Meeting the Challenge: Professional Learning for Integrating ICT into Science and Mathematics Classes

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A research project to assess the efficacy of in-school professional learning to support use of on-line learning objects is being conducted in remote schools in Tasmania. This paper reports on the implementation of the project and provides information about how individual school contexts have influenced delivery of the professional learning. Challenges have included recruitment of schools and scheduling of professional learning, logistics of coordinating multiple sessions in remote areas, and technical issues. It is clear that in projects of this type the need to address both technical and pedagogical innovation, whilst meeting the needs of schools and individual teachers is of paramount importance.

The integration of Information and Communication Technologies (ICT) into teaching and learning in school classrooms has received significant attention by both researchers (Cuttance & Stokes, 2000; Jamieson-Proctor, Watson & Finger, 2003; Newhouse, Clarkson & Trinidad, 2005) and Government bodies (CEO Forum, 2001; Ministerial Council on Education, Employment, Training and Youth Affairs [MCEETYA], 1999, 2000, 2002, 2005a). This attention has highlighted the potential for ICT to be integrated into teaching and learning to improve student outcomes. As a consequence, there is an expectation that teachers will incorporate ICT into teaching and professional practice (Fitzallen, 2004). Nevertheless, there have been a number of factors identified as barriers to integration of ICT. These barriers include: lack of teacher training; lack of curriculum, technical and administrative support; limited time for planning; computer access issues; budgetary constraints, and a general resistance to change (Roblyer, 2004).

> Without adequate infrastructure and technical support, meaningful ICT learning experiences by students might not happen at all. Similarly, learning and development which provides training and professional development for teachers in ICT use needs to be effective. Teachers need to gain the competencies, confidence and knowledge base required to plan, implement and assess productive student use of ICT for learning.
>
> (Finger, Russell, Jamieson-Proctor & Russell, 2006, p. 17)

In 2001, a MCEETYA task force was constituted to provide leadership, strategic advice, and a forum for collaboration for ICT in education. The task force was also established to initiate, implement, and support national projects related to ICT in education (MCEETYA, 2002). In its 2004 report, the task force indicated a number

of ongoing challenges in relation to 'people' (educational leaders, teachers, and administrative staff). Three of these challenges were:

- Professional learning opportunities to enhance teachers' capacity to utilise and embed ICT into learning and teaching.
- Investment to ensure reliable infrastructure, technical support, and affordable and appropriate bandwidth.
- Availability to schools of a critical mass of quality digital content.

On-line learning objects

One of the factors identified by the MCEETYA ICT task force, curriculum content, has been addressed by a component of the Backing Australia's ability initiative, The Le@rning Federation (TLF). Working collaboratively with the MCEETYA task force and in conjunction with teachers and educators, TLF has developed a series of on-line learning objects (The Le@rning Federation, 2005). Covering a range of curriculum areas, these have the potential to make ICT integration very easy for schools (Freebody, 2006; Fluck, 2004). Technically they are accessed through a web-browser, providing a rich variety of curriculum content without users needing administrative rights for installing new software on workstations. A further advantage of this quality controlled system is to minimise the risk to school networks from malicious software.

From a change-management perspective, it is recognised that as with any new resource, professional learning around the resource is necessary. This is certainly true in the ICT sphere with resistance to change being identified as a major barrier to integration (Roblyer, 2004). However, the education of teachers, both pre-service and in-service through professional learning is recognised a being a major catalyst for change (Finger, Russell, Jamieson-Proctor & Russell, 2006).

Although vitally important, research has also shown that professional learning is insufficient in itself for adoption of ICT into teaching and professional practice. Teacher beliefs, confidence and expertise (Jamieson-Proctor & Finger, 2006; Phelps, Graham & Kerr, 2004; Albion, 1999) and access to appropriate equipment and infrastructure (Norris & Soloway, 2000) have also been identified as important. A framework has been developed by Fitzallen and Brown (2006) building on research into factors that impact on successful teacher implementation of professional learning. This framework, incorporating a consideration of Shulman's essential teacher knowledges (1987a, b) identifies three interconnecting categories:

- Teacher knowledge (including knowledge of; content and curriculum, learner characteristics, ICT content, application of ICT in context).
- Teacher dispositions (confidence, previous success, engagement in community of practice, engagement in reflection).
- External factors (background, professional learning, time and access).

In introducing a new ICT resource, such as the on-line learning objects these interlinking factors would need to be considered. Without doing so the full promise of digital content may not be realised.

A particular perspective taken by this research team was that access, by teachers in rural and remote schools, to professional learning in ICT should be a priority. Traditionally, these schools are relatively isolated from professional learning activities

for teachers (Squires, 2003). It is also recognised that many students in rural and remote areas have limited opportunity to interact with hands-on experiences designed for students (such as museum exhibits or science centres) and sourcing of science resources locally can be very difficult (Lake, Faragher, Lenoy, Sellwood, Archer & Anderson, 2006). Quality on-line learning objects may therefore be particularly useful for rural and remote schools by providing stimulating and interactive learning environments to supplement aspects of the usual classroom curriculum in Mathematics and Science.

A rural and regional perspective

There is a genuine concern in Australia that students in rural and regional schools have a lower level of achievement than their metropolitan counterparts (Lyons, Cooksey, Panizzon, Parnell & Pegg, 2006). Results from the Programme for Internationals Student Assessment (PISA) testing in 2003 clearly show a decreasing level of achievement in mathematical literacy, scientific literacy, and problem solving between metropolitan, provincial[1], and remote students. This difference in achievement was statistically significant, with remote students doing particularly poorly (Thomson, Cresswell & De Bortoli, 2004).

In response to issues identified in rural and regional Australia, particularly with respect to the study of Science and Mathematics, a National Centre for Science, Information technology and Mathematics Education in Rural and Regional Australia has been established. Known as SiMERR, this federally funded centre is directed out of the University of New England, and has hubs in each of the states.

A major national study was undertaken by SiMERR in 2005, to interrogate science, ICT, and mathematics education in rural and regional Australia (incorporating provincial and remote schools). Through a nation-wide survey and state-based case studies many possible reasons for the lower achievement of students in provincial and remote areas were identified. These include difficulty in finding suitably qualified teachers (Beswick & Brown, 2006; Harris, Jensz & Baldwin, 2005; Skilbeck & Connell, 2003); teacher access to professional leaning (Beswick & Brown, 2006; Squires, 2003); lack of professional networking (Tytler, Mousley, Tobias, MacMillan & Marks, 2006) and resourcing (Creswell & Underwood, 2004). When considering ICT, there has also been a 'digital divide' (Roblyer, 2004, p.17) identified between metropolitan and provincial/remote areas, particularly with respect to internet speed and reliability (Afamasaga-Fuatai, Lyons, Merrotsy, Paterson & Smith, 2006).

As a result of this nation-wide research, conducted through SiMERR, a number of key recommendations were formulated to address the identified issues. Improvement of professional learning, provision of compensatory ICT resources and access to curriculum resources were all addressed in these recommendations (Lyons et al., 2006).

[1] A standardised framework to compare geographical differences between schools, the MCEETYA Schools Geographic Location Classification (MSGLC) has been established by MCEETYA and outlined in their report of 2001. PISA data has been categorised according to this framework. The terms rural, regional and remote indicate schools that have been incorporated into the Provincial or Remote classifications of this framework.

The Tasmanian context

In Tasmania, a new 'Tasmanