RETAINING MATHEMATICS AND SCIENCE TEACHERS IN RURAL AND REMOTE SCHOOLS

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ABSTRACT

Why teachers in remote and rural schools do not remain longer in their posts is a central concern in Australian education. In particular, the lack of mathematics and science teachers in regional areas has reached critical levels endangering the adequate delivery of the curriculum to thousands of school students. While many teachers' personal grievances revolved about geographical isolation, other factors point at a number of instructional, curricular and organisational factors influencing teacher attrition. This study characterises and examines those factors using data from 191 teachers in 27 remote and rural schools in the State of New South Wales (NSW). The findings suggest a professional environment where, as mostly beginning practitioners, teachers are put into work situations with related pressing demands and expectations, puts them at risk.

INTRODUCTION

The purpose of this study was to explore mathematics and science secondary teacher perceptions of factors hindering their permanency in rural and remote schools.

In 2012, secondary school teachers in NSW schools classified as rural and remote participated in a survey study on teacher recruitment and retention (Handal, Watson, Petocz & Maher, under review). Although the underlying research purpose was to identify different response patterns between mathematics and science teachers and the other six NSW key learning areas (KLAs) (Creative Arts, English, Human Society and its Environment, Languages, Personal Development, Health and Physical Education, and Technology), no statistically significant differences were identified between the two groups. Hence, the findings can be generalised across all eight KLAs.

A study conducted by Handal, Watson, Petocz and Maher (2013) found the majority of teachers in NSW rural and remote schools had little teaching experience, indicating a worrying attrition phenomenon. The study also found that teachers moved to rural and remote schools: to secure a permanent position; for a perceived sense of a stronger staff collegiality; because of the attraction of a rural ambiance and the desire to gain exposure / experience in rural education, and to help rural and remote communities. Furthermore, this study found that respondents were more likely to move to a rural and remote school if they were: raised in the country and had a family reason to move; female teachers with a family reason to move; and teachers in the 18-30 year age range who wanted a rural teaching experience.

This present paper reports mathematics and science teacher comments about the factors that motivated them to work in a rural and/or remote school and the difficulties, as they perceive them, in recruiting mathematics and science teachers for these regions. It was anticipated that responses to

these two questions would provide insights about the retention of mathematics and science teachers in rural and remote schools.

LITERATURE REVIEW

The choice to teach or not to teach in rural and remote schools

The fundamentally important anchors that aid or hinder the choice of teachers to work in rural and remote schools are identified in the *Science, ICT and Mathematics education in rural and regional Australia study* (SiMERR), *National Survey* and *Case Studies* (Lyons, 2006). From 153 teacher comments, 46% said the main reason for not working in rural and remote locations was they wanted to maintain close links to family and friends in cities. The SiMERR National Survey, (Frid, Sparrow, Trinidad, Treagust & McCrory, 2006) found that indirect influences on teachers moving to rural and remote locations was concern with the difficulty of living environments such as housing; the nature of community relations; the extent of student transience (distance and isolation) and whether teachers were attracted to schools but then not retained after a few years (Frid, 2006).

Overall, there are a number of studies that explore the challenges that impact the choice of teachers to work in rural and remote schools and they arise from the lack of:

- sound workforce planning to ensure that predicted staffing needs are met to promote teaching and living in the country;
- training and development, particularly to cater for the diversity of rural students;
- appropriate succession planning;
- development and utilisation of community expertise and leadership, essential to building and operating sustainable services and support; and
- consideration of higher costs of living (MCEETYA, 2007, pp. 8-9).

One government enquiry or working party after another and a plethora of research studies have identified the reasons why many teachers, especially mathematics and science teachers, do not choose to work in rural locations. Essentially, economic rationalism, closure of industries, shrinkage of communities and relocation of services have made living in remote and rural Australia less attractive to people who have careers as teachers but who are also parents of children and members of a community. Consequently, the fundamental issue is that distance provides a tyranny and a barrier to the provision of educational services (Commonwealth of Australia, 2000, p.3*).*

The Ramsey Report (2000), *Quality Matters*, stated there is a need to provide "targeted incentives to prospective teacher education students from remote and rural communities as recruitment strategies for these programs" (in Boylan, 2003, p.6) and "centres of excellence ... in specialized fields, such as regional and rural education" (in Green & Reid, 2004, p. 262). Likewise, the Vinson Report (2002) in NSW recommended identifying "deficits or disadvantages inherent in rural locations using educational, social, economic and service access instances to support the deficit orientation" (in Boylan, 2003, p.6). Other reports include those by the Australian Government Department of Education, Science and Training, (2004), MCEETYA (2007; 2009), and the TERRAnova Project which all highlight the need to address the lack of teacher incentives to work in rural and remote locations (Reid, White, Green, Cooper, Lock & Hastings, 2013).

