‘To improvise and be innovative in the way you teach’

Report from SiMERR Northern Territory

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The Northern Territory (NT) is characterised by space, distance and low population densities. Comprising just one percent of the Australian population, and 20% of the continent, the unique demographic and geographic profile of the Northern Territory presents specific issues and challenges for education. About one person in four is of Indigenous descent, and 60% of these reside in remote communities spread across 1,346,200 square kilometres. Approximately half of this land, including 87% of the coastline, is owned by Aboriginal people. There is a broad range of distinct language, culture and clan groups based in different regions.

The capital, Darwin, has a population of approximately 70000, 10% of whom identify as being of Indigenous descent. The population of Darwin’s satellite, Palmerston, is approximately 24000, while Alice Springs, the major centre in central Australia, has approximately 26000 residents, 18% of whom identify as Indigenous. The other regional centres, Katherine, Tennant Creek and Nhulunbuy, have populations less than 10000 with more than 24% Indigenous residents (Australian Bureau of Statistics, 2005).

The Northern Territory has the youngest population profile of any Australian state or territory with 40% of those under 14 identify as Indigenous. Population growth is increasing faster in Indigenous communities than in the non-Indigenous population (Northern Territory Government, 2005). Indigenous students comprise 38% of the total student cohort. Thirty-nine percent of students in the Northern Territory speak English as an Additional Language (EAL). However, in some regional and remote areas this proportion is much higher so that in some schools almost all students are EAL learners.

Primary and secondary education is provided by the Department of Employment, Education and Training (DEET), the Association of Independent Schools Northern Territory (AISNT) and the Catholic Education Office (CEO). As the major education provider, DEET administers 151 schools and employs 3700 full time teaching and support staff, with a focus on quality lifelong education for all students, particularly Indigenous. The AISNT represents 12 religious and independent primary and secondary schools in major, regional and remote centres which include major boarding secondary schools that attract students from across the Northern Territory. The Catholic Education Office manages ten schools in major and regional centres, five in remote Indigenous communities and two in remote Indigenous outstations.

PROFILES OF SCHOOLS IN THE STUDY

To explore issues affecting the teaching and learning of science, ICT and mathematics in the Northern Territory, focus groups with teachers, students and family members were conducted in late 2005 and early 2006. The focus groups were undertaken with school communities in two primary schools, one secondary school and the secondary school section of two schools that offer education from transition to Year 12. The selected schools represent government and non-government sectors and are characterised by varying degrees of remoteness and Indigenous student populations.

Desert Rose Primary School[13], classified as a Remote Area school (MSGLC category 3.2), is located in a town approximately 300 kilometres from Darwin. It provides classes from transition to Year 7. Special programs available at the school include life education, computer studies, physical education and music.

Wallaby Primary School is located in Darwin (MSGLC category 2.1). The school is organised into upper primary and early childhood departments and has approximately 300 students. This government school has a culturally diverse student population with significant populations from Indigenous and migrant backgrounds. The school's specialist areas include English as a Second Language, Information Communication Technology and Art.

Goanna Community Education Centre is a Remote Area School (MSGLC category 3.2) with a student population between 101-200. This bilingual community school caters for students from preschool to Year 12. All students have English as an additional language and bring a high level of Indigenous cultural practice and understanding to school. English and Indigenous languages are used in the school. The school is currently involved in developing quality education programs for students who are already, or in the process of becoming bilingual and bicultural.

Brolga Secondary School is a Provincial City (MSGLC category 2.1) school with student population between 601-700. This government school is based in a regional centre and has a learning centre that offers a modified program including accelerated learning for high achieving students and a special education centre. The school caters to students from Year 8-12 and has an added focus on middle schooling, English as a Second Language and Information Communication Technology.

Frilled Lizard Secondary School is classified as a Remote Area School (MSGLC category 3.1) with a student population between 201-300. This non-government school is located in a rural area and offers classes from transition to Year 12 across several campuses. The focus group interviews were conducted with senior secondary school students. The school incorporates Indigenous education programs to encourage the involvement of Indigenous people in the school.

[13] All names of participating schools and individuals used in this report are pseudonyms

LIVING AND TEACHING IN A RURAL/REGIONAL SCHOOL

Teachers

The majority of teachers interviewed had originally lived and trained outside the communities in which they were currently teaching, generally coming from interstate regional and capital centres. Very few had previously lived in major or regional centres in the Northern Territory. The teachers noted that their decisions to change schools tended to depend on the proximity of the school to a major centre, its reputation, whether it had a stable core of long term staff and opportunities for staff to develop their areas of interest. Few of the schools involved had been able to develop and maintain a core of long-term staff, a common experience across NT schools. Long-term staff were defined by parents and teachers as those staying between ten and 25 years in the one school. Most of the teachers had been in their current schools for less than five years. Generally, the more distant a school was located from a major centre, the lower the average length of time teachers had stayed in the school. They tended to move for promotion or family reasons, but in either case they were concerned about the difficulties involved.

