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Educating for the future: technological advantage?

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Abstract
In rural areas of Victoria, Australia, a professional development program was implemented to address some of the disadvantages faced by teachers when they attempt to integrate Information and Communication Technologies (ICT) into their classroom practice. This paper will report on the findings of a research project which surveyed teachers and students at various stages before and after the implementation of the program. Despite the awareness of previous literature, which informed the development of the program, there were still significant disadvantage being demonstrated in the rural areas.

Introduction
Information and communication technologies (ICT) play a critical part in the lives of individuals – at work, for recreation and for learning. Digital technologies are embedded in every aspect of daily life. At work, businesses and organisations use computers to assist in more efficient and effective operations. People use computers to accomplish tasks more competently, and faster. Computers are used as tools of communication at a global level and for accessing readily-available information. In our rapidly expanding technological world, people need to be technologically literate to operate the systems that surround them. The new electronic media brings to our homes the cultures, ideologies and values of people from outside our sphere of experience. Schools need to prepare students to be active participants in this world and to utilise the technologies which surround them.

There is a clear corpus of research which confirms the link between improved learning outcomes for low-performing students (in literacy and numeracy) and the effective use of learning technologies in their learning program. The research demonstrates that when ICT is used in appropriate ways to support learning objectives there is a positive relationship with learning attainment (Cox et al, 2003; Kingston et al, 2003). One of the key determinants of effect is the ability of the teacher to integrate appropriate ICT applications into their pedagogical practice (Calnin, 2004, 2006).

Many students are already competent users of computers, the internet, CD-ROMs and other digital forms, and it has been recognised for some time that increasingly, students use digital media to help with their school work (Levin and Arafah, 2002). Schools need to use ICT to change curriculum, teacher instruction and how students learn. However, what is also apparent is that many schools and teachers are slow to respond with a change in teaching practice (Levin and Arafah, 2002). While there seem to be compelling arguments for the incorporation of computers and their applications into curricula (Harrison,
Comber, Fisher, Haw, Lewin, Lunzer, McFarlane, Mavers, Scrimshaw, Somekh, & Watling, 2003) the impact of computer-mediated learning has been low and limited (Brown, 2005). Osborne & Hennessy (2003) indicate “research shows that even where technology is available, it is often underused and hindered by a set of practical constraints and teacher reservations”. For schools to change, a number of factors need to be in place (Ping, Swe, Hew, Wong & Shantri, 2003) and not surprisingly, teacher competency with the technologies is high on the list. Effective professional development, technical assistance, instructional sharing and collaboration and attitudinal changes are all required to effect change in classrooms (Godfrey, 2001).

Chalmers (2002) argues that effective professional development is critical to the integration of ICT in the curriculum. In Australia, less than 15% of schools’ technology budgets have been used to train teachers in the effective use of ICT (Williams & Price, 2000). Generally teachers are expected to train themselves, in their own time, to learn not just the software and hardware, but also how to adapt it into curriculum. It is no wonder that many teachers resist bringing computers into their classrooms (Godfrey, 2001)

Science and ICT

As with all teaching, the incorporation of ICT into the science curriculum offers a challenge to the teaching and learning of science. Whilst the literature recognises that ICT can have a positive effect on the teaching and learning of science (Becta, 2004), ICT is often under utilised in classrooms. Even after many years of computer use in the world outside school, the well-integrated and effective use of ICT in science is rare (Osborne & Hennessy, 2004, p. 5). Most of the constraints are common to the integration of ICT into any curriculum, however, the largely content driven science curriculum allows even less room for maneuverability and innovation. Harmon, Henderson and Royster (2003) have indicated that of all the issues facing science (and mathematics) teachers in rural schools, ICT implementation comes out as one of the most important. Significantly, Osborne and Hennessy (2004, p. 5) argue that current research suggests that it is not appropriate to assume simply that the introduction of learning technologies in schools "necessarily transforms science education. Rather, we need to acknowledge the critical role played by the teacher, in creating conditions for ICT-supported learning".

Rural disadvantage

A recent Australian national survey has shown that the problem of ICT integration is exacerbated in rural areas (Lyons, Cooksey, Panizzon, Parnell & Pegg, 2006). It found significant disadvantage for rural schools, teachers and students in terms of availability and quality of on-line access, resource provision, professional development and access to technical assistance. There is clear data from TIMSS and PISA that rural and regional students are significantly disadvantaged in terms of learning outcomes (Pegg, J.: presentation at the national summit on

There is also clear evidence of a growing ‘digital divide’. Despite widespread access to ICT, we need to be cognisant that ICT is not universally available with rural communities being particularly disadvantaged. Access and opportunities for use – and therefore access to the educational benefits of technology – have become divisive rather than inclusive and has given rise to the use of the term ‘digital divide’ which describes the division between those who are ICT ‘haves’ and ‘have nots’.

This digital divide is not just a generational phenomenon for we know that there is inequitable provision across schools and within the sectors. The risk is that the ‘digital divide’ will perpetuate and exacerbate social inequities rather than ameliorate them. Access is only one part of the equation, for students need to be discriminating users of contemporary learning technologies and this necessitates both a national strategy to develop information literacies, but it also requires that we make provision to ensure that all teachers are able to maximize the learning opportunities that these technologies provide in the classroom. Effective professional learning requires a significant investment from individual schools and sectors. (Calmín, 2005)

Supporting teacher and school change

As argued above, many teachers have considerable difficulty in gaining familiarity with and implementing significant ICT use into their classroom practice. Such change involves the acquisition of technical knowledge and skills, access to resources including hardware, software and web access, and also mastery of pedagogies that support the effective use of ICT. In the face of such complex issues, teacher professional learning must be supported by the input of information, and also supported in ongoing implementation. Professional development of teachers most often occurs through the medium of workshops and conferences that focus on particular elements of practice, classroom activities and ideas, and skills and content knowledge. While this short term ‘skills and knowledge’ approach can be valuable and efficient in disseminating information and ideas, it has been shown to be quite ineffective in challenging and supporting more fundamental aspects of teaching practice and beliefs practices (Owen et al. 1987, Carrick 1989, Hoban 1992). The ineffectiveness of the approach is related to the lack of connection with school priorities or the direct needs and concerns of participants, and the lack of long term and systematic planning (Webb 1993). There is thus almost universal agreement amongst education researchers that long term, ongoing professional development, sensitive to the needs of teachers and schools, is necessary to support significant teacher development.

Many writers (eg. Hargreaves 1994, Hall & Hord 2001) have emphasised that change requires teachers to ground new ideas in their own personal experience. Joyce and Showers (1995), drawing on research from a large number of studies, argue strongly for the need to situate professional development within the school context. They emphasise that professional development occurs within a framework of cultural change, and argue the need for social support as teachers practice strategies that are new to their repertoire or implement the difficult areas
of a curriculum change. Contemporary large scale reform projects in a number of countries have tended to incorporate these principles (Beeth et al., 2003).

The Professional Development Project

In response to the Australian research, the Association of Independent Schools of Victoria (AISV) collaborated with schools across Victoria (Australia) to implement a project aimed at enhancing teacher capacity to use ICT. The schools involved are located in rural and regional areas of Victoria in towns with populations between 5,000 and 60,000 people. The size of the student cohorts within the schools involved in the project varied from 50 to 600 students. The computer facilities and resources available in the schools are influenced partly by their size and rural location, for example, generally smaller schools do not have the infrastructure and resources available at the larger schools. Gibson (2003) refers to the digital divide being influenced by socio-economic variables including educational status, income, location, indigeneity and birthplace. The project provides professional development and resources to teachers in rural and regional areas aiming to promote an awareness of the use and role of ICT in learning. This research project investigated three hubs of schools located across the state as both the schools and teachers attempt to integrate learning technologies as a normal part of classroom practice. In total, sixteen schools were studied, with a mixture of both primary school levels (grades preparatory to year six) and secondary (grades seven to twelve). School principals, coordinators, classroom teachers and students were initially surveyed to provide a baseline of Information and Communications Technology (ICT) competencies, interest and daily use. It was clear that there was a huge difference across all sectors and in particular, the coordinators varied greatly in their skills and abilities.

The principles that have informed the Professional Development model used by AISV in this project are articulated above, namely: sensitivity to the needs of teachers and schools; new ideas grounded in the teacher’s own personal experience; professional development within the school context; implemented within a framework of cultural change, and the need for social support. The PD model provides a combination of intensive training in ICT knowledge and skills and pedagogies in support of literacy and numeracy learning, and support by the training consultants back in schools. This constitutes a modified ‘train the trainer’ approach whereby teachers are trained to implement ICT and also to train fellow teachers in their schools, supported by ongoing contact and by network support including on-line contact.

Selected teachers from each of the schools involved in the project were assigned the role of coordinator. They participated in five consecutive days of instruction into the use of ICT in the classroom, covering issues such as curriculum, inclusivity, pedagogy and integration in addition to learning a variety of new skills such as blogging, using search engines and learning computer programs.
Figure 1: The PD intensive program

<table>
<thead>
<tr>
<th>Day</th>
<th>What research says about effective use of ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Curriculum frameworks - VELS, NCC, Inquiry based learning</td>
</tr>
<tr>
<td>2</td>
<td>The learning federation, learning objects and digital resources, interactive whiteboards</td>
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<tr>
<td></td>
<td>Exploration of learning objects, and their pedagogical use</td>
</tr>
<tr>
<td></td>
<td>Mathematics, numeracy learning objects</td>
</tr>
<tr>
<td></td>
<td>Mathematics interactive web resources, Microsoft student, Graphical calculator</td>
</tr>
<tr>
<td>3</td>
<td>Digital storytelling</td>
</tr>
<tr>
<td></td>
<td>Microsoft producer, photostory, movie maker</td>
</tr>
<tr>
<td></td>
<td>Mid training exploration of use of resources in the unit of work that is to be created</td>
</tr>
<tr>
<td>4</td>
<td>Planning and support for unit of work creation</td>
</tr>
<tr>
<td></td>
<td>Development of resources throughout the day, with frequent pauses for reflection, collaboration, support</td>
</tr>
<tr>
<td>5</td>
<td>Finishing touches to resources</td>
</tr>
<tr>
<td></td>
<td>Presentation to group. Discussion of how to train others. Blockers to PD</td>
</tr>
<tr>
<td></td>
<td>Feedback session</td>
</tr>
</tbody>
</table>

After the intensive training period, the coordinators returned to their respective schools, implementing changes in their own classroom as well as providing professional development sessions for the staff at their school - under a “train-the-trainer” model.

The coordinators introduced the professional development at their own schools in a variety of ways and with a recognition of the variation in teacher ICT abilities. Some provided weekly sessions with curriculum examples, some prepared a CD sampler with suggested ICT use under different teaching situations, whilst others took a slower approach and provided training over 2-3 sessions. Most coordinators relied on being approached further by interested teachers to extend the ICT use. After a period of 4-5 months, schools were visited by both the professional development provider and the evaluation team member to discuss progress and provide advice. Interviews with coordinators, teachers and students were undertaken. At the conclusion of the project, the coordinators presented examples of successful curriculum innovations to each hub group. At this time, surveys were administered to coordinators, teachers and students to gain some insight into the impact of the project.

This paper reports on the project, addressing two research questions:
In what ways has the project enhanced teacher capacity through professional learning in the use of ICT in mathematics and science teaching? and

What factors are relevant to the uptake of ICT by teachers in rural areas of Australia?

**Data Sources and Analysis**

The structures, relationships and content of the professional development program and the people involved were explored. This entailed engagement of the interpretive categories of the social values, educational values, beliefs and attitudes of the coordinators, the main participants. Secondly, how the teachers translated the information and expertise gained in undertaking the professional development program was of great importance. The researchers wanted to illuminate the distinctive approach the teachers were using and to detail the complexity of this situation.