Many sources stated that rural challenges "will persist and are likely to intensify", (Halsey, 2009, p.139) as a consequence of drought, climate change and globalisation (Cockling & Dibden, 2005; Alston & Kent, 2006). These influences were seen to increase transience and demographic shifts, especially in relation to youth (Salt 2004; Skibeck & Connell, 2003). Transience is a threat to rural communities in terms of social and economic sustainability. In addition, when families send their children to schools away from the local country schools or teachers leave to return to the city, these "defections are commonly viewed as a threat to the continued existence of the rural school" and to those teachers who remain (Cornish, 2009, p, 109).

Responses to challenges, incentives to teach in rural and remote schools

The Commonwealth Government Human Rights Commission Report on Rural and Remote Education (Stokes, Stafford & Holdsworth, 1999) advanced the following responses that would manage the challenges that make rural school choices problematic. A quality over cost approach needs to underpin funding models of incentives and support for rural teachers. This means money needs to be spent by governments and quality needs to prevail over economic rationalism. Cross-sectoral collaboration can help overcome limitations on subject choice and supply of subject specific teachers among schools in remote locations. Appropriate incentives would include a rural component, delivered in all PST (pre-service student teacher) courses with rural practicum experience incorporated; reduced rent; more money through an isolated teachers allowance; subsidised travel to the nearest major centre twice a term and in-service and professional development to be provided in remote schools to counteract the need to travel. Similarly, MCEETYA (2007), and White, Green, Reid, Lock, Hastings and Cooper (2008), also identified incentives as a way to increase teacher relocation to rural and remote locations.

Skilbeck and Connell (2003, p. 22) reported that the Queensland Remote Area Incentives Scheme provided teachers not only with incentives to move to remote areas but that the particular combination of incentives encouraged teachers to remain there beyond the obligatory first three years. The incentives: $5000 a year, plus payment for dependents; eight days extended leave provisions; and induction programs for newly appointed rural teachers are such that they support a 'quality over costs approach' to staffing rural and remote schools as suggested by Stokes, Stafford and Holdsworth (1999).

Similarly, the SiMERR Case Studies report recommended that education authorities extend eligibility of incentive schemes to apply to a broader range of locations. Scholarships and retraining schemes for accredited teachers in mathematics and science were also recommended. Furthermore, it suggested providing weekend accommodation in home urban centres, airline tickets to fly home annually and travel subsidies (Beswick & Brown, 2006; Wallace, Nair, Shaw & Barton-Johnson, 2006).

Incentives relating to professional development that would appeal to Generation Y teachers emerged from the work of Plunkett and Dyson (2011) who considered insights gained over three years from 102 Victorian beginning teachers. Seventy-one percent of these teachers belonged to Generation Y. According to Mackay (1999, p. 3) Generation Y has a "desire to reconnect ... by creating communal connections that stimulate the village life". McCrindle (2006, p. 5) also indicated that Generation Y did "not relate to traditional styles of leadership ... they are looking for relating, mentoring and guidance ... they want direction, feedback and good communication channels". This suite of incentives provides a different emphasis to those indicated by earlier studies (Plunkett & Dyson, 2011).

Roberts (2004) recommended more scholarships for PST of science, mathematics and ICT and suggested an expansion of the number of places for science, mathematics and ICT teachers at rural and regional universities. Roberts (2005) argued that this would increase the numbers of teachers who would choose to work in rural schools because 73% of science, mathematics and ICT teachers studying in regional areas opted to work in the country. He also suggests adopting a systems or whole of government approach to recruitment and retention issues. Boylan (2003) recommended implementing place based pre-service courses in teacher education programs that allowed students to familiarise themselves with the rural educational and contextual environment with a view to move there after graduation.

Retention of rural and remote teachers

Lyons, Cooksey, Panizzon, Parnell and Pegg (2006) identified a number of barriers to teachers working in rural schools. However, those related to retention of teachers in rural and remote schools were:

- professional isolation such as the lack of mentoring expertise, release time, collaboration, difficulty of contributing to syllabus development and HSC marking;
- poor access to technical and support services and resource provision for mathematics teachers teaching higher order thinking skills;

- improved employment prospects in urban schools; and
- personal and professional considerations due to relocation.

These concerns were despite a long list of incentives to attract teachers to rural and remote locations. Lyons et al., (2006, p. 152) concluded that such incentive schemes were not effective in retaining teachers. Consequently, Lyons (2009) cited a number of reasons why teachers left rural schools which included lack of employment opportunities for partners, the education of their own children and assistance with parenting support, broader family influences, a sense of social isolation and greater career opportunities in cities.

Other recommendations for teacher retention in rural and remote schools from the SiMERR national survey include:

- ongoing career development and targeted leadership training tied to retention;
- professional development, including qualification for sabbatical after a period of service;
- improved leave entitlements, maturing at intervals of service;
- progressive rather than a flat system of financial incentives; and
- inbuilt relief in staffing formulae for locations where there is a difficulty employing relieving and short term contract teachers (Lyons et. al., 2006, p. 155).

SUMMARY

Governments remain slow to act on the recommendations repeatedly provided by their own working parties, enquiries, reports and ministerial councils, as cited by this review. Government funding is viewed as the main basis for more effective incentives and support for rural teachers. The advantages of rural workplaces can be made more accessible to more teachers while at the same time the disadvantages of distance, social, cultural and professional isolation can be more effectively managed.

The literature provides clear evidence that many rural teachers, including mathematics and science teachers, are committed to their rural communities with their associated rural lifestyle and that it is these aspects of living in rural communities that influences their choice to move from the city to a rural or remote location as well as from one rural school to another or to remain in a given rural school. This study documents the views of teachers and their articulation of the specific professional needs of programming time, professional learning and participation that motivates them to operate effectively within their profession. In general, the above literature suggests that factors impacting on teachers' permanency in rural and remote schools are associated with personal, instructional, curricular and organizational/logistics issues.

Consequently, the research questions for this study are:

- What are the instructional, curricular and organisational factors affecting teacher retention in rural and remote secondary schools in New South Wales? and
- What fundamentally important anchors aid or hinder teacher retention in those regions?

PROCEDURE

The original study utilised a questionnaire. The quantitative results have been previously reported (Handal, Watson, Petocz & Maher, 2013) and summarised in the introduction to this paper. The questionnaire was designed to identify the factors that motivate teachers to work at a school in a rural and/or remote area. The questionnaire consisted of two sections. The first section involved questions about respondents' personal and demographic background such as gender, age, Aboriginal or Torres Strait Islander ethnicity, teaching experience before and after their rural appointments, teaching qualifications and KLA. The second section included a Likert-type scale consisting of twelve semantic items related to potential teachers' decisions for working at a rural and/or remote school. The third section involved open ended responses that were designed to document the factors that motivated teachers to work in rural and/or remote schools and identify the difficulties in recruiting teachers in their KLAs for these regions.

THE SAMPLE

Questionnaires were mailed to 51 high (7-12) and central schools (7-10) that were classified as rural or remote by the NSW Department of Education and Communities (NSW DEC). A pre-paid, self-addressed envelope accompanied the questionnaires along with a letter addressed to the school principal assuring anonymity and confidentiality. The letter requested school principals to pass on the questionnaires to all teachers who were secondary trained.

One hundred and ninety-one teachers from 27 of these schools returned the questionnaire survey representing 77% of the total number of schools targeted. Respondents were distributed across all eight KLAs in their schools. A total of 301 comments were collected from the open-ended section of the questionnaire (Handal, Watson, Petocz & Maher, 2013).

For statistical purposes, the whole sample was split into two groups. The first group consisted of teachers trained in mathematics and/or science while the second group consisted of those trained in other KLAs. Both groups were found comparable except for the "Age" variable as described below.

Age

Two-tailed *t*-tests for independent samples (a = 0.05) for each questionnaire item revealed that there was no statistical differences between the mean scores of the mathematics and science (MS) and the Other KLAs teachers except for the variable 'Age'. For the latter, a significant statistical difference *(p* =0.018) was found between the age mean score of MS teachers (mean = 4.84 range) and Other KLAs teachers (mean = 4.32 range) which indicates that MS teachers were significantly older than the Other KLAs combined. Age frequencies by year ranges in percentages are outlined in Table 1 showing that over half the sample is between the 41-60 years range:

Table 1: Teacher Age

Range	Age (years)	MS Teachers (%)	Other KLA Teachers (%)	Total (%)
1	18-21	-	0.5	0.5
2	22-25	2.1	7.4	9.6
3	26-30	2.1	18.1	20.2
4	31-40	5.9	9.0	14.9
5	41-50	10.1	13.3	23.4
6	51-60	9.6	19.1	28.7
7	61+	1.1	1.6	2.7
	Total	30.9	69.1	100.0

Teaching Experience Before and After Teacher Rural Appointments

Years of teaching experience before and since appointment to a rural and remote school are shown in Table 2. The data show that a large proportion of teachers began to teach in rural and remote schools as the modal range of previous teaching experience (before going rural) is 0-5 years. Sixty two percent of respondents were female; the academic qualification median was a bachelor degree combined with a diploma in education. Fifty-four percent of the 191 respondents were above 41 years of age.

Table 2: Years of teaching before and since going rural for MS teachers

Number of years experience	Number (frequency) of MS teachers	
	Before going rural	Since going rural
0-5	46	19
6-10	2	9
11-15	0	7
16-20	4	10
21-25	3	6
26-30	0	1
30+	4	7
Total	59	59

METHODOLOGY

The open-ended responses were sorted into two groups. Those that were related to professional issues and those related to personal issues. The professional issues centred around three broad clusters: instructional, organisational and curricular issues (Memon, 1997). These three clusters served as a guide to the selection of categories and subcategories used to analyse the teacher views reported, as outlined by Cohen, Manion and Morrison (2011). The number of personal issues was small so they were grouped together.

In order to analyse teacher responses about professional issues, responses were preliminarily coded using the instructional, organisational and curricular nature of each remark. This is a methodological design used in educational evaluation research to thematically organise respondent perceptions (Handal & Herrington, 2003). Instructional issues were those identified as teaching and learning practices enacted within the rural education environment such as teaching in other KLAs, being the only KLA teacher and lack of teacher professional development opportunities. Curricular issues referred to concerns related to the way teachers felt the implementation of the curriculum was supported and resourced. In turn, organisational issues were those connected with administrative workload, workplace uncertainty and the trend for schools to become smaller.

The themes were subsequently split into emerging smaller sub-themes representing single meaningful concepts. Likewise, each sub-theme was further reduced taking into account common ideas underlying the data. This process was repeated until no further comparison was possible due to saturation (Handal & Herrington, 2003). The final analysis is summarised in Table 2.

DATA ANALYSIS

Analysis

As outlined above, all responses that related to professional issues were coded as one of three categories: instructional, organisational and curricular and then further coded into the emerging subcategories depicting single meaningful themes. Each sub-category was further refined and consolidated so that it reflected the concepts embedded in and underlying the data. As the analysis

unfolded subcategories were further subdivided. Responses that related to personal issues were placed in a separate category.

Table 2: Qualitative analysis

Nature of Issue	Category	Subcategory
Professional	Instructional	Teaching in other KLAs
		Being the only KLA teacher
		Lack of teacher professional opportunities
	Curricular	Curricular Support
		Curricular resources
	Organisational	Administrative workload
		Workplace uncertainty
		School downsize
Personal		Isolation
		Cost of Living

FINDINGS AND DISCUSSION

Participants provided data in the context of their professional life as a teacher. Consequently, responses may have been biased in terms of issues that impact teacher professional lives rather than their personal lives. This could be an unintended limitation of this study. Nevertheless, although the majority of the study findings concern the professional aspects of why teachers choose to remain in rural and remote locations, there were some findings that were personal. Consistent with the data analysis, findings will be discussed in terms of instructional, curricular and organisational categories. However, there will also be a discussion of personal issues that are additional to the categories stated above.

Overall, the discussion will focus on teacher retention and suggest unrealistic demands and expectations as the underlying cause of teacher attrition. Teacher responses suggest the majority of participants were overwhelmed by the instructional, curricular and organisational factors that characterise rural and remote school environments.

PROFESSIONAL ISSUES

Instructional factors

The analysis of teacher comments about instructional issues generated three subcategories or themes. These three themes were: the effect of being the only subject specialist; being asked to teach outside the KLA in which the teacher was trained; and the lack of teacher professional learning (TPL) opportunities.

Being the only subject or KLA teacher

Many rural and remote schools are small and, therefore, a teacher can become the only one in his or her teaching subject. This problem becomes more acute if that single subject teacher is a new beginning teacher who lacks experience. The reality is that such a teacher would normally be mentored by a more experienced subject specialist, but this is sometimes not possible. Typical comments made included:

> *It is often difficult when you are the only person in your KLA.*
>
> *You are unable to communicate with teachers in your KLA within the school because there are none.*
>
> *There are smaller schools than mine. There is a lack of colleagues for support within a KLA and that is a problem.*
>
> *There is a strong need for the mandatory 7-10 KLAs and specialist areas are a luxury.*

Teaching in other KLAs

The issue of teaching in other KLAs seems to be a product of lack of local casual teachers as well as of permanent KLA specialists. Some respondents expressed their concerns as follows:

> *Small school numbers mean teachers have to be prepared to teach outside their subject area. Some teachers are not prepared to do this.*
>
> *Inability to get casual teachers is a huge issue. Teachers are required to do lot of extra classes.*

Teacher Professional Learning (TPL) Opportunities

Professional learning is necessary to promote and develop teacher professional maturity. One teacher commented: "New teachers [are] not trained or confident in using appropriate pedagogies: .e.g. Access program; connected learning; collaborative teacher/curriculum networks". Participation in TPL is limited because of the lack of local casual teachers as well as the geographical distance between rural centres and training venues. Other respondents said:

> *There are very few, nearby (2 hours away) TPL opportunities.*
>
> *Training is ONLY offered in Sydney which is a 12 hour drive. Who pays for accommodation and travel? Professional learning point score is predominately geared towards city based schools. It is very hard for rural schools to find time and or funding to send teachers on a 3 day trip to city.*

Such professional isolation negatively influences student learning because, according to a respondent, "even senior students suffer from the lack of discussion and networking that is required..."

Engaging in NSW Higher School Certificate marking is also a TPL issue:

> *Teachers of the HSC (preliminary) course need the experience of HSC marking. The only option at the moment for rural and remote teachers is complicated. It should be possible for teachers to participate in the marking process without exchanging/long service leave. It is hard for young teachers in rural schools.*

These findings are consistent with those of Lyons, Cooksey, Panizzon, Parnell and Pegg (2006). They highlight the reality that professional isolation precipitates a professional environment characterised by the lack of mentoring expertise, release time and collaboration. This is despite system incentives to retain teachers in rural and remote schools (Lyons et al., 2006).

Curricular factors

There were two issues associated with curriculum delivery. They were lack of curricular support and resources.

Curricular Support

Getting appropriate curricular assistance in small schools that are geographically isolated is particularly difficult for new teachers because they do not have KLA-specific support in terms of programming and content and often they do not even know what it is they need to know. In general, there are concerns about the lack of support networks and the lack of programming support. The need for in-school support structures was mentioned:

The lack of adequate support structures such as professional support and counselling services, consultants and professional development courses, due to the remoteness from large centres AND [emphasis by the respondent] from regional office is an issue. Our regional office provides very little support.

Curricular resources

The lack of curricular support is related to the physical means needed to deliver such support:

> *There are limited text options due to the size of the school and budget.*
>
> *The size of faculty budgets and the resources required by specialist KLAs are of concern for young and enthusiastic teachers.*
>
> *Having less access to large resources (i.e. excursions, lectures) makes teaching in my KLA harder in rural and remote areas*

Although curricular resources were cited by previous studies, for example, Lyons et al., (2006) as one of a number of factors that contributed to low retention rates for teachers in rural and remote locations, respondents in this study related lack of curricular support to the size of schools and their associated budgets. Nevertheless, remoteness was also cited as a reason for lack of curricular resources. It would seem that although lack of curricular resources was a concern, to say that they were a significant reason for low retention rates would be beyond the evidence of the data collected.

