall, nearly 40% of respondents indicating spending more than 20% of their time managing and maintaining ICT resources, while 31% 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 4. Percentages of ICT respondents reporting that >20% of their time is spent managing equipment and assisting others.



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)

Elsewhere the study revealed that the highest support needs of secondary science and mathematics teachers were ICT related, particularly the need for skilled personnel to help them integrate ICT in their teaching. This finding supports the views of ICT teachers that their services are in high demand by other teachers.

Students' ICT related learning needs

ICT teachers were asked to rate the importance and availability of a set of items relating to educational experiences for their students, such as extension activities, excursions, alternate activities for targeted groups, and a broad range of academic courses. Table 4 shows that among ICT respondents the areas of greatest need for their students include 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 4. 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).

STUDENT LEARNING EXPERIENCE NEEDS - ICT ITEMS	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

Further analysis of the Student Learning Experience items identified three substantive components: Alternative and Extension Activities for Targeted Groups, Teaching Context in the School, and Student Learning Opportunities (see Appendix, Table A3). The multivariate test for differences between schools from different MSGLC categories across the three components was suggestive.

Figure 5 displays the profile plot of the original Student Learning Experience 'need' items by components and MSGLC category. The figure shows that ICT teachers in metropolitan schools reported a substantially lower need for learning activities to cater for targeted groups than did respondents in other locations. The suggestive difference in Student Learning Opportunities was due to a substantially higher need for students in remote and provincial areas to visit educational sites related to ICT.

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

> [One problem is] remoteness to large business ICT infrastructures for excursion purposes. (ICT teacher, Provincial City NSW)

The need for composite ICT 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 students in the same class) in order to have sufficient numbers to offer courses in these subject areas. Figure 6 shows that a greater percentage of ICT respondents reported this arrangement for their senior classes compared with science or mathematics respondents.

Furthermore, Figure 7 shows that ICT teachers in metropolitan areas were significantly less likely than those in provincial schools to be required to teach students in composite classes, while those in remote areas were significantly more likely to be required to make this arrangement. While composite classes may allow schools to offer courses which otherwise might not be available, it is clear that teachers in rural areas are required more often than their metropolitan colleagues to be flexible in their class dynamics and lesson structures. Rural students are also required more often than their city counterparts to compromise their learning dynamics.

Figure 5. Profile plot of mean 'need' scores of ICT respondents for the Student Learning Experience components, compared by MSGLC categories. [see Table 4 for item names in full. Light shading indicates suggestive differences (p < .01) on a component.]

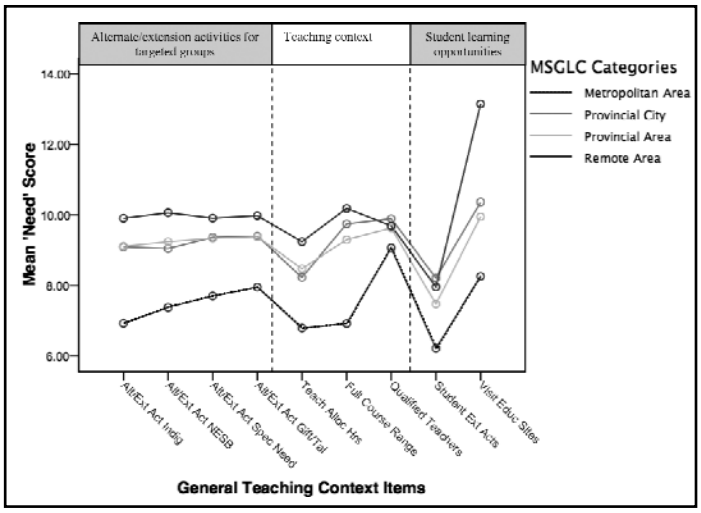


Figure 6. Percentages of secondary respondents in different subject areas indicating that composite senior courses in these subjects were taught in their schools.

