Issues in Teaching and Learning Science, ICT and Mathematics in Rural, Regional and Remote Western Australia

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Abstract: Issues in Teaching and Learning Science, ICT, and Mathematics in Rural and Regional Australia: A National Survey (Lyons et. al, 2006) highlights data from 2940 teachers, and 928 parents and caregivers in rural, regional and remote areas of Australia and provides the largest amount of quantitative and qualitative data ever collected on factors relating to teaching and learning mathematics, science and Information and Communications Technology (ICT) in such schools. Data collected from focus groups of parents, students, and teachers in each of the states and territories enriched and expanded on this national data source. This paper presents the focus group data collected from Western Australia as part of The National Centre of Science, Information and Communication Technology and Mathematics Education for Rural and Regional Australia (SiMERR) project. Qualitative data were gathered from four case study schools (n= 23 teachers, 17 parents, and 20 students). A semi-structured interview protocol was used and the transcriptions were analysed and coded for recurring themes and emerging patterns. The four schools were selected to provide a range of sectors, types, and contexts to illustrate the diversity of schools within rural and remote classifications. The key issues and themes emerging covered a range of aspects concerning teaching in remote and regional Western Australia and indicated a number of direct and indirect influences including living environment, professional development and allocation of resources.

BACKGROUND AND PURPOSE

The National Centre of Science, Information and Communication Technology and Mathematics Education for Rural and Regional Australia (SiMERR) project funded by the Department of Transport and Regional Services conducted one of the largest surveys of teachers ever undertaken in Australia. Every primary and secondary teacher involved in science, ICT and mathematics education in non-metropolitan schools was invited to comment on a range of issues. Lyons et. al. (2006) reports on data gathered from 2940 teachers and 924 parents and caregivers on issues relating to the key areas of science, ICT and mathematics education, particularly as they concern rural, regional and remote communities. As a part of the national survey, the SiMERR WA team from Curtin University of Technology gathered qualitative data from teachers, parents and students from four case study regional and remote Western Australian schools. Western Australia is a state of 2.5 million square kilometres with only about 500,000 people living outside the Perth metropolitan area. Perth is the only major city in the state. The distances are great, the population is sparse, and people live and work in a wide range of geographic and socio-economic environments. Such data were able to highlight the factors affecting student outcomes in science, ICT and mathematics in four regional and remote schools in Western Australia. This paper presents that data gathered from the focus group interviews and discusses a number of the key aspects that emerged from this study.

METHOD

Four schools in Western Australia participated in the focus group discussions. The project team selected the schools to represent some of the geographic and socio-economic diversity of the state (see Table 2), and in this regard the phrase ‘regional and remote’ is used in place of ‘rural and regional’ to describe more appropriately the context of these Western Australian schools. Once a school was identified as a potential focus group site, a researcher contacted a teacher or the principal to organise an on-site visit. The visit involved individual interviews with teachers and principals at Bush Junction, Rocky Hill and Sandy Cove primary schools and group interviews with
teachers at Seaview Catholic College (school names have been changed to preserve anonymity). The team conducted individual interviews with parents at Rocky Hill Primary School, group interviews with parents at the other three schools, and group interviews with students at all four schools. Decisions about whether to conduct interviews individually or in small groups were based upon what the school and individuals deemed to be most convenient and efficient at the time. For example, it was usually most convenient to conduct the teacher interviews individually when each person had free time during the day or as a relief teacher rotated between classrooms to provide free time. In addition, an informal meeting was conducted in Perth with two experienced teachers from the northwest region of WA. Thus, the interview sample overall consisted of 23 teachers, 17 parents, and 20 students (see Table 2).

Within the context of student learning in science, ICT and mathematics, the interviews focused upon each individual’s views of the school’s strengths in helping students achieve their potential, obstacles to improving learning outcomes and programs or practices that have been successful in supporting outcomes. They also explored the nature of the curricula and recommendations for how education providers might support the improvement of student learning outcomes. In a more general context, teachers and parents (but not students) were asked to comment on teacher attraction to and retention at the school, their reasons for living and working in that community, their reasons for staying or planning to leave the community and other issues they deemed relevant to rural and regional education.

### THE SCHOOLS

As previously stated, the four schools were selected to represent some of the geographic and socio-economic diversity of the state.

‘Rocky Hill’ is a small community of about 200 people in a formerly vibrant mining area, the best part of a day’s drive from Perth. It has few facilities, and the school has an enrolment of about 50 from Kindergarten up to Year 9. The school has a grassed sports oval, a main reception area, a principal’s office, a very small kitchen area serving as a staff room, three classrooms, and some additional ‘sheds’ for use as a library, storage, and a workshop. Along with the principal, the teaching staff includes three teachers (Years K-2, Years 3-7, and Years 8-9), an additional support teacher, an early childhood teaching assistant, and an Indigenous teaching assistant.

‘Bush Junction Primary School’ is located in the outskirts of a medium-sized coastal regional city (population approximately 30000) in the southwest of Western Australia. The town has a growing infrastructure of shops and local facilities. The school is housed in a series of modern brick
buildings spaced around a horseshoe-shaped grassed area. Each building is open plan in design and accommodates four class groups of a similar age range. Teachers generally work with one of the class groups and share a central area of the building. The school is relatively well resourced and equipped. Staff at the school, equivalent to approximately 20 full-time teachers, are of a range of ages and teaching experience. The school is a merit select school (i.e. appointment of teachers is by interview), but in reality many of the staff have been appointed via the Employer Initiated Placement (EIP) procedure by which vacancies are filled by teachers who are surplus in other schools.

‘Seaview Catholic College’ is located in a small northern coastal regional city. The journey from Perth to visit the school takes over three hours by commercial jet, or one must drive for two to three days. It is one of five schools servicing a local regional population of about 18000. The school building is modern, less than ten years old, and well resourced. It is built in modules around grassed playing areas. The student population in K-12 is over 400 and there are 30 teaching staff. Two of the teachers provide curriculum support and one, who supports ICT, has introduced interactive whiteboards and a new computer laboratory with 25 new computers. The older computers are now used in classrooms throughout the school. Seaview once had additional funding in recognition of its Indigenous student population, but this was cut recently, eliminating specific endeavours such as a funded lunchtime homework support program.

‘Sandy Cove Primary School’ is in a remote northern coastal community, over 120 kilometres from the nearest town. The Sandy Cove ‘community’ has a population of about 150, with the school also catering for students who travel from several small Indigenous communities within driving distance. The school caters for K-10 students, most of whom are Indigenous, apart from the principal’s children. Officially, the school has over 120 students enrolled but on average the school is attended by 70-80 students at any one time. The first term can reach an attendance of nearly 120 students, but after holiday periods numbers are more typically about 45-60 students. The school currently has ten teachers. There are support programs for ICT, and physical education and health, and there is a Teacher Librarian. Sandy Cove has five Aboriginal Teacher’s Aides (ATAs) and a special centre for training them that is well resourced. This was established by a Catholic Sister who had previously worked at the school.

THE FINDINGS

The interviews with parents, students and teachers at the four schools yielded some interesting results. Within the data five broad themes emerged, each containing similarities and differences in observations from the research participants, and these five themes of community and living environment; school-created curricula, resources and ICT; professional development, leadership and issues of distance/isolation; teacher attraction and retention; and student transience are addressed in turn below.

Community and living environment

All four schools made reference to issues of community and living environment, although not always along the same lines. At Rocky Hill, for example, parents and teachers saw the culture of living in a small town as a positive feature, fostering better communication and connections, while students found it ‘boring’. In contrast to their positive approach to the social aspects of living in a small, remote community, the teachers of Rocky Hill identified aspects of the living environment, in particular housing conditions, as being one of the factors indirectly impinging on students’ learning.

That’s the biggest thing we could do. If we had decent housing for the teachers out
here, we would retain our teachers and would improve the learning outcomes of the students, because they’d want to stay (David, Principal at Rocky Hill).

Teachers, students and parents at Bush Junction all identified the lifestyle and physical environment of the community as being a positive influence.

I like [Bush Junction] because it’s like a close community and I feel safe and I like all the streams and that (Female student at Bush Junction).

Established family connections with the school and the community area in general were identified by parents and students of both Seaview Catholic College and Sandy Cove as positive factors.

I’ve lived here all my life. It’s my home town. … I chose this school for them because their father went through [Seaview] as a child. … I like the Catholic ethos of caring, sharing, … and being a Catholic school, teachers here go above and beyond (Debbie, parent at Seaview).

My family is originally from here. ... My parents moved away from here and we lived in Wyndham. So my school years were up there. Then we finally came back as adults. Back to the community. So I’ve been here for a while. Over ten years now (Cindy, parent at Sandy Cove).

However, the living environment at Sandy Cove was also seen as potentially restricting students’ learning opportunities.

They have work experience and things like that in the other schools [referring to apprenticeships and other opportunities]. More social things happen in the school too [other schools]. And that helps their learning (Cindy, parent at Sandy Cove).

… I would say the real obstacles are the lack of interaction from the wider community and the fact that there is no stimulation. Like they don’t see signs, traffic lights, advertising. It is really just the nature of where we are (Dan, teacher at Sandy Cove).

The established and supportive relationships between community and school at Seaview were seen as being particularly important elements both in parents’ choice of Seaview as their children’s school and in the school’s ability to support students to achieve.

When it comes down to it, it’s about how we educate and talk to our children about our values and what we would or would not expect of them, but how we would like to see them go. We can arm them with all the information, but literally it comes back down to their own choices. With this good community, community values, and good parents’ values, and just the support, you know, our kids can go a long way. We’ve got a lot of role models in the community now that have been through and even been at [Seaview Catholic College] and now they are somewhere where our kids can look at them and say, “I want to be like them.” … That’s what this school is all about. You work for yourself and try to achieve higher than you think you can go (Phillipa, parent at Seaview).

**School-created curricula, resources and ICT**
A common thread in the data from all four schools was that teachers value the flexibility of the WA Curriculum Framework. It allows them to develop their own curricula, which more directly meets the needs of their students. Teachers feel that they are better able to build resources and develop learning programs that motivate students to come to school and engage in learning activities. Students and parents, too, value the more meaningful ‘hands on’ tasks that are now often employed in the classroom, although teachers and parents at Sandy Cove noted that the creation of curriculum learning activities that engage and interest the students, and thereby broaden their experiences, requires money and other resources.

All four schools also saw ICT as being a strength of their school and instrumental in motivating students, with teachers at Rocky Hill suggesting that the visual and hands-on nature of these technologies are appropriate to the learning styles of the students, many of whom lack literacy skills to learn effectively with more print-based learning materials.

… because they’re very low in literacy and numeracy, you have to find a lot of other ways to get messages across or to get content across and I think that we’re quite strong on ICT. We’ve got projection equipment, we’ve got laptops, we’ve got video cameras, lots of technology. We’re looking at Smartboards as well (John, teacher at Rocky Hill).

Use of the internet was seen by staff at Sandy Cove as being particularly useful in opening up the world to this remote community that, in the past, was closed due to its overall isolation and flooded roads during the wet season. Computers offer access to the outside world:

I would recommend that children be given more opportunities and resources, for instance in the IT area. They are highly motivated by things like computers and they are able to work at their own pace. They get instant feedback from them and kids come to school early in the morning because the computer room is open. Anybody would say the best way to engage students is to get stuff that is interesting and if they are engaged then they will learn, so these are highly motivational pieces of resources. They are expensive but they are necessary, and if you look at the world, in particular the big picture communication and computing, and those sorts of skills are what makes everything tick. So without focus on these skills the students are being left behind. They must not be left behind because they are isolated. They must be given opportunities to compete and perform and achieve and be part of what is really happening in the big picture. So isolation should not be an obstacle, particularly in this day and age when you can be connected electronically (Andrew, Principal at Sandy Cove).

Concerns about ICT in schools were expressed regarding the unbalanced distribution of resources, with more being spent on ICT than other areas (Seaview College); technical issues (Sandy Cove); and an imbalance in terms of focus. Three of the four schools noted that more attention is paid to ICT than science and mathematics, and that these two areas are somewhat neglected in terms of resources. However, this perception may be heightened for teachers, as parents at Seaview were not aware of the teachers’ concerns regarding this issue:

I think we have something like three or four calculators between 40 kids, so the resourcing is one of the big hurdles as far as science and maths goes (Mark, teacher at Seaview).

The kids are happy. Plus they’ve got the up-to-date technology. Everything’s there. State of the art. A Smartboard (Sharon, parent at Seaview).
There was also concern regarding funding for resources. Staff at Rocky Hill noted that while the school is not lacking in resources, resource funding allocation and funding for professional development were issues of concern. At Seaview Catholic College, too, parents and teachers were confused about allocation of funding. One parent referred to a specific case where the unique needs of a remote school did not seem to be reflected in funding decisions made elsewhere:

One recommendation for education providers, especially to do with us, why change something that worked and provided opportunity not only for Aboriginal children but it also catered for and provided that support for non-Indigenous? And one being the homework centre. … We’ve actually put it in place because we know our parents want it happening. So we’ve actually got TAs and teachers giving up their time and not getting paid for it. Previously it was funded (Debbie, parent at Seaview).

This parent’s views were echoed by one of the teachers at the same school:

The money we do have sometimes seems to get spent on some confusing things. … they spent a whole lot of money on projects which confused a lot of teachers when we’re all sitting in staff meetings going. But we need to be able to teach these kids. We need money to buy resources (Peter, teacher at Seaview).

One of the parents at Bush Junction also noted the effect of distance on learning opportunities for students, in the context of what are easily accessible to the students as resources or activities to support or extend learning. Centres such as Scitech are located in Perth, and activities such as maths and science competitions require travel to Perth.

Professional development, leadership and issues of distance/isolation

Professional development was identified as being a critical factor in both support for teachers and in helping children achieve their potential. Dissatisfaction with professional development was consistent throughout all four schools, with existing opportunities and content seen as not meeting the challenges of distance and isolation.

Attending a professional development session will, for many teachers in remote towns and communities, entail being away from the school for several days at least, and the costs in both time and money can be considerable.

It’s three days for us [for PD]. We leave the day before and we come back the day after because we’re hampered by distance, by the local environment. Kangaroos. You can’t travel after dark. … if you do hit a roo you’ve lost your car for weeks on end, so then you can’t go anywhere. So these things are very difficult for us. People planning PD need to look at these schools and how they do it (David, Principal at Rocky Hill).

It’s like the PD is focused on Perth, which is where the bulk of the teachers are. That’s fine, but for anybody else, travelling, it’s hard work. … What about everybody else? And that stops people from learning new things because the travelling is too difficult. … You’ve got to be committed, keen and enthusiastic to, after your teaching day, put yourself through professional development. … If it was done during the school day, part of your up-skilling during the day, you wouldn’t have any problems at all. Then it will be down to finance. Can the schools release teachers because you need relief teachers. … because to go to Perth is a whole day.
You’re not going to go after school to Perth, you’re going to need the whole afternoon to get up there. People are going to think about driving back in the dark. All those logistical things (Anna, teacher at Bush Junction).

Allocation of funding for attending professional development was identified as being of major concern as it was not seen as meeting teachers’ and schools’ needs in relation to travel costs and teacher relief time. This is summed up clearly in the words of Nathan who reported he had clocked up over 6000 kilometres already that year, at his own cost, to attend ‘required’ professional development sessions [e.g. Making Consistent Judgements program]:

I’ve definitely done lots of K’s, so I get lots of tax back at the end which is good because the school doesn’t pay me. I just pay for it all. … Yeah, the budget is just blown. … what they could do with schools here is really, really beef up our professional development budgets. … if you wanted to be a real tightwad, you could do it, but you know, I’d rather be a good teacher and be poor and go and do all these things. … And then having support [is important] because if I’m away, because of the travel time, if I’ve got a maths PD in [regional city] it’s basically a day there, PD two days and then a day back, so you’ve missed four days, you’ve almost missed a whole week to do a PD and who’s covering my class? So that’s an obstacle as well for excellence in the kids’ learning (Nathan, teacher).