> The cost of living is higher than in some areas, if there was some way of reducing that cost burden that would tempt and encourage people out here. (James, teacher)

> If you want any (mathematics or science) department to go ahead, there need to be more incentives for people. To make the change, there are (considerations such as) their family, shipping, etc. There's bugger all for that …once they're here we do bugger all to retain them. (Mike, teacher)

Of some locations it was said: 'Rentals are really hard to find … people need to hit the ground and feel comfortable.' Teachers also noted the negative financial effects experienced when any transfer between schools was not supported by their own or their partner's employer.

Many of the teachers planned to stay in the NT system for 'a while', as they liked the lifestyle of a small community, the atmosphere and supportive environment. Furthermore, they felt the education system had been good for their children and they enjoyed the professional challenges and experience in their schools:

> I like the Northern Territory, like the lifestyle. (Kim, teacher)

> I can't see myself teaching in a big city school after this…I don't think I'd like it because I enjoy the smallness. (Jane, teacher)

> I really enjoy teaching in this environment because you are in a very isolated community and you don't have to go far to get out of town. You do get to know the kids quite well, particularly in a school like this where it's quite small as well. (Mike, teacher)

Teachers tended to have a broad range of educational backgrounds and experience, due in part to their many places of origin, teaching institutions attended, and the fact that they were often required to work in areas of need in schools rather than in their area of expertise. The latter factor was linked to a lack of positions directly related to their specialty areas (either in their

schools or elsewhere) and the transient nature of employment in the NT. Teachers noted the negative impact of these situations on students:

> As a team, the staff do socially support each other, personally support each other…we have had to combine classes…people take on huge workloads … students are sometimes adversely affected by what we have to do. (Mike, teacher)

> Continuity of content – when teachers change so often – is terribly confusing. There needs to be some serious thought given to increasing the salaries of the people who are teaching in science, maths and ICT in an attempt to recruit people who are passionate about the subject into teaching. (Terry, teacher)

Families

While families lived locally, close to the children's schools, many had originally lived in eastern states and other parts of the Northern Territory and a few had been overseas for a period. The high transience levels typical of NT regional areas were reflected in the families' experiences and histories. Transience was often linked to employment opportunities or transfers. Families liked living in the rural areas where populations are small and people knew each other. Indeed, after leaving, some families had chosen to return to these areas where possible. Choice of schools was based on proximity to home, programs offered and reputation.

Students

Students were positive about the regional areas in which they lived and the schools they attended because they knew people, their friends were close by and they felt safe. They also felt they had a lot of freedom to be involved in activities related to sport or visiting local natural attractions like waterholes and shops. Students placed a strong emphasis on sport across all sites. As Robert (teacher) noted: 'In a small community like this, sport is highlighted a lot more than in a city area.' However, for many students, participation at a competitive level was limited by distance and cost of travel.

Most students lived close by their schools, less than ten minutes travelling time, and either walked to school, rode bicycles or were dropped off by car or bus each day. Students generally liked school since it offered opportunities to spend time with friends. They enjoyed areas of personal interest which were spread across the curriculum. Science, ICT or mathematics featured as preferred study areas at schools where one of these was a particular focus of school activity. The majority of students planned to leave their current town in the future and go to Darwin or major centres on the east coast of Australia when they were older. They identified places that had a wider range of opportunities or interests, particularly the Gold Coast and its theme parks, or Brisbane.

EDUCATION AND VOCATIONAL ASPIRATIONS

Families

When asked about their post-school aspirations, many students expressed the hope that they would become a sportsperson, particularly a football player or cricketer. Students and parents who identified trade-based occupations as goals for the future were fairly evenly distributed

across sites. These roles included working on oil or gas rigs, being a butcher, chef, actor, dancer, babysitter or dirt bike rider. A minority of students were interested in professional occupations such as lawyers, pilots, zoologists or veterinarians. The majority of parents expected their children to complete Year 12, noting, in particular, the value of including vocational training course in the secondary curriculum. Several parents identified university attendance and trade qualifications as future aspirations for their children. For example:

> My oldest will probably do something scientific. He's very curious about nature, (the youngest) will probably be the motor mechanic or builder. (Grace, parent)

> I did my degree…whereas my husband only went as far as Year 10 and got an apprenticeship. I'd love to see my kids with a degree, whereas his focus is maybe more the trade way. (Jade, parent)

The students all had several potential careers in mind and were able to describe a range of steps in their educational and vocational preparation. These included developing practical skills, competing at high level, being healthy, and attending university as essential in their preparation for the future. Senior secondary students noted there were many opportunities for work that conflicted with completing school, and that relationships with people can be more useful than qualifications to get apprenticeships and work. This observation was supported by teachers' comments.