To ensure the richness of the data, both qualitative and quantitative methods were selected. Quantitative data from the participating schools and teachers provide indicators of change to teacher practice, in particular in aggregated form. Case studies of two representative teachers provide qualitative data. Multiple data sources including surveys, interviews, observations and blog entries collected throughout the six month duration of the project are used to address the research questions. In analysing the data, supporting evidence from multiple data sources are used to validate the results. Teachers’ perceptions and opinions are compared with evidence of change in teachers’ practice.

**Results – Aggregated data**

On the final day of the PD intensive, participants (n=16) filled in a questionnaire which consisted of a number of Likert scale items, and open responses to questions (see Figure 2).

Analysis of PD Survey responses

The scoring for most Likert items indicates a high level of approval of both the PD program and the consultants. The survey results indicate that all the teachers in the project agreed that the professional instruction stimulated their interest, and confidence in using ICT in their classroom practice (item 3,4), and stimulated their abilities to use ICT (item 6).

Figure 2: Evaluation of the 5 day professional development program in ICT (n=16)

'Strongly agree' (SA), 'Agree' (A), N- 'neutral', 'Agree' (A) to 'Strongly disagree' (SD)
1. My attitude towards ICT has changed during this week 2 2 7 5
2. The PD was relevant to my teaching 3 13
3. The PD was successful in increasing my confidence to teach with ICT 1 1 7 7
4. My interest in the applications and resources of ICT has been stimulated by this unit 1 3 12
5. I have been introduced to some new ideas about curriculum 2 7 7
6. My ability to use applications of ICT has been stimulated by this unit 6 10
7. I have identified links between the use of ICT and the curriculum 6 10
8. The balance between learning ICT skills, developing curriculum resources and exploring strategies for implementing ICT effectively has been appropriate 1 7 8
9. The resources on the CDROM have useful to support my learning 4 12
10. The PD session has motivated me to think about my teaching 4 12
11. The PD has prepared me well to train other teachers 1 1 7 7

Analysis of responses for open questions

1. What are the most useful and/or valuable thing that you have learned in this PD?

The responses related to:

- Technical knowledge and skills (13 references) — resources, software packages (folio, photo story) and web sites
- Pedagogy (5 references) — models of teaching, varied presentation, how to integrate ICT and use it for curriculum planning
- Nature of the PD (3 references) — small group support, having a full week, guidance and support

2. Please comment on your experience of the small group teaching that was part of this professional development

The response was overwhelmingly positive concerning the value of the small group environment:

Excellent; will use this at school • small group was essential for feedback/support; limits frustration • it heightened my awareness of how individual the learning process is • excellent; great sharing; hopefully a
network will develop from the group • a good opportunity to network with professionals in the region; a supportive environment for risk-taking • excellent; Paul is a great facilitator; we shared ideas and had fun

3. Please comment on the value of:
• The reflective journal / blogs?
   Again the comments were uniformly positive:
   • an excellent tool; enables one to assess development over time • excellent; gave chance to see how others were progressing • good communication tool • great; set up my own • did not have time to read • good to “off-load” at the end of the day and read other peoples’ opinions • great to track thoughts/ideas • it is good to reflect on what one has learnt

• Your presentation
   The comments were mainly positive, but some indicated the frustration and difficulty experienced:
   • It was good to show and learn • excellent; gives opportunity to draw the week’s learning together • happy but frustrated (hyperlinked documents were lost) • felt under-prepared; encouragement was appreciated • I had something to show for my efforts; enjoyed it • overwhelming at times • would have liked to have completed more but happy with initial effort

4. Are there any changes you would recommend concerning the running of the PD?
   Again the majority suggested no change was needed. There were a few suggestions, however, and more reference to Gippsland access to websites.
   • bring “hands on” learning forward to the first two days; information overload can inhibit learning • hourly breaks • step by step demonstrations; whole class activity “that we do together before starting on our own folio” • ensure the hub/host site unblocks web access for the PD • better access to websites

