



## “And twelve months later, we are still waiting...”: Insights into teaching and use of ICT in rural and remote Australian schools

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### **Abstract**

*This paper presents an analysis of the combined data sets from a large ARC (Australian Research Council) funded study on the declining enrolments of female students in high school information technology subjects, and a SiMERR (Science, ICT and Mathematics Education for Rural and Regional Australia) study of 9 rural or remote schools in the state of Queensland. The aim of examining the combined data set was to investigate any apparent differences between girls' perceptions of studying higher level ICT subjects in rural areas compared to metropolitan areas. The findings of the study highlighted some problems experienced by female students studying outside of metropolitan areas. They perceived the subject offerings to be 'more boring' than their city counterparts and reported a lower level of home ownership. The paper offers possible explanations for the findings and strongly recommends that strategies need to be implemented to overcome these problems.*

**Key words:** ICT, information communication technology, girls, female students, rural education, high school, secondary education.

### **Introduction**

From word processing to the purchase of goods, services and communication between people, Information Communication Technology (ICT) has become an integral part of modern industrialised society. The sheer scale of ICT use within society has mandated the need to provide appropriate and representative approaches to more user-oriented technology. Currently the ICT field is both male dominated and oriented (Adya & Kaiser, 2005; Margolis & Fisher, 2003); therefore, it is important for technology creators to ascertain information about users, and to design to the needs of users, in order to ensure that the technology matches the stated purpose (for example, Oudshoorn, Rommes & Stienstra, 2004). Furthermore, while ICT promises to minimise geographical and time barriers to communication, it can also serve to exacerbate frustration and alienation by its lack of accommodation of cultural sensitivities, especially in areas with high indigenous populations (Anderson, 2005). It is with this in mind that one of the aims of the current paper is to

investigate the perceptions about ICT held by high school girls who live in rural and remote areas of Queensland (Australia).

### **The current focus on rural and remote Queensland**

This paper presents an amalgamation of findings derived from two project sources: the Australian Research Council (ARC) linkage project “Girls and ICT” survey (Anderson, Klein & Lankshear, 2005) and the focus group research of the Centre of Science Information and Communication Technology and Mathematics Education in Rural and Regional Australia (SiMERR) (2006). The rationale for the first research project was to develop understanding and specific information on a local level in order to determine appropriate ways, through policy and action, of redressing what is a worldwide problem; that of declining numbers of women choosing to take up careers in ICT (Millar & Jagger, 2001). Other papers derived from the Girls and ICT survey examined differences between high school girls who participated in advanced computing subjects, such as Information Processing Technology (IPT) and Information Technology Systems (ITS) within the Education Queensland (EQ) system, and those who chose not to take these subjects (Anderson, Lankshear, Courtney & Timms, 2006; Courtney, Timms, Lankshear & Anderson, 2005; Timms, Courtney & Anderson, 2006). The SiMERR project was not gender specific and targeted issues that pertained to rural and regional schools in regard to Science and Mathematics as well as ICT use. Some of the SiMERR focus group material has been reported in Lake, Faragher, Sellwood, Lenoy and Anderson (2006) and Lake (2007).

It is noted that the Girls and ICT project was targeted specifically at girls, whereas the SiMERR project was directed towards the needs of schools in rural and regional communities. The current paper has, however, used findings from the Girls and ICT project to tease out some differences between students attending high schools in rural and remote areas and those attending high schools in more metropolitan centres. It is noted that the SiMERR research included regional centres; however, in the present study larger regional centres were treated as metropolitan as they typically are well serviced in regard to technological support and backup. Therefore the current focus is on rural and remote areas of the state of Queensland as defined by Education Queensland’s ‘zone system’.

Queensland is a state characterized by the vast distances between its major towns and by its tropical climate. The bulk of its total population of 3,980,778 estimated population reported by the Queensland Government Office of Economic and Statistical Research, ([OESR], 2005) is concentrated in the southeast corner within several large metropolitan centres. Consequently, substantial areas of the state are far from major urban centres and sparsely populated. A Ministerial Committee of Education, Employment, Training and Youth Affairs (MCEETYA) (2003) report noted that rural and remote Australia has similar educational issues to those encountered in comparable regions in the United Kingdom (UK), New Zealand (NZ), United States of America (USA) and Canada.

Intuitively, it would appear that those students who attend rural and remote schools would have increased incentive to develop skills in communication technology as these are particularly suited to the needs of people experiencing isolation. However, it is evident that providing the means of the technology without provision for support or training of teachers is short-sighted, piecemeal and exacerbates the problem by ignoring the social context (Victoria State Government, 2001). Focus groups were conducted by members of the present research team under the auspices of SiMERR (2006). The SiMERR National Survey was conducted with the aim of identifying key issues affecting

educational outcomes in science, ICT and mathematics education in different parts of Australia, with particular focus on regional and rural Australia, including very remote schools. Members of the present team met students, ICT coordinators, teachers and parents/caregivers in Queensland and their findings have informed the current investigation. One recurrent positive theme in the SiMERR research was the confirmation that many rural and remote schools have ICT resources that are equal to or better than city schools. Schools generally reported a good computer to student ratio and highly satisfactory levels of peripheral and associated ICT devices. On the negative side, the most commonly reported challenge in the SiMERR research was the distance from technical assistance and repair agents. Breakdown of critical servers and associated networks was reported as a major issue compounded by the long wait for repairs to be completed and machines returned by post or courier.

These findings are supported by Lennie (2002), who found that, in spite of the enthusiastic support of rural women when they were provided with the opportunity to learn from, and participate in, ICT projects, the cost of installation and maintenance of computers and peripherals constituted a significant barrier to its uptake in western Queensland. Anderson (2005), in a discussion of Internet access within developing countries, referred to “mere access” (p. 33) as only one part of the complicated social configuration of the digital divide. It is one thing to provide access; another thing to provide skills to use technology; and yet another thing again to provide adequate and cost-effective ways to maintain the technology. Therefore, when people within rural and remote communities consider the potential benefits of ICT, they must consider all of these factors which may be exacerbated by severe financial constraints. Lloyd, Harding and Hellwig (2000) found that incomes of people living in rural and remote areas of Queensland are considerably lower than those of people living in metropolitan areas, suggesting a potential for inequality of opportunity. Moreover “the data suggests that the income gap between those living in cities and those living in regional and rural towns is increasing” (p. 7).

In 2001, the Office of Cultural Enhancement and Diversity (OCED, 2001) pointed to the central role played by schools within the community in providing it with a source of expertise, information and provision for networking. Consequently, schools can contribute to the social cohesion (social and human capital), the viability of the community and the lifelong learning of its citizens. It is this extension of economic realities to implications for schools within the whole community which is important for governments to address through policy and initiatives. A key aspect of these economic realities is the disinclination of qualified teachers to be situated in rural and remote areas where they might well be required to teach outside their main area of expertise (MCEETYA, 2003). Another important factor is that the teaching profession is 68% female, an increase of 9.6% from 1985 to 2005 (Australian Bureau of Statistics [ABS], 2005) and, based on current teacher training estimates, it would appear that the profession is likely to become even more feminised (MCEETYA).

### **Teacher interests and training**

Unfortunately, in the high school arena, women teachers tend to specialise in subject areas such as English, Humanities, Business, Arts and Languages other than English (LOTE) leaving areas such as Mathematics, Science, Technical Studies and Computer Studies difficult to staff (MCEETYA, 2003). This leaves school administrations with the difficult decision to staff such subjects with personnel who are lacking expertise and familiarity with the subject and who may well be disengaged from it. In 2001, the Victoria State Government found

that there was “almost universal concern among all stakeholders that IT teachers were not adequately trained or resourced” (p. 43). Granger, Morbey, Lotherington, Owston and Widman (2002) suggested that successful ICT implementation within schools requires individual characteristics of teacher comfort (familiarity) and confidence with the subjects. A previous paper from the current ARC project (Timms et al., 2006) observed, in the light of comments from students on their experience of ICT subjects in schools, that “supportive teaching, therefore, requires social as well as computer fluency, and awareness on the part of educators of how important it is to attract diversity to the ICT industry” (p. 8). This problem would be compounded in rural schools which are generally hard to staff and regarded as less desirable locations by some teachers (Preston, 2000), as “those teachers judged by school authorities to be most competent and having the highest professional standards will also most readily find positions in desirable schools” (p. 12).

### **Other issues**

In order to provide a more relevant picture of this complex problem, Batchelor (2002) suggested that it is simplistic and unrealistic to assume that once access to ICT is provided, it will be readily taken up by people. “There is a need for content that is grounded in the reality of the local context and the best way to generate this content is to get members of the same community to create it” (p. 4). It is only by involvement of the community that the potential of ICT to empower people within that community can possibly be realised. This was supported by Anderson (2005) who suggested that ICT must be provided to communities “in response to community needs and consultation rather than being large projects imposed from afar” (p. 40). Kent and Facer (2004) suggested that an important factor in the development of skills in ICT involved the ability to use computers at home for recreational use and that this then enabled students to generate confidence and familiarity with technology.