> I've had kids in Year 12 in their fourth year of work. Any one of these kids can get a job down the street any time they want, so obviously it's quite different to city areas. (Robert, teacher)

STRENGTHS OF RURAL/REGIONAL SCHOOLS IN HELPING STUDENTS ACHIEVE THEIR POTENTIAL IN SCIENCE, ICT AND MATHEMATICS

Teachers

Teachers described school strengths in ICT, mathematics and science in terms of the pedagogy and professional support available in their schools. Key features of successful approaches included:

- using a team approach (particularly emphasised by staff)
- communication between staff
- having a champion with a particular interest that is promoted in the school
- supportive pedagogy relevant across discipline areas
- integrated curriculum
- access to meaningful professional development
- access to effective resources and celebration of success.

In the larger high schools, discipline-based staff formed teams and had developed coordinated approaches that worked from their knowledge of students, teaching and learning and their specialist expertise:

> There is a general feeling that we are doing it tough and we are isolated. This tends to make people work together a lot better…there's an element of creativity that comes out in that situation. You have to improvise and be innovative in the way you teach. (James, teacher)

Of particular importance to teams was access to staff with strong ICT skills, experience in a range of delivery modes across all types of abilities and age groups and the chance to test their ideas. In smaller schools teams formed around a commitment to an issue or area of interest. These groups usually had an advocate, a teacher who had particular interest or expertise in the area and a commitment to be innovative and to develop new approaches in the school. Such teachers had the opportunity to pursue this commitment through the principal's and school's support, evident in curriculum, pedagogy, organisation and consequent gaining of external funding to develop that area of interest. Programs that were maintained had the following characteristics:

- a core group around a person with a particular interest
- across-school involvement and planning
- school activities and staff showing enthusiasm and commitment for the topic
- staff supporting each other, particularly sharing their resources at short notice
- identified funding over an extended period
- celebration of success
- inclusion of families and community in the program through communication and involvement in activities.

The professional conversations supported the development of specific strategies for teaching and behaviour management that had been effective in classrooms. For example:

> I think the greatest strength is the extremely strong professional and personal rapport between staff … the experience amongst staff, the approach to students on the basis of support … that reflects itself in the quality teaching and the equality of teaching we have at the school. We are a very close faculty, the strengths are we have strong specialised skills…range of delivery across all range of types and ability groups. (Mike, teacher)

> We do make a point of confronting each other and taking the time to talk about stuff. Sometimes you inspire each other by the swapping, changing and enthusiasm for different stuff that we use. (Kim, teacher)

The importance of effective communication in supporting team members was stressed, since it maintained teachers' focus on what can be achieved rather than what cannot be done. Staff described their approaches as encouraging a shared dialogue where they could discuss professional issues in a personal and friendly environment. These professional conversations are important for developing programs and pedagogies. The teachers described small rural schools as having strong links to the community. In these schools staff felt the focus was on individual students and their place within their community.

> I like it being a small school. (You) pretty much know all the kids …and the kids generally get to know you pretty quickly. (Robin, teacher)

Teachers found that successful outcomes were those that made learning relevant and engaging. In some schools teachers focused on ensuring children had the tools to access and use information that they need to know, rather than emphasising only knowledge transfer. The

success of this approach was evident in students' outcomes and engagement in a range of schools and programs.

> The successful part of the science curriculum is getting kids to accept things aren't black and white, to inquire and to give (them) the skills to do it. They're lifelong skills. (James, teacher)

Human and physical resources were identified as key supports by teachers and students. Special education teachers, who supported students, were considered invaluable, and teachers described their role and influence as highly significant in developing the curriculum, supporting students and achieving high-level outcomes.

> One of those strengths is a special education teacher who will teach children who need a push to get to their potential. What's special…(is) the way the teachers treat all the kids, it's not about what you can't do it's about what you can do. (Robert, teacher)

Schools had an emphasis on upgrading computer technology. One school had upgraded classrooms to accommodate multimedia technology and teaching – a popular move with most teachers and students. Teachers expressed concern about needing professional development in using ICT and adapting their teaching to use the equipment effectively. Also important was in-house training, along with having a well-stocked resource room. This aspect of ICT use is considered later in the chapter.

External funding was an important resource for developing the infrastructure and necessary professional development.