Nathan’s words reflect his valuing of professional learning as a teacher, and also his commitment to being a ‘good’ teacher. The dedication of the teachers was evident in their attitudes to their work, and in what they said about what they do as teachers living in a small, isolated town. Instances where a particular colleague was able to give specialist support were recognised and valued by teachers. Science teaching, for example, was seen as a strength at Bush Junction due to the curriculum leadership of a particular teacher. As well as obtaining, maintaining and organising resources, the coordinator provided valuable support in teaching science. Staff noted how their teaching, and by implication the students’ learning, had been enhanced by the support received from the Science Coordinator. Teachers suggested that the quality of professional development opportunities would improve if more specialist people were sent to remote communities to help teachers:

[My recommendation] would have to be for more support and PD … not going to Perth to do it, because you wouldn’t drive to Perth for PD, and it is unfair on the people back here who have to do your work. And it is just too expensive for the school. … The PD would have to come here. It is much cheaper to move one person than all of the staff (Elaine, teacher at Sandy Cove).

One of the other things that could attract people is if we get more professionals to come up and actually do a lot more PD. We don’t have the PD opportunities that people in the city have because of resources, distance, all those obvious reasons. I think if people were going to come up here and know that they were going to get quality PD that was going to be lifelong for them and career-wise, that would then be a good incentive for them to come up as well (Andrew, Principal at Sandy Cove).

The content of professional development was also a matter of some concern for teachers in remote areas. Adequate and appropriate professional development supports all teachers, but is especially important for those working in remote areas. Their lives require a degree of personal resilience, resourcefulness, and adaptability which they perceive as much greater than for a city teacher. It requires them to be multi-skilled at school, to work much more independently in their daily work, to
be an active part of the local community and to be flexible and creative in living in an environment with few basic services. Professional development for teachers in remote schools needs to not only be accessible, but to reflect their specific needs and aspirations.

Teachers felt their content knowledge, too, was an area where improved professional development could contribute to better teaching and learning. At Bush Junction, for example, the lack of or limited knowledge related directly to basic science content information, especially in the non-biological areas, was noted as a hindrance to students’ science learning. Teachers were not concerned with pedagogical issues related to science since they felt they had received sufficient professional development in these areas in recent years, but rather, they were unsure of their own understandings underpinning what they were teaching. That is, they were confident in how to teach but not as confident in what to teach with regard to science:

Content stuff, that’s one of the big things that I want to bring up in terms of science. … I think that’s one thing that can hold kids back, if the teacher is not confident in the subject area that they’re teaching … and there hasn’t been PD available to up-skill teachers in that area. It’s been up-skilling in teacher approaches and it’s been up-skilling, now, in assessment. But it’s kind of assuming that teachers have already got the content knowledge (Melissa, teacher at Bush Junction).

There was a similar feeling about limited knowledge in mathematics and in ICT. Lack of confidence, negative experiences, and lack of content knowledge restricted what a teacher could do to support students’ learning.

Small remote communities and small schools place teachers in environments in which they are professionally isolated. They do not provide teachers adequately with people-related resources, professional mentorship, or rich, spontaneous, professional sharing and discussion.

I think an obstacle would be the isolation, you know, because by teaching maths myself, now that I teach high school maths, and not having any other high school maths teacher for 80 kilometres that way and 120 kilometres that way, I’m the only high school maths teacher in [Rocky Hill]. So there’s no one to sort of bounce ideas off regularly (Nathan, teacher).

You’ve got that community [in a larger school] where you can actually sit down in a break and you pick the brains of all the other people. One of the things I would love to have is maybe someone to turn around to, just over a morning tea or coffee and say, ‘What have you done in this area to gain success?’ And they’ve got, like, ten, twenty years worth of trial and error that they can share with you, that might give you another idea (Nick, teacher at Rocky Hill).

From the teachers’ responses it would seem there is a real and urgent need for both rethinking around the type of professional development offered to teachers in remote schools, and innovations in the manner in which it is delivered.

**Teacher attraction and retention**

High staff turnover can be a problematic issue for schools in remote areas. Teachers and parents at three of the four schools commented on the issue of retaining staff for reasonable periods of time, and the effects of poor teacher retention on student outcomes. Teachers at Seaview Catholic College described how when teachers leave, their knowledge and resources leave with them, and how staff transience can lead to things in the school happening in an unplanned, non-strategic way.
Staff and parents at Rocky Hill and Sandy Cove pointed to the unique challenges of living and working in a remote community and the influence of ‘culture shock’ on teachers’ decisions to leave after a relatively short period of time in the community.

When we need people it’s just so hard. It’s hard to get them here and it’s hard to keep them here. Because it’s hard enough living in the country anyway. … there’s not enough understanding … there are some advantages but there’s lots of disadvantages as well. They don’t realise you can’t just pick up the phone and hop down to the dentist or doctor. … I don’t think the city people realise (Elizabeth, parent at Rocky Hill).

Keep in mind the average is two years, perhaps even less. But some come and go. This year we have had two teachers like that. They come and see that this is not the life for them. They left before the end of the first term (Andrew, Principal at Sandy Cove).

It is a problem. Teachers will come here with very high hopes and think this is fantastic. But it is a different situation when you actually get here. We do get some teachers who stay for some time, like myself. And some very short term, when they suddenly realise what the place is like. They go, maybe after six months (Kevin, teacher at Sandy Cove).

Several key points emerged from the interviews at Seaview Catholic College. One is that while teachers were concerned about retention of staff, they did not consider attracting teachers to Seaview to be a problem. Unlike the other three schools, part of the problem with retaining teachers at Seaview was attributed to the short-term employment policy of the employer (Catholic Education Office). Interestingly, unlike teachers, the parents did not see continuity of staffing as an issue, speaking instead of the commitment of the teachers to their work and mentioning features of the school they perceived to be strengths for supporting their children’s learning:

Small classes. There doesn’t seem to be a high teacher turnover. Initially some of the teachers we get here are just starting off, they are in their first year out, but they stay and they gain the knowledge about kids, but also they want to be here. It’s more than their job. … and also we have a specific teacher for computers. What more could you ask for? (Janice, parent at Seaview).

A final point regarding the attraction and retention of teachers was made by a teacher at Rocky Hill. With the exception of the Principal, all teachers at Rocky Hill were in their first or second year after graduation, and all expressed concerns about the challenges of being novices in a small remote school and how the common practice of placing new graduates in such demanding situations does not promote equity in educational opportunities for students. For example:

If you take into consideration one of the schools that I did my prac at, where you’ve got teachers … [who] have twenty years worth of teaching behind them. That’s a lot of shared knowledge that you can gather. … [I’m] brand new to teaching. I’ve experimented on the kids with doing different things and seeing what works and what doesn’t and whilst that’s part of a learning process for me, and in some ways it’s a learning process for them, it is also a hindrance for them as well. If you had a seasoned teacher come up here and teach them for a year, [someone] who’s got a wealth of filing cabinets to play with and also the years of knowledge that they’ve got, they could most probably come up here and do a brilliant program. But none of them want to come here and so these kids all get new graduates. Some are good, some are tragic. (Nick, teacher at Rocky Hill)
Student transience

This was an issue of particular relevance for Indigenous students at Rocky Hill and Sandy Cove, whose culture and lifestyle do not always support regular school attendance. Teachers at both schools noted the need to get the students to school before effective learning can take place, and that poor attendance is a major obstacle to students achieving their potential.

A lot of students are transient, you know, they come and go. That hinders their learning, that’s an obstacle … where they turn up one day then they’re not there the next, and it really affects your programs (John, teacher at Rocky Hill).

Drifting for students is an issue because students can be related as family, and family groups are important for people here, and they may be related to people throughout the peninsula or throughout the Kimberley. So it is not uncommon for a child to transfer out to a school miles and miles away for different reasons. … students take off and drift back from being away (Andrew, Principal at Sandy Cove).

A significant difference between the two schools is related to community involvement. At Rocky Hill the community relationships actively fostered between the school and families were seen to be a strength of the school in supporting attendance and retention, whereas at Sandy Cove a lack of community involvement in the school was identified as a main issue. Both parents and teachers at Sandy Cove noted that what happens in the community affects the school:

There are personal community issues that seem to affect kids. Before, there used to be all this support from the community. Now there’s business between family groups and that really affects the school. … And it can affect a child’s learning. Like some of the kids don’t come to school. They stay in the community. Or if they come to school they won’t talk to any of the other kids. (Beverly, parent)

… some kids are just not turning up … often due to issues that are happening in their homes. So they are not coming to school, due to not just us, but other issues. (Andrew, Principal at Sandy Cove)

CONCLUSIONS

An initial finding from these four case studies was that it is essential to consider the holistic and contextual features of regional and remote schools. That is, global aspects of educational contexts can be fundamental to what schools are able to achieve regarding learning outcomes in science, ICT and mathematics. The conclusions outlined here therefore take into account this vital aspect of the case studies.