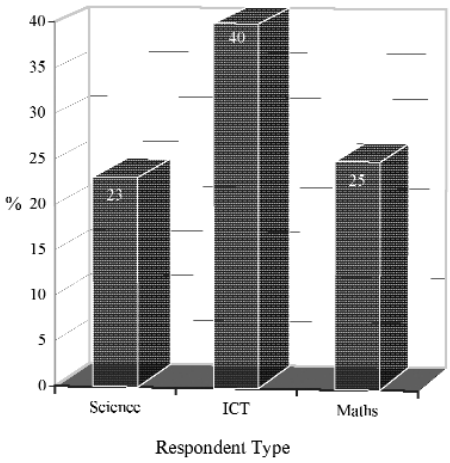
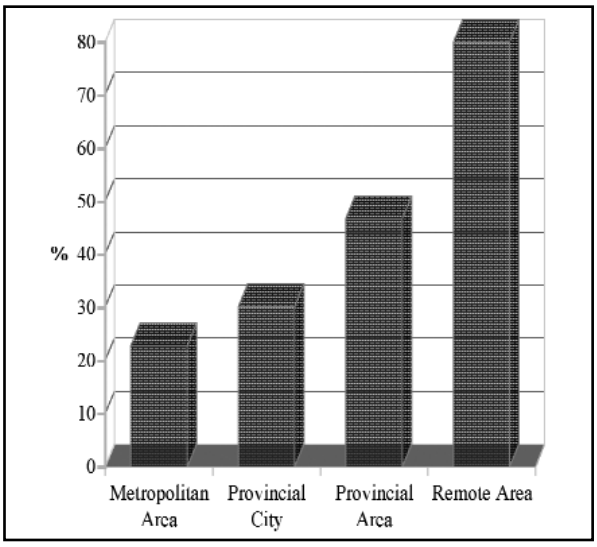


Figure 7. Percentages of ICT respondents in different locations reporting that ICT is taught in composite classes in their school.



Conclusion and recommendations

Findings from the SiMERR National Survey provide evidence that ICT teachers are in short supply in Australia, and formally qualified ICT teachers doubly so. To address this situation, it is recommended that education authorities investigate strategies to attract more students into ICT pre-service education courses, including scholarships, HECS relief and postgraduate conversion courses. Compared to science and mathematics teachers, ICT teachers have generally had less pre-service preparation in their subject area and are in greater need of collaborative professional development and mentoring than are other secondary teachers. Indeed, the study found that ICT teachers on average have a greater unmet need for professional collaboration and mentoring than for resources, support personnel, learning opportunities or other areas of professional development. Ironically, the extra-curricula demands on their time and skills from school administrators and fellow teachers mean that they have less time for the type of continual self-education their subject requires. The National Survey report recommends that support networks and mechanisms be established in each state and territory to orientate and mentor new ICT teachers in rural and remote schools, and that professional associations play an key role in the development and maintenance of these networks. Furthermore, it is recommended that a Rural Senior Teacher Program be established to provide attractive career path options to experienced ICT teachers in order to encourage them to stay longer in rural and remote schools.

The evidence suggests that the resources of greatest need among ICT teachers are support personnel to help them manage ICT resources and assist teachers and other staff to use these resources effectively. This finding is supported by the high levels of need for ICT support reported by science and mathematics respondents. The evidence also indicates that ICT teachers are spending considerably more time managing and maintaining ICT resources and assisting other staff to use ICT than is allocated to them. This increasing demand on their time appears to be the greatest area of concern for many ICT teachers.

The results further 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. However, there was no evidence that ICT teachers in remote areas are in greater need of computer hardware than those in metropolitan schools. Rather, remote schools appear to be in greater need of resources and personnel to support and maintain their hardware and networks. Hence a key recommendation from the study is 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. Suggested initiatives could include the establishment of strategic partnerships with other ICT users in the local area or the employment of additional human resources for ICT systems support.

While the differences in learning needs across location were suggestive rather than significant, the findings clearly show that ICT teachers in provincial and remote schools perceive a markedly higher need for a range of student experiences than do teachers in metropolitan schools. Furthermore, students in provincial or remote schools wishing to take senior ICT courses are more likely to be part of a composite class than are their metropolitan peers. While this arrangement may have some advantages, the effect on learning outcomes needs to be studied more closely. To address the issue of equity of educational opportunity, it is recommended that education authorities, in partnership with schools, rural communities and other

Compared to science and mathematics teachers, ICT teachers have generally had less pre-service preparation in their subject area and are in greater need of collaborative professional development and mentoring than are other secondary teachers.

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 ICT comparable to those available to metropolitan locations. Such experiences should include excursions and on-site visits, summer schools, opportunities to interact with students from other schools nationally and internationally, and activities that address the learning needs of a range of students, including those in composite classes.

The results of the SiMERR National Survey may not come as a surprise to many ICT teachers. Nevertheless, the data provide professional ICT education associations with the quantitive and qualitative evidence necessary to convince education authorities of the need to better cater for the professional development, resource and support needs of Australian ICT teachers.

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APPENDICES

Table A1. Pre-service teacher preparation items for rating (see Figure 2)

How well do you think your teacher education prepared you for:
■ teaching ICT?
■ teaching in rural and regional schools?
■ managing student behaviour?
■ teaching gifted and talented students?
■ using ICT across the curriculum?
■ teaching special needs students?
■ teaching Indigenous students?
■ teaching NESB students?

Table A2. Mean ratings of ICT respondents on Material Resources and Support Personnel item components, broken down by MSGLC categories.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

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

Table A3. 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

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