> The cost of PD becomes expensive too. If you want to go to a conference it becomes expensive; if you want to run an excursion that becomes expensive too. In these sorts of places people would feel more confident if they were upskilled in an area and could bring that back into their maths or science class. If they felt they were getting lots of rewards and confidence from PD by being here, they might tend to stay longer. (Terry, teacher)

Students

The students' positive comments tended to reflect their school's subject area specialisation. Some saw ICT as an area they wanted to learn about, and one that they enjoyed. In particular, they appreciated innovative programs, flexible student-centred delivery and using multimedia and graphics programs. Most students enjoyed computer classes and used the computer to play games, conduct research, explore the Internet, type, do homework, write stories, make slide shows and access email. The majority of students had computer access at home superior to that of the school. Students were generally positive about mathematics where it was hands-on and relevant. Many students described enjoying mathematics games, algebra and learning timetables and valued being challenged and learning new ideas. Students who had trouble seeing the relevance of particular areas or needed a lot of additional assistance tended not to enjoy those classes. While this may appear self-evident, it supports the teachers' focus on good teaching and learning practice. Students felt their learning was assisted by teachers, parents, tutorial assistance, hands-on activities, independence and their calculators. Students enjoyed science classes and made particular reference to the hands-on aspects of classes. One school had classes with Questacon and CSIRO scientists and talked about enjoying working with materials that exploded making volcanoes and firecrackers:

> My daughter doesn't like science but, gee, she loves the Helix program. Bringing that sort of stuff into the school…it's great for the kids. (Lyn, parent)

Families

Parents preferred schools where staffing had been stable over a long period. Some students were sent to schools outside the local area to broaden their experience, but most had since returned to the local school, as these were smaller and better met their needs. The influence of a 'good teacher' was considered by parents to be of prime importance in achieving good outcomes for students. The parents also discussed the positive effect of teachers who were enthusiastic about ICT, mathematics and science. Families noted the positive outcomes of programs that were integrated, had consistently good teaching, low teacher turnover and were supported by good facilities. These included computer mini-laboratories in classroom for easy access by students. Specialist programs where teachers communicated well with families increased their understanding and support of such. These programs were seen by parents to improve students' attitudes to school. Features of effective programs included:

- making the ICT, science and mathematics curriculum explicit throughout students' education and the school's activities
- having specialist teachers to demonstrate and professionally develop staff
- better communicating teaching methods and improving parents' ability to follow-up in the home
- being involved in competitions to improve the profile of a discipline in the school and community.

Examples of successful programs

The themes around successful programs consistently reflected the importance of good teachers who are developed and supported to achieve their goals and who remain in a school for long periods. The other theme clearly evident was the opportunity to develop positive approaches based on best practice models of teaching and learning relevant to the local context. These were supported by the programs exemplified below.

- Mini-computer laboratories in classrooms and multimedia-designed and equipped classrooms.

- Development of an ICT focus for the school through targeted programs funded by NTDEET, CEO and/or community funds which invested in infrastructure and professional development and resulted in innovative programs being conducted in the classroom.
- A mathematics out-of-school program that supported secondary students who wanted additional help and, staffed by teachers, had been very successful in improving students' outcomes, the relationships between teachers and students, and staff-developed initiatives.

- Boys in Education Lighthouse had provided a withdrawal program for boys that has resulted in their returning to class, participating, and achieving well in the classroom.

- The ALFHA (Accelerated Learning for Higher Achievers) program designed to group and meet the needs of gifted and talented children has had particular success in mathematics, science, English and social science education.

- A range of hands-on experiences in science. For example, students visited Questacon in Canberra, conducted experiments with CSIRO, participated in Double Helix which conducted a number of popular activities in schools and conducted experiments in 'Labs on Legs'.

- Popular online sites including Reskids.com and Cahoots (American online programs).

OBSTACLES TO HELPING STUDENTS ACHIEVE THEIR POTENTIAL IN SCIENCE, ICT AND MATHEMATICS IN RURAL/REGIONAL SCHOOLS

Teachers

The teachers identified several obstacles to implementing science, ICT and mathematics curricula in their schools. These were mainly related to inadequate resources to implement programs effectively and according to best practice, the transience of teachers and students, and the shortage of appropriate staff.

ICT-related obstacles

The preferred pedagogy of teachers was to learn through relevant and real-life experiences rather than focusing on stencils and teacher-centred instruction. Integrating ICT into the school classroom on a weekly-to-daily basis was seen as a positive approach but limited by the availability of computers. Computer access for the most part was hampered by a lack of spontaneous access to computer laboratories as most of the time was booked in advance for classes. This made integrated or impromptu ICT teaching difficult. Having functional computers in sufficient numbers in every classroom was, in turn, limited by the availability of hardware, software and technical support. In addition, the lack of teachers with knowledge of how to resolve hardware and software problems limited the educational effectiveness of ICT. Teachers identified a lack of confidence, knowledge and skills in ICT as major obstacles to its efficient and regular use in classroom teaching and learning.

> I'm not as confident as I'd like to be and wasted a lot of my computer time this year… things are moving too fast for me to pick up. (Linda, teacher)

> If I'm teaching older children, I will be challenged computer-wise because I (only) do what I have to do and I know what I need to know. I wouldn't go and play… I never played a computer game, I use it because I have to for work. If I would have someone encouraging me to use it more for fun… it would be good. (Kim, teacher)

Teachers and students had different emphases in relation to ICT; teachers used ICT for work, while students used computers for games. Different levels of knowledge about and attitudes towards the use of ICT thus emerged. Some teachers incorporated students' knowledge and peer teaching into the curriculum, recognising their students' computing knowledge as superior to theirs:

> Another obstacle is teacher's knowledge of the hardware… And technical support… you just get frustrated when you could utilise it (ICT) better. (teacher conversation)

> Part of our ICT problem is the infrastructure, some of our hardware is really dated, so it's difficult to use. We've moved a long way down the track, but we've a long way to go … (East coast schools) are light years ahead. (Mike, teacher)

> I'm of the belief (ICT) is going to be integrated across the Year 9 curriculum next year …if you are teaching any subject you should be able to integrate ICT into that subject area. (Robert, teacher)

Science resourcing obstacles

The science curriculum provides an opportunity to develop and implement hands-on activities which are particularly effective with children who are experiencing difficulty with literacy concepts. Access to physical resources is a particular challenge in rural areas as they are difficult to buy locally and must be ordered and transported from afar. For example:

> My biggest obstacle is the physical hands-on resources that go with (science). They're very expensive. When we used (a specific kit) the first time it was great, but the second time (with improvised equipment) didn't work. Because we're so remote it's a trip to Darwin to go and get the stuff. (Linda, teacher)

Some of the solutions staff identified included Double Helix and 'Labs on Legs' which supply a range of materials for experiments. These programs have been successful, but it is difficult to replace used components which often have a short 'shelf life' in the extreme NT climate. Ordering materials takes considerable long-term planning; a pack of activities that can be resourced via the local supermarket would be useful. The heavy reliance on science shows like Questacon are inspiring, but not well integrated into the curriculum and schools need to be able to access these resources when they are available.

> Schools rely on visiting Science shows…everyone's going to do science right now. (Robin, teacher)

Transience

The schools are affected heavily by transient populations of students and teachers. In some schools this can represent up to 50% of the student population and is due to armed forces' posting cycles, seasonal and casual work patterns, community life and cultural requirements. Appointing relief teachers can be difficult in regional centres where there may be limited experienced people locally. These circumstances make school planning difficult:

> We do have a big turnover of staff here. It's almost disastrous for the Year 12 class, for example, to change teachers half way through. (Simon, teacher)

> The caravan park has a big impact. Over this year, I probably had a turnover of about half the class. They're all caravan park people - that turnover is seasonal. (Sally, teacher)

As a response to transience one school has developed a mathematics curriculum that is consistent across the school and this has been particularly effective in introducing new

teachers and students to the curriculum. The reliance on individual teachers to develop the curriculum is affected by high staff turnover. Changes in student numbers can also have a drastic effect on staffing numbers and maintaining specific programs. It is often difficult to recruit staff with the right expertise thus resulting in teachers regularly teaching outside their discipline areas, particularly in science, ICT and mathematics:

> In the maths and science area there (are) just too few teachers available. When you're already in an area like this, where you are isolated, it's hard to (get) people. You're really pushing it up hill to get enough teachers out here and that's what really impinges on kids, the change over of core maths teachers. Every year affects the kids so badly. (Robert, teacher)

The teachers called for student drift to be considered in budgeting structures and formulae in order to ensure schools are not disadvantaged by influences beyond their control.

Community dynamics

Community involvement in school activities varied considerably across schools, affecting fundraising, payment of student fees and support for student activities and studies. Schools in the NT have multicultural populations resulting in many students speaking English as an Additional Language, for many as a third or fourth language. This brings diversity to the school and requires different ways of working that celebrate that diversity as a strength and involves parents who come from different experiences and have different expectations of schooling. In one school peer pressure and lack of attendance had a significant adverse effect on student participation and learning. Racist behaviour is intimidating for students and contributes to their lack of attendance or participation. The teachers felt there was a need to develop staff to cater for diversity in the classroom and school.

Students

Older students did not like boring classes which they described as those where the work was not creative and involved using stencil sheets, copying work or work that is meaningless and not contextualised. They preferred work that allowed them to show initiative and negotiate their learning. Secondary students wanted their work to be relevant and were frustrated with mathematics that was based on applying algebraic equations. Older students were frustrated by the science curriculum's focus on theory and writing reports and preferred to be involved in practical work. The majority of students at all ages had access to better computers at home and used them for a broader range of activities. School computers were described as either being too slow or often not working at all. The students' comments about computers were consistent with those of their teachers – technical support to fix faults takes a long time and there are usually some computers not working in many schools, frustrating their efforts.