The key themes and issues from the four school case studies outlined here span a range of aspects concerning teaching in regional and remote schools in WA, including:

- living environment
- professional environment
- nature of community relationships
- student transience
- teacher attraction and teacher retention
distance and isolation
- curriculum leadership
- teacher content knowledge
- school created curricula
- integration of ICT
- allocation of resources
- teacher professional development.

To some degree, all these key issues were in evidence at each school site, although between sites they sometimes were ‘opposite’ in nature and their effect upon teachers e.g., the ‘desirable’ living environment at Bush Junction versus the ‘challenging’ living environment at Rocky Hill. Again it must be noted that these factors are not independent of one another but instead could be described as an inter-connected web of contextual and educational features of a particular school and its community. For example, student transience and school-created curricula are integrally linked, as are living environment and teacher retention, and also professional development needs and the challenges of distance and isolation.

The issues can be viewed as being predominantly direct or predominantly indirect influences upon student learning outcomes in science, ICT and mathematics (see Table 3). However, as made explicit by the interviewees in their comments and recommendations, indirect influences are not necessarily of lesser importance because they are often pre-requisite to being able to develop and use factors that are direct influences. For example, student transience needs to be addressed: that is, students need to be attending school before teachers can provide appropriate learning experiences for science, ICT and mathematics. One way this is addressed by the schools is through locally created curricula designed to motivate and engage the students. Hence, the factors become inter-connected and mutually influential upon one another.

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Overall, the factors that emerged with strong commonalities across the four case studies lead to the following assertions:

Assertions related to indirect influences:

- The living environment has a major effect upon the attraction and retention of teachers to regional and remote schools, with the quality of housing of particular importance. Aspects of living within a small community are also of importance in that they impinge upon one’s daily lifestyle.
- The nature of the community and the school’s relationship with the community have a major effect upon what schools can achieve in relation to attendance and the students’ valuing of education.
The attraction and retention of teachers is a complex issue in that many factors play important roles, including the quality of the living environment, professional support, personal support for the challenges of living in a small community, the challenges and rewards of teaching in a regional or remote school, and the challenges of distance and isolation both professionally and personally.

Assertions related to direct influences:

- **ICT** is vital to schools and teachers. It is used to motivate students to attend school and to engage in stimulating and relevant learning activities. It provides learning resources, activities and opportunities that would otherwise not be available to students living in regional and remote locations. Schools need to be provided with suitable resources to enable these learning activities to happen.

- School-created curricula, developed within the context of the varying needs of the student cohorts, allow teachers to provide learning opportunities designed to improve student outcomes in science, ICT and mathematics.

- Curriculum leadership can play a vital role in school professional development through support of content knowledge development and related skills, through resource support, and through professional encouragement and modelling.

- Professional development for teachers in regional and remote schools is lacking because teachers do not have easy access to ‘people’ resources such as workshops or mentoring in an ongoing, interactive way. Professional development needs to be in context, and in this regard needs to be brought on-site – to the teachers at the schools. Schools in regional and remote locations need to be allocated additional professional development funding and related resources if professional development is to happen in a productive way.

**CONCLUSIONS FROM THE STATE CASE STUDIES**

The SiMERR hub reports (Lyons et al., 2006) provide a wealth of detail about rural, regional and remote school education in general, and science, ICT and mathematics education in particular from across Australia. A number of recurrent themes can be clearly discerned in the report that is consistent with those identified from analysis of questionnaire data in the first phase of the National Survey. As stated by Lyons et al. (2006, p. 3) school factors such as staffing, professional development, resources and learning experiences may be associated with the lower student achievement in rural and remote schools, interview respondents also pointed to parental, community and teacher expectations and aspirations as affecting student outcomes. The development of a National Rural Education Strategy, with the roles outlined in the National Survey Report, should be the next step in recognising and addressing the concerns of teachers, families and students in rural, regional and remote Australia.

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