### **Aim**

The focus of the current paper is on differences drawn between “Takers” and “Non Takers” of advanced ICT subjects in high school who fell into two groups derived from the Education Queensland’s zone system. The system uses four zones (Metropolitan, Provincial City, Rural and Remote) to describe schools within its jurisdiction. These categories have been adapted from the ‘Accessibility/Remoteness Index of Australia (ARIA) Plus Scores’ which are widely used in Australia to determine economic advantage (MCEETYA, 2001). The aim of this paper is to explore specific issues, in regard to teaching and learning using ICT, faced by students and teachers in schools in rural and remote areas of Queensland.

### **Methodology**

The mixed method design of the current paper includes quantitative findings from a survey conducted by the ARC research project and qualitative focus group findings from the source material of Lake, et al.’s (2006) SiMERR Queensland focus group report. It was used in the current paper to corroborate the quantitative findings of the ARC research and will be referred to as the SiMERR research or focus group data.

## Quantitative Data

Two populations of female students, approximating to ‘typicality’ by socio-economic status, location, and school type, government schools (GS) and non-government schools (NGS) were identified for survey purposes. The first, comprised of students taking Board Level ICT subjects (IPT and/or ITS), was the Takers and the second group was Non Takers of the Board ICT subjects. The survey did not ask respondents for their ages; however students in the target grades (11 and 12) are typically between 14 and 17 years of age. Questions for the survey were determined from the findings of a pilot survey conducted in 2004 (Anderson et al., 2005). A particularly striking finding of the pilot study was a polarity in attitude towards advanced ICT subjects between Takers and Non Takers; hence the quantitative questions were designed to achieve awareness of where the incongruence sprang from, rather than to establish that it existed. Takers responded to a bank of 14 questions and Non Takers responded to 15 questions designed to identify reasons students decided whether or not to take advanced level ICT subjects in high school (e.g., influences of family, friends, teachers, timetable conflicts, interest in subject, future career plans).

For purposes of parsimony the EQ zone system was collapsed from four groups into two groups. The first group included participants from metropolitan or provincial cities and the second group integrated the rural and remote groupings; these are described in Table 1.

	Metropolitan or Provincial City	Rural or Remote	Total
<i>Takers</i>	95	36	131
<i>Non Takers</i>	1074	248	1322
<b>Total</b>	<b>1169</b>	<b>284</b>	<b>1453</b>

Table 1. Participant distribution by geographical area.

## Participants

The participants were 764 Year 11 and 674 Year 12 female students attending 26 schools in Queensland. Sixteen respondents did not indicate their year level resulting in a total of 1453 respondents. A total of 131 respondents (9%) were Takers and 1322 respondents (91%) were Non Takers. The survey was voluntary and responses were only accepted from participants who completed consent forms in accordance with ethical clearance requirements. In some schools response rates approached 70%, while in others the response rate was below 10%.

## Materials

The pen and paper survey consisted of a mixture of Yes/No questions; 14 Takers questions and 15 Non Takers questions regarding reasons for choosing or not choosing advanced level ICT subjects on questions on a five-point Likert scale (“strongly disagree” to “strongly agree”); and open questions.

## Procedure

The survey was conducted between August and November 2005 with Year 11 and 12 female students throughout Queensland. Twenty-six of the 31 invited schools elected to participate. School selection was based on an attempt to obtain a study population as typical as possible of the state as a whole, but

without any claims to producing a representative sample. Emphasis was on pursuing scale of responses and ensuring that participants ranged over key variables like socio-economic status, ethnicity, rural/urban location and school system (e.g., GS and NGS). Schools were supplied with sufficient questionnaires and instructions. Most surveys were completed at school; however, in some instances surveys were sent home. Completed surveys were returned by the schools and entered into SPSS by means of scanning software.

### Qualitative Data

A series of focus groups was conducted in nine schools throughout rural and remote areas of Queensland in 2005. Participants in these focus groups included parents/caregivers, ICT coordinators, teachers and students from rural and remote primary and secondary state (government) schools. Three of the nine schools were situated in communities where over three quarters of the population were Indigenous Australians. Primary schools were selected on the basis of their status as ‘feeder’ schools for the secondary schools in the study. The purpose of the clustered school selection was to provide for optimal comparison of Science, Mathematics and ICT resources within the school systems (Lake, et al., 2006; Lake 2007).