Families

Families identified the need for improved teacher resources and professional development to improve and support teachers in meeting the needs of students. They felt that teachers need greater support to work with students' abilities, develop hands-on activities and use flexible strategies in their teaching. Supplemental support in specialist areas, with behaviour management and with children with additional needs through effective staff assistance was also considered important. Families wanted programs that were consistent across the whole schooling experience, including primary and secondary schools and noted that the lack of follow-up on ICT and mathematics in later years of schooling had resulted in students losing their passion for these subjects. One major obstacle noted was high teacher turnover,

particularly as this had a significantly negative effect on students' learning during the school year.

> Children's opportunities for success in maths are being (affected) because of the teacher turnover, the loss of teachers who are long term and really know their stuff. (Sam, parent)

> My son just failed Year 11 maths because he had five maths teachers this year. (Lyn, parent)

Families wanted to have better communication with schools through the use of clear assessment requirements, homework that reflected class work, and descriptions of what was happening in class and the programs being implemented. One group noted that the use of mathematics textbooks meant parents could follow and support students' progress particularly through changes of teacher.

VIEWS ON ATTRACTION AND RETENTION OF GOOD SCIENCE, ICT AND MATHEMATICS TEACHERS

Across the Northern Territory, in all educational systems and at all levels, many teachers of ICT, mathematics and science were not teaching in their specialty areas. They suggested a number of strategies to better attract and retain ICT, mathematics and science teachers. These included providing financial incentives that are not available to staff in major regional centres – including fuel, rent and food subsidies. Some suggested teachers in rural areas should be eligible for two airline tickets to fly home annually (available in past Commonwealth-based agreements). Travel subsidies were seen as helpful by some, but most wanted the subsidies made more widely available and for education authorities to recognise the cost of travel in and between regional centres. Parents noted that while they were able to get subsidies through other organisations such as the RAAF, these were not available to teachers.

> It's not an attractive (place) … not (because of) the place or the children. It's the things you don't get here, as opposed to other organisations (that) classify the area as remote. When a teacher gets here, what do they get? Nothing. There's no incentive for them to stay. (conversation between parents)

There are some subsidies currently available to remote teachers in the Northern Territory. One suggestion to encourage staff to stay was a mortgage subsidy for those who commit to stay long-term. Staff also needed better availability of relief teachers to enable them access to professional development activities, as these usually involved being away from the local area. Staff also wanted additional access to professional development in their specific areas of expertise, as well as in ICT, managing diversity, and conflict resolution. However, 'Opportunities for professional development are difficult to get to, because you need someone to cover your class.' (Kim, teacher)

Reflecting the values placed on lifestyle in a small community, a number of teachers suggested that communities establish groups of people who assist new staff to feel a part of the community and encourage them to stay.

> If you've got a (local) community of your own it makes a big difference. (Robin, teacher)

The teachers also recommended that education authorities and others encourage teachers to understand the benefits of working in smaller schools, including increased opportunities to take on more responsibilities and higher-level positions. They felt this to be particularly important, as staff leave looking for higher-level positions. Some staff preferred a model that developed a career path and then encouraged them to take on a mentoring role, sharing their expertise across a number of schools. Teachers noted two important factors in improving retention rates – a focus on improving behaviour management to make learning possible and investment in the stability and reputation of a school as a positive learning environment. Successful programs take a long-term view of staffing and are therefore linked to stability in leadership and teaching positions.

RECOMMENDATIONS FOR IMPROVING STUDENT OUTCOMES IN SCIENCE, ICT AND MATHEMATICS

Teachers

Teachers made a number of recommendations with regard to pedagogy and resources. They wanted a three-year, or whole school continuum of learning established to improve the mapping and pathways undertaken by students. They felt that this strategic and outcome-oriented approach provided a proactive way of interpreting the curriculum consistently as well as managing change in the school, staffing and students enrolments.

A number of teachers commented on the need to develop and access expertise through shared agreements. This could be achieved through developing a cluster of specialist programs that include ICT, mathematics and science and the relevant specialist support staff who provide in-service programs and appropriate resources. Schools would identify their area of focus for a year and share access to a specialist 'bank'. As each school developed its expertise it would become part of the professional development support for other schools.

Teachers sought access to better resources to assist them to teach in innovative and hands-on ways. In ICT this means mini-computer laboratories in classrooms, or a bank of laptops and relevant technical support, professional development in order to stay abreast of technological developments and their integration into the classroom. Mathematics and science teaching were best supported by access to resources needed to integrate the curriculum effectively and make activities meaningful to students and increase the hands-on nature of their teaching and assessment. A package of activities that can be undertaken with locally available resources would assist teachers. This concept is also related to accessing funding and industry partners such as CSIRO.

Students

In the future students would like to have more games and hands-on activities in classes. These include use of computer hardware and software by using speech recognition, choice in their mathematics activities, large scale hands-on science activities such as Questacon or CSIRO programs, and rewards for mathematics activities. Students identified the need for better ICT infrastructure, technical support and access to ICT on a regular basis. Mini-computer laboratories in classrooms were identified by some students as a positive way to improve their learning. Students also preferred interactive and self-directed work in all areas.