ORGANISATIONAL FACTORS

Teachers appear to be pressurised by logistical demands such as being asked to do time-consuming administrative tasks and to engage in higher duties. However, most comments referred to the possible withdrawal of the transfer point system whereby teachers in rural and remote schools are currently awarded more points per year because of the remote location of their employment. This was added to by the uncertainty of schools being closed because of declining regional populations impacting the viability of rural and remote schools.

Administrative workload and higher duties

Respondents expressed their concern about inexperienced beginning teachers being expected to undertake additional administrative work normally undertaken by more senior staff. They were expected to take up higher duties either formally or informally. Comments in that regards included:

> *Inexperience teachers were expected to 'step up' to take leadership roles.*
>
> *There was extra workload for classroom teachers – basically head of the department stuff.*
>
> *Young inexperienced teachers were executive staff. So, there was often poor leadership and limited support for staff.*

Transfer points system

A feeling of uncertainty was perceived about the possible withdrawal of the transfer point system which allows new rural and remote school staff to acquire a significant number of transfer points within a short period of time so they can relocate to a preferred destination. The transfer points system was perceived as both legitimate and enticing. For some respondents the scheme "[influenced] my original decision to come out here" and "allow[s] me to return to coastal areas after teaching in a rural area for a period".

For a number of respondents withdrawing the system would mean that:

Rural schools will struggle even more to get qualified specialist teachers.

Rural and remote schools will become increasingly harder to staff.

Teachers' working conditions and benefits will worsen.

The incentives that often draw teachers to rural areas may no longer exist.

The fear of being trapped here forever will discourage relocations to rural and remote schools.

School downsize

The possible withdrawal of the transfer points system adds an element of job insecurity because there is the potential for a school to be downsized. Regional schools are declining in student numbers, in a respondent's words, "because of agricultural or political reasons" or poor school academic performance. As two teachers said:

> *Falling numbers could be a problem. There could be possible forced transfers. If a school is too small, parents would be more inclined to send more capable students to private schools. This could mean that we might not get the same job satisfaction if we don't achieve our current excellent HSC results (Teacher 1).*
>
> *The poorer performance of students in recorded tests (NAPLAN [National Assessment Program – Literacy and Numeracy], ESSA [Essential Secondary Science Assessment] and HSC) could lead new teachers to avoid the school in light of current political changes (Teacher 2).*

Not surprisingly, such workplace landscapes result in a high annual turnover of personnel. Teacher responses referred to the need to consider retention as being as important as recruitment:

> *There don't seem to be many mathematics teachers in the system. When they get to a school they are generally on their own and a lot can be expected of them. They burn out or go after one to two years. The difficulty is getting them (Mathematics and science teachers) to stay for more than the time it takes them to get a transfer which is often 3-5 years (Teacher 1).*
>
> *Recruiting is not only a problem, keeping teachers here is also an issue. I have been at my school for 7 years and considered to be an old hand. Most years we have a big turnover in staff (Teacher 2).*

Although organisational factors at the school level were cited by a number of respondents as a factor in retaining teachers in rural and remote locations, the organisational issue that was the greatest source of comment was the possible discontinuation of the 'points transfer system'. This is a significantly different issue when compared with the other influences discussed so far. It suggests the original reasons for moving to rural and remote locations may have all been secondary when compared with the desire to use the time spent in rural and remote schools as a means of 'cashing in' to eventually obtain a placement at a more highly sought after location. Consequently, although this organisational factor has been classified as 'professional', the reality is it may be a more 'personal' factor. Teachers who move to rural and remote locations may do so because they will then be better placed to request a transfer to a location where they want to live.

PERSONAL FACTORS

Isolation

A number of personal difficulties were cited by teachers in rural and remote areas which are associated with living in isolated places. About one third of the responses to the question *What could be the difficulties in recruiting teachers in your KLA to rural and/or remote schools?* underscored a sense of both social and family solitariness in their new communities. One respondent said "most graduates have little experience of life outside metro areas". Some teachers said they really felt "isolation from

extended family". Such feelings became particularly acute when "some newer teachers leave families behind to come out here".

Family issues extend to their own children with one teacher commenting that it was "hard to create life opportunities for children", while for others there were issues with "teachers in relationships being a long way from partners" as well as the "problem of employment for partners". Some suggestions from teachers sound very original and practical. One teacher said "if all teachers were given Skype access and internet at home, this could help combat home sickness". Other perceived forms of isolation included being away from friends and the "lack of access to galleries, cinema and other cultural experiences", citing shopping, concerts and live theatre.