7. Any other comments about the unit are appreciated
   Mostly the results were very positive.
   Thanks for fueling my enthusiasm for IT • enjoyed it but was tired; look forward to sharing experience with colleagues at school • gratitude to Robyn; it was good to be reminded how students feel (i.e., challenged, unsure) in the classroom every day • fantastic; wonderful opportunity • the fact that the PD was local, free and covered by teacher replacement costs was critical; not able to attend otherwise • the best PD attended in many years • have had a stimulating week; length of PD was good; more valuable than short PD • loved the chocolate! • great to develop
links with other schools, share ideas and resources • thanks Paul for professionalism and positive/encouraging approach •

The survey results provide consistent evidence that teacher's appreciation of the use of ICT in mathematics and science teaching was influenced by the professional instruction in very positive ways.

Case One - Broadchurch College – Morris' story

Broadchurch College is a small ecumenical college situated in a coastal town in Victoria, Australia. The town consists of 12000 people and is involved in major shipping for the southern regions of Victoria. The local economy is strongly supported by industry and fishing. The college has a school population of 270 students and boasts “a carefully constructed curriculum model designed to allow students to proceed at a rate of progress appropriate to their ability...”. The school webpage (a single page only) portrays students interacting on computers. One of the senior science teachers, Morris, attended the professional development intensive training and became the coordinator for his school. He commented that it was the first professional development session he had attended in over two years. Due to financial constraints at the school and the cost of travel and accommodation, teachers were not able to access training at the nearest large city (246miles). Local provision of professional development was non-existent. “Teacher replacement funds was critical. Without that, I would not have been able to attend” Morris commented.

After his initial training, Morris inserviced two other staff in the science faculty. The recruitment of teachers occurred through the science teaching team and an invitation to undertake training. There was no additional support to the coordinator or the trainee teachers. There was an expectation that they would complete this training in their own time and that it should not impact on their ability to deliver the curriculum Morris commented that there was “no overt encouragement' and that he hoped the new principal would be more ‘switched on' to change and ICT. Morris used the ICT to modify a unit on Forensic science which he and another teacher had delivered. However, his attempts to fully integrate ICT into his programs are hampered by policy and procedures within his school. There is no ICT committee of interested teachers making decisions on computer use based on pedagogical need. Rather the computer technician makes all decisions relating to computer and web access. The technician restricts student use of the web by applying “nanny” systems across the board. This is in addition to the safety systems put in place by the state Department of Education. Teachers have full access to the internet, but cannot make use of its varied applications, simulations and information for student use. Morris is not only hindered by the internet access, but also by the way computers are physically set up at the school. The computers reside in a computer laboratory which is a traditional set-up relating to the “good old days” of typing pools based on skill acquisition. Rather than have computer access in all teaching spaces, so that every class can access the computer or internet as a learning tool, teachers
have to book the computer lab in advance. Morris indicates the impracticality of this as well as the pedagogical disadvantages to students. Rather than computer use being a seamless part of the learning environment, which caters for individual learning progression, it becomes a ‘chunk’ of the students’ experience. These limitations on computers in schools has been documented by research (Levin & Arafah, 2003, p. 15)

Morris commented that he found the professional development session gave him a much greater knowledge of software and systems which he could apply in his own setting. He found the collegiate atmosphere of working in small groups was crucial in providing a “good learning environments and spirit of cooperation”. In particular, he commented on how the PD provided him with an “almost-ready” set of skills to run with. He also commented on how he was now seen as a “guru” in his school, someone to talk to about ICT integration into curriculum. “...one of the indirect, but probably the best results has been that staff identify me as a possible helper...” He has been approached by other staff and has supported their efforts to change their teaching through the use of ICT. Not only is he seen as more approachable than the ICT staff, but his skills are those needed by teachers trying to adapt ICT to curriculum. Morris is hoping that with the new principal in place, he will be in a position to offer his ICT skills to a greater number of teachers. It is clear from his responses that his capacity to deliver units of work using ICT has been significantly improved through attending the professional development.