Families

Families stressed the importance of small class sizes and individual attention through additional help in the classroom as keys to improving outcomes for students. One recommendation was for increased funding for support staff, including teachers' aides and relief staff. They wanted teachers to have adequate professional development and to be open to new strategies for teaching students effectively i.e. hands-on activities and ICT integration into the curriculum. Continuity of curriculum and staffing were also identified as key areas of focus for schools. Families wanted programs to be communicated well to parents so they could continue to support schools and their work. Secondary parents wanted schools to link the learning and content that occurs in schools with that in tertiary education. Parents recommended focusing on the basics of education – handwriting, literacy, numeracy and behaviour management to enable schools to develop environments conducive to learning in all areas.

INDIGENOUS EDUCATION

Indigenous education is integrated into all schools in the Northern Territory. As such, all of the issues above are relevant to Indigenous students, communities and staff in provincial and remote areas and schools. Indigenous students represent 38% of all students, a proportion that is steadily increasing. Across the Northern Territory there are 985 Indigenous communities, 54 Homeland Learning Centres and 183 schools (151 public and 32 private). Three quarters of all Indigenous students are enrolled in the 118 schools located outside the main cities of Alice Springs and Darwin. Forty-one of these schools are staffed by between one and four teachers. In urban and remote schools 38% of students use English as an Additional Language, with 75% of these identifying as being from an Indigenous background. The range of different languages students may speak is illustrated by the 104 Indigenous languages and dialects registered by the Northern Territory Aboriginal Interpreter Service. In many remote schools all students speak English as an Additional Language. (Northern Territory Government, 2005)

In order to improve outcomes for Indigenous students, the Department of Employment, Education and Training (DEET) is focusing on increasing the provision of secondary education in remote areas and including alternative pathways such as vocational education, accelerated literacy programs, partnerships with Indigenous communities and the Indigenous Community Coordination Pilot at Wadeye.[14]

This section explores one Indigenous school - Frilled Lizard Secondary School - and its surrounding community.

Living in regional and remote areas

Students in this remote community described the importance of living where they were close to their families and friends and linked to Aboriginal-owned and managed land. When asked why they chose to live in remote areas, they replied:

> Because we've got friends and families around here and we've got our own home land. (Kelly, student)

[14] Details may be found at http://www.deet.nt.gov.au/education/Indigenous_education/ and http://www.deet.nt.gov.au/

> Because it is (Aboriginal) land … hunting and fishing. (Tony, student)

The students enjoyed being involved in community activities such as hunting, fishing, playing sport, going to the Blue Light disco and going to school. For the future, the students aspired to careers in their community, including teaching or being a principal, being a musician, working for the government in local community and ranger organisations or offices, being a shopkeeper or a mechanic. They were aware of the stages of education involved in these careers and were influenced by seeing Indigenous staff working in a variety of local organisations and by a small cohort completing Year 12 recently. Students were able to attend secondary classes which focused strongly on career development. Composite classes allowed students to work through programs at their level and included those who were aiming to complete Year 12 over the next one-to-four years and those preparing for vocations.

Teachers lived in the community and in a local township. There was a high turnover of staff at all levels relating to a number of issues including a lack of appropriate housing. This resulted in people living in substandard conditions or being unable to access housing at all. The sustainability of successful programs had been challenged by staff turnover and the lack of certainty about the future. Staff commented about the effects on morale and student outcomes of stopping programs that had encouraged students to be involved and experience success.

Some of the obstacles in undertaking focus groups in remote school communities exemplify many of the issues in educational provision for these schools. There were significant changes in leadership and senior staff mid-term; schools' funding formulas are based on student numbers that fluctuate every year, resulting in a lack of security for specialist teachers and the school programs. Many Indigenous community members are employed in the school in positions ranging from principal, teachers, linguists, literacy support specialist and teacher's aides. Generally, local community staff are unable to access DEET housing and live in crowded and substandard housing in their own community.

Provision of mathematics, science and ICT education

To participate in the remote secondary provision the school has had to move from a thematic, integrated workshop approach to learning offered in blocks to a discipline-based curriculum. Students study a limited range of subjects taught by a cohort of teachers across the secondary school. The subjects are limited by the availability of specialist teachers, appropriate resources even at a basic level, and their integration into the bilingual program. While secondary students have interrupted histories of education, and classes include many students with low levels of Standard Australian English literacy and numeracy, Indigenous students generally have strong and extensive understandings about their languages, cultures, environment and community business. The curriculum then is trying to meet the requirements of the mainstream education system by preparing students for active involvement in the future of their community.

With a considerable focus on improving enrolment, the school has 14 students in Year 9/10 and 20 in Year 11/12 composite classes. This has improved from four senior secondary students in 2005, a difference which demonstrates the volatility of enrolments in many regional and remote Indigenous schools. Delivery is undertaken by a team of Indigenous and non-Indigenous teachers in a bilingual and bicultural program that recognises and values Indigenous and non-Indigenous knowledge systems.