Other difficulties mentioned by respondents included lack of teacher housing, problems associated with obtaining supplies and services due to remoteness, particularly the availability of medical and dental services with teachers making particular references to the lack of female doctors and mental health specialists.

Cost of Living

By far the greatest response to personal issues was the cost of living in rural or remote areas. The benefits derived from cheaper rent and additional 'incentive income' as a teacher in rural and remote locations were quickly eroded or at least neutralised by more expensive costs of living. Benefits were often 'eaten up' by additional transportation costs of goods and services from larger urban centres. This is despite the fact that teachers received extra financial allowances to compensate for any loss of real income (NSW DEC, 2012). The following comments were made by some teachers:

> *Poor pay in rural areas, high costs of living and isolation and lack of services all make life difficult. They are appalling work and living conditions. You need your own transport (car) and they are expensive in the country.*
>
> *Travel anywhere is expensive – both for professional development and personal travel to even get to a doctor.*
>
> *I receive benefits and allowances but they are nothing compared to the actual costs. How are they supposed to attract a person here? You are so far from services that you spend twice that in petrol and you have to buy dear groceries from the local store. Supermarkets – what are they?*

Lyons, Cooksey, Panizzon, Parnell and Pegg (2006) reported similar personal issues related to the retention of teachers in rural and remote schools. However, their comments were more general and were in the context of teacher concerns being despite the list of incentives. Consequently, this research agrees with the conclusion of Lyons et al., (2006, p. 152) incentive schemes are "not effective in retaining teachers". They may be more effective in attracting teachers to rural and remote locations but teachers soon work out that they are not sufficient to keep them there.

CONCLUSIONS AND IMPLICATIONS

This research sought to characterise and examine the instructional, curricular and organisational factors affecting mathematics and science teacher retention in rural and remote schools as suggested by the literature review. As a consequence of the data analysis, additional personal issues were also identified. Statistical analysis of the 191 secondary teachers surveyed indicated no significant statistical differences between the mathematics and science cohort compared with teachers of the other six KLAs in NSW rural and remote secondary schools (Handal et al., 2013). The data revealed a set of instructional, curricular and organisational factors that developed a working environment that promoted teacher attrition fuelled by professional burnout.

Teacher responses suggest the majority of participants become overwhelmed by pressure resulting from poor access to professional development, lack of resources and, due to the tyranny of distance, deprived of professional networking. Despite being beginning teachers, most have to function as if they were curricular experts. They have to teach outside their KLA training and knowledge base and assume executive responsibilities, if not fill executive positions, in schools with a high annual personnel turnover. The transfer points system, which enticed many teachers to their rural and

remote schools, is perceived to have limited future viability (NSW Teachers Federation, 2012). Unfortunately, the findings of this research indicate if this were the case both the attraction of teachers to rural and remote locations would be reduced as would their retention.

To reduce attrition of teachers in rural and remote schools it is necessary to address the issues identified by this research. In particular, professional development and curricular mentoring are relatively easily addressed. These two issues can be addressed using contemporary technologies such as online media that compensate for geographical distances and promote a supportive professional community that extends beyond the geographical space of rural and remote locations. Rethinking and implementing a contemporary view of blended learning and support can effectively relieve the burden of being the only KLA teacher, the lack of specialised curriculum support, being disconnected from professional communities and so enable empowerment through access to the professional learning opportunities available to urban colleagues.

While the discomfort experienced by some teachers in rural and remote locations is both understandable and unavoidable in the case of family, cultural and social isolation, there are many issues that can be addressed by the creative use of technology. The development of a comprehensive and fair compensation package would also go some way towards addressing teacher grievances that are exacerbated by the feeling of 'being stuck here forever' as the government withdraws what has been a valued transfer point system. The scheme once attracted many teachers to rural and remote schools in the hope that eventually they would be able to relocate to a place more to their liking.

Overall, it appears that teacher retention has an even lower profile than the process of attracting teachers to rural and remote schools. This needs to be addressed, not only for the wellbeing of rural and remote communities, but in its own right because, in the long term, it will be a more strategic economic strategy.

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