In discussing the negative aspects of his work with ICT, Morris commented on the age of the computers. There had been no upgrades in over two years and many of the computers could not run new software as the operating system was quite old. The infra-structure did not support ICT use – when booking the computer room as frequently as he did, Morris was aware that frequently he was denying its use to other classes. In addition, the school, through the control of the ICT technician, did not allow students to download any material from the web, did not allow them to print out (too costly) and did not allow them to use memory sticks (in fear of virus introduction). Such intense control essentially stopped teachers from using ICT except in the most limited way. Another factor which influenced the use of ICT in the school was the fact that the Curriculum coordinator was also moving away from the school and had not implemented any large changes. With two key personnel (principal as well) lacking the motivation to drive change, little happened in the school across the year of the PD program.

In summary, whilst Morris was extremely successful in implementing changes in his program and in training 2 other staff, he experienced the following ‘blockers’

- The degree of remoteness reducing access to PD,
- resources/ facilities were outdated
- curriculum requirements not supported – e.g. Victorian Essential Learning Strategy promotes an integrated approach with ICT,
- the inclusion of ICT in programs of study – not supported by relevant staff
- expectations of the rural/remote teachers to do it without support
nature of the school and its philosophical foundation – lack of committee to ensure ICT integration, much staff movement in/out of school causes uncertainty

Case Two - Aragon College – Janelle’s story

Aragon College Senior Campus, consisting of 400 students, is a co-educational day and boarding school located in the rich south-western region of Victoria, Australia. It has a separate computer centre as well as computers located in each classroom and science teaching spaces (laboratories). It is also a Registered Training Organisation for Information Technology through the Vocational & Educational Training group. Each classroom has an interactive whiteboard and all teachers are supplied with a laptop or tablet for their exclusive use. There is an expectation that all teachers are comfortable using the technologies supplied. The computer facilities are overseen by a computer manager (Brian), and supported by a full-time computer technician. The role of the computer manager is to ensure the smooth running of all computers and digital facilities in the school, to purchase and recommend educational software and to train staff in both hardware and software use. He has no teaching qualification and is very aware that he cannot train teachers in the application of software or the integration of ICT into curriculum development. Brian indicated that by attending specific sessions throughout the PD, he hoped to gain an understanding of what he could do at a personal level to improve things for teachers. The intensive PD was conducted in a computer facility adjacent to his office.

Janelle is a senior biology teacher who has been developing her own skills in ICT through experimentation. However, she admits that the hardest thing to do is to know how to incorporate the knowledge and skills into the curriculum to enhance student learning. After the PD intensive, she provided some PD to staff, through a half-day presentation. Further training has occurred in an ad hoc manner, but she indicated that between 50-60% of staff had increased or improved their computer applications. Despite having a high baseline of computing skills already, she claims that her own ICT skills and knowledge have improved significantly through undertaking the PD intensive. She is more confident to “trial and explore” the information given at the PD. In terms of her classroom use, she has found that she has both increased the amount of time she uses ICT and also increased the complexity of what she is doing “half of every lesson is ICT based...” The response from the students has been extremely positive. She comments “the learning is so much more, the uptake so much quicker...they are more focused, have more fun and are more engaged”. The students in her classes are increasingly engaged with the new technologies she is using and she is finding that students who were once reticent to participate are “jumping” in class. She has introduced a range of new initiatives to her classroom program-for example the students’ use of digital video to document and record animal growth. She is experimenting with blogs for student use in senior classes and is likely to introduce pod-casting for students. She works closely with another
coordinator from the junior campus of the college which provides ongoing support and encouragement. Both she and the other coordinator provided an overview to a whole staff meeting at the conclusion of the PD week.