Students are currently working through the NTCE Stage 1 and 2 in a planned program over semesters 1 and 2, 2006. The program emphasises tasks to support students' ability to make influenced decisions in daily activities in work, home and society in general and is developed in line with the community goals and priorities and the local community Action Group which includes senior Indigenous community members and staff. The integrated curriculum is displayed in a large, shared space in the school. The science curriculum recognises students have had little or no exposure to Western concepts of science but have a wealth of knowledge about science through cultural involvement and living in their country which is not profiled in the Northern Territory Curriculum framework. Students have access to their family and community's knowledge and understanding of the biological world which has many layers of meaning and is a reference point to develop skills to work scientifically and represent biological concepts in a scientific way.

ICT is integrated into courses where possible, rather than being studied as a discrete unit of work. There is a lack of up-to-date ICT hardware and software available to students, by far the lowest standard across all schools involved in the study, and no Internet access. The computers are not compatible with each other and regularly do not work. While the school has money to pay for a technician to install Internet connections to classrooms, it is unable to attract a tradesperson to the school as it competes with a nearby mining company. The ICT content work and assessment is based on current investigations and projects in other discipline areas. Students are keen to use computers more in their studies and recognise the adverse effect of poor quality equipment on their studies. The majority of students have no other access to ICT and use computers at a basic level related to the standard of computers available.

In the maths curriculum students are studying two themed areas – earning and spending and measurement. In the measurement stream students are designing and building cane toad traps. Once these are completed, students will work with local rangers to trap cane toads and then collect and analyse data about toads as part of their mathematics studies. This course of study will include relevant mathematics and scientific concepts, practices, processes and communication genres. Cane toads are a study focus as their arrival in the NT is threatening the ecosystems and cultural life in the region. Through this study students will add to their Indigenous scientific knowledge and process by also learning how to work scientifically as defined by the Western tradition. This will include developing skills in the relevant literacies and ways to reflect on these processes. They will also work with local resources and organisations. The earning and spending theme involves students planning and implementing a trip interstate. Students are preparing the budget, planning and undertaking fundraising and then booking and participating in the trip. In the science curriculum, students are focusing on horticulture, environmental mapping and interpreting students' environmental awareness. The lack of resources available in many schools was evident, for example, up to date maps, protractors or scientific calculators. This approach combines Indigenous and Western understandings of the environment, horticulture and their interpretations.

This section of the report has outlined some of the issues in Indigenous education, but further study would be required to present a deep understanding of the complex issues in Indigenous education across Northern Territory schools. Addressing these issues involves a long term, consistent, well-resourced and integrated approach to education that is sufficiently flexible to recognise and reflect the Indigenous community's knowledge, business aspirations and realities. The involvement of local Indigenous community members in the solution with sensitive and knowledgeable non-Indigenous educators, government and non-government agencies is an essential component of this approach to achieve a positive future for Indigenous education.

CONCLUSION

Underlying the positive approaches in science, ICT mathematics were a set of key activities including appropriate and targeted infrastructure and professional development, integrated curriculum, targeted programs and staff working in collegial teams. The catalysts for initiatives and team development included encouraging individuals with particular interests, and involving specialist staff, management and the whole school and local community members. Students also emphasised the importance of actively leading their learning, engagement in flexible and relevant curriculum and approaches across all subject areas. Their interest and engagement in ICT was evident in their appreciation of mini computer laboratories in their classrooms, as technology was accessible throughout their learning experiences. Educators and families have worked to develop innovative and effective approaches through teamwork and focusing on what can be achieved through local support and accessing wider networks.

Northern Territorian educators, families and students clearly valued and recognised the advantages of living, working and learning in regional and remote areas. They also identified and shared many of the challenges that are part of the realities of living in regional and remote areas. Some of the challenges included the transitory nature of lifestyles and careers across the NT, the lack of specialist teachers, housing availability and financial support, and the impact of these factors on learning and schooling. Their effects are significant and influence educational outcomes across schools and learning areas. Addressing these challenges essentially calls for increased long term planning and security, effective infrastructure and professional development across the spectrum of schooling.

Elements that could be described as challenges have been integrated into the whole school system to the benefit of students, schools and families. This study demonstrates the importance of incorporating the diversity of local languages, knowledge, skills and experiences into the classroom and curriculum. Nowhere was this more evident than the Indigenous classrooms that effectively incorporated Indigenous and Western knowledge and properties as part of complete and successful programs. Evidently, developing pedagogies, resources, curriculum and support processes that incorporate stakeholders as essential and expert has the potential to improve outcomes for regional and remote educational communities across the NT. This evidence challenges accepted understandings about regional learning and offers opportunities for future educational policy, theory and practice development.

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