### Quantitative Results

When Metropolitan /Provincial City Takers’ responses were compared with those of Rural/Remote Takers the only statement to demonstrate significant difference between the two groups was “The subjects are interesting” ( $\chi^2 (1) = 4.73, p < .05$ ). Rural/Remote Takers of IPT/ITS were more likely to disagree with this statement than were Metropolitan/ Provincial City Takers. The difference in responses between the two groups is demonstrated in Table 2.

	Metropolitan / Provincial City		Rural/ Remote		Total
	N	%	N	%	
Strongly Disagree	3	3.16	1	2.78	4
Disagree	7	7.37	4	11.11	11
Neither Agree nor Disagree	7	7.37	7	19.40	14
Agree	50	52.63	17	47.22	67
Strongly Agree	28	29.47	6	16.67	34
No Response	0	0	1	2.78	1
<b>Total</b>	<b>95</b>		<b>36</b>		

Table 2. Takers’ responses to “The subjects are interesting” by geographical distribution.

On the other hand, when Metropolitan/Provincial City Non Takers’ responses were compared with those of their Rural/Remote counterparts, the only significant difference between the two groups noted was on the statement “I don’t have a computer at home, or have limited access to a home computer” ( $\chi^2 (1) = 12.52, p < .001$ ). Rural and Remote Non Takers tended to agree with this statement more than did Non Takers in more urban environments; participant responses are summarized in Table 3.

	Metropolitan/ Provincial City		Rural/Remote		Total
	N	%	N	%	
Strongly Disagree	676	62.60	131	52.82	807
Disagree	231	21.39	61	24.60	292
Neither Agree or Disagree	94	8.70	27	10.89	121
Agree	46	4.26	17	6.85	63
Strongly Agree	21	1.94	12	4.83	33
No Response	6	0.56	0	0	6
<b>Total</b>	<b>1074</b>		<b>248</b>		

Table 3. Non Takers' responses to "I don't have a computer at home, or have limited access to a home computer" by geographical distribution.

## Qualitative Results and Discussion

The aim of the larger ARC research project was to identify any significant differences between high school girls in Queensland which may shed light on issues pertaining to reduced female participation in ICT professional careers. The research team has sought to organize data by assigning respondents into two groups: Takers and Non Takers of IPT/ITS (Anderson et al., 2005). The present paper has further divided the two groups into Metropolitan/ Provincial City and Rural/Remote. Statistical comparisons between the two geographical groups found a significant difference between Rural/Remote Takers and Metropolitan/Provincial City Takers on only one statement "The subjects are interesting", with Rural/Remote Takers more likely than their city counterparts to indicate that they disagree with that statement. On the other hand, Rural and Remote Non Takers tended to agree with "I don't have a computer at home, or have limited access to a home computer" more than did Non Takers in more urban environments. It has to be noted at this juncture that in the case of the Takers only one comparison out of 14 found significance, and in the case of Non Takers, the figure was one significant comparison out of 15. Therefore, on their own, these findings represent only an indication as to differences between the experiences of students in Rural/Remote areas and those in Metropolitan/Provincial Cities; however, the quantitative findings are further contextualized by the findings of the SiMERR focus groups research.

The focus group research highlighted a perception within rural communities that specialist teachers capable of taking higher level ICT subjects were not as readily available in regional and remote areas and that this meant that higher level ICT subjects were not offered. One parent from a small sugar cane farming community explained:

I think most of the IT subjects they have here are very basic and when they think that's what they want to study and they come from the primary school and they've done a lot there, and what they've done there is at a higher level than what they do when they come to high school. And yeah, even Grade 9 and 10 computer studies aren't adequate.

Parents also expressed the view that teachers did not have access to adequate professional development “You know the teachers aren’t getting the training and like many teachers at the school, you know, like they’re not getting the updated training”.

This is indeed an accurate reflection of reality in light of findings from a national report (MCEETYA, 2003) that, like comparable areas in other countries, rural schools are hard to staff and that, out of necessity, many rural teachers teach outside their own particular subject areas. Adya and Kaiser (2005) highlighted the importance of technological training for both veteran teachers and those at the undergraduate level,

Over 93 percent of teachers report that their main source of technological training is independent learning or support from colleagues. K-12 systems need to provide an environment where teachers can become comfortable with their technology preparedness and convey enthusiasm about it to students (p. 252).

This was supported by the Victoria State Government (2001) which found an “almost universal concern among all stakeholders that IT teachers were not adequately trained and resourced” (p. 43).

The issue of training and providing teachers with necessary confidence with, and access to, technology is, however, only one part of a much bigger picture. Moreover, it would appear from the focus groups that rural and remote schools actually fare quite well in acquiring the technology by which students and teachers can develop technological fluency. One recurrent positive theme in the focus groups was the confirmation that many rural and remote schools have ICT resources that are equal to or better than their city peers. Schools generally reported a good computer to student ratio and highly satisfactory levels of peripheral and associated ICT devices in quantities which surpassed previous teacher experience in metropolitan schools.

On the negative side, the focus group research found that the most commonly reported challenge was the distance from technical assistance and maintenance. Breakdown of critical servers and associated networks was reported as a major issue compounded by the long wait for repairs to be completed and machines returned. One example cited spanned a 12 month period:

*Investigator:* How do you deal with the dramas when they arise?  
*Participant teacher:* Going away from the computer and wait for a technician to come out and fix it up and after 12 months of waiting, we’re still waiting.

In a western Queensland centre a teacher commented:

We weren’t getting the support that we needed to get it [the network] up and running. When it worked...it was great but then we’ve got other issues where different computers within the school would break down and you could get the part replaced easily enough but we can’t get the person to reconfigure it so it created a problem.

Another commonly cited problem was the slowness of Internet connections resulting in frustration and wastage of time. One parent expressed the problems caused by many students logging on to share a fairly slim, older style ISDN broadband connection: “But once you get onto the Internet, it is really slow because of the server, and while everyone is on you have got to wait to log on because a lot of kids are on it.”



It is, therefore, hardly surprising that teachers in rural areas, faced with such predictable unreliability of the technology they are supplied with, and driven by the daily imperative to provide subject material in a manner that will keep students actively learning, choose not to embed ICT within their teaching practice. It would be difficult to convey enthusiasm to students, as suggested by Adya and Kaiser (2005), about equipment that is not dependable, no matter how much training one has in its use or how 'well resourced' one is. Furthermore, many rural teachers teach outside their subject area (MCEETYA, 2003) and reliability issues may well provide messages to students that ICT is not relevant. This can only exacerbate the digital divide (Anderson, 2005) owing to the central position that schools occupy (OCED, 2001) within rural and remote communities which may well be suffering financial disadvantage compared with local communities in a more urban milieu (Lloyd, et al., 2000).

When the spotlight was turned to a comparison between Metropolitan/Provincial City and Rural/Remote Non Takers on survey statements, the only statement in which a significant difference was found was "I don't have a computer at home or have limited access to a home computer", with the Rural/Remote respondents agreeing with the statement more than their city counterparts. Hence schools may well provide students' only access to computers in rural areas. Kent and Facer (2004) noted that those students who had developed computer fluency at home were "more likely to experience particular computer activities at school and to use school computers more frequently" (p. 447). Therefore, a link is suggested between home and school use of computers and confidence in using technology. Lennie (2002) found that the cost of technology was a concern in rural areas. Lloyd and colleagues (2000) reported that rural households in Australia were more likely to suffer financial hardship and the focus group research indicated that rural schools were more likely to experience technological unreliability and difficulty in repairing broken-down machinery and connections. Another factor involves lack of access to fast, affordable internet connections in rural and remote households in Australia. Ono and Zavondy (2007) studied computer use and access in five countries including the United States, Sweden, South Korea and Singapore and found internet access to be less available and more expensive away from the major centres. It is therefore hardly surprising that some rural households choose not to provide computers for their children's use.

## **Conclusion**

This paper has highlighted some important difficulties facing schools in rural Queensland. Takers of advanced ICT classes tend to perceive that the subjects are not interesting. The problem could be explained by the fact that that specialist teachers are reluctant to situate themselves in rural areas (MCEETYA, 2003) combined with indifferent reliability of the technology itself. On the other hand, Non Takers of advanced computing subjects in rural communities are less likely to have a computer at home than Non Takers in city environments. This would necessarily mean that rural students are less likely than city students to develop fluency in using computers and are therefore excluded from the benefits of the many opportunities offered by communication technologies (Kent & Facer, 2004). It is therefore recommended that issues in regard to the access to and maintenance of technology systems, along with the training and attraction of specialist ICT teachers for rural areas, be addressed within a policy framework for equity within education. Furthermore, in the light of an increasing gap between incomes of rural and city people (Lloyd, et al., 2000), it is imperative that those school authorities and educational systems address the issue of the reliability of ICT in rural communities. It is when technology is reliable and cost-effective and people have the opportunity to use it, that ICT can play its role in

reducing social isolation within Australia by the promotion of networking and providing people with the opportunity to pursue lifelong learning agendas.

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