Janelle attributes her success to a number of factors. A contributing factor is the strong level of school support. The principal visited the PD on several occasions and has provided opportunities for Janelle to work with the other teachers. The upper administrative team (principal and leading teachers) have provided moral support through their ongoing encouragement when she initiates new things. The support from the ICT manager and technician has also made life much easier for her. Apart from their readiness to answer questions, any technical problems are usually solved within the same day. Another strong contributing factor was the PD itself. The PD “worked brilliantly” for her, providing her with significant self-motivation. She found the five days challenging but important to her “re-invigoration”. She saw it as the start of a bigger project in which she was committed to improving ICT in her classroom. She considered the ongoing contact with the consultant important in continuing to focus her energies towards attaining results. She has set up an ICT area network, developed from the original group, to provide support as members implement new ICT in their teaching. She envisages that it will expand. As she indicates, the PD training was only step one, where each person in the network take it from there, will depend on their own particular circumstances. However, for Janelle, the sky is the limit.

For Janelle, the project not only improved her already existing skills, but gave her increase motivation and enhanced capacity to implement ICT through validating her use of it. However, it is also clear that in-school support is high on her list of factors that continue to endorse her use of ICT. Student response to ICT has provided her with strong motivation through actually seeing her students increased engagement.

Concluding comments

In what ways has the project enhanced teacher capacity through professional learning in the use of ICT in mathematics and science teaching?

It is clear that there is a strong element of success with the project. The professional development intensive five day block, followed up with consultation and an expectation of deliverable results, has developed a culture of consideration of ICT as a component of curriculum in a way that didn’t exist for many of the participants and their schools previously. Certainly, the coordinators who attended the PD have nothing but praise for the program they attended. Results from the data (surveys, student comments, questionnaires, observations) indicate a general improvement in the use of ICT both at the level of coordinator and at the schools involved. The project enhanced teacher capacity by: stimulating their interest in ICT; providing them with skills of application; improved their knowledge of software and hardware systems; stimulated their abilities to
use the new knowledge and skills and provided them with the confidence to attempt to use ICT in their classroom practice.

What factors are relevant to the uptake of ICT by teachers in rural areas of Australia?

The factors which are relevant to the uptake of ICT by teachers include the opportunity to develop skills in a situation which allows time for experimentation and reflection (ie the PD intensive). The role of support is crucial. All teachers commented on the sharing which existed during the PD and the subsequent support back at school. If there was strong support for the integration of ICT into the curriculum, then the teachers felt validated to ask for time to train staff and to impose the ICT agenda on the school staff. Without the support, many coordinators continued to develop their own skills but lacked the opportunity to further develop others' skills in the way they wanted. For many, they became the ICT expert, but tended to be isolated in that role.

It was clear that there were still some existing blockers to the successful implementation and integration of ICT into classroom use. This research highlights the fact that not all students have equal access to the technologies they need. A number of reasons are being drawn out from the surveys and interviews with the participating coordinators, teachers and students. These include, but are not restricted to, the impact of:

- The degree of remoteness/ rurality,
- the size of the school,
- lack of technical support
- resources/ facilities available,
- teachers' ICT skill level,
- teachers' ability and confidence to integrate ICT in classroom,
- curriculum requirements – e.g. Victorian Essential Learning Strategy promotes an integrated approach with ICT,
- the inclusion of ICT in programs of study- add-on, carrot- motivator, reward, etc
- expectations of the rural/remote teachers, students and community,
- additional requirements placed on teachers,
- students’ learning, the impact of the PD on students’ learning, LE, attitudes etc
- nature of the school and its philosophical foundation

This paper has reported on some of the factors which tend to make the integration of information and communication technology (ICT) more problematic for rural teachers. Despite the design of a PD program to overcome many of the above 'blockers', it is clear that some aspects are outside the control of the program designers and the coordinators themselves. Educational disadvantage in terms of the "digital divide" is still existent, particularly in rural schools.
The challenges exhibited by the Victorian project are common to those present in many other educational communities around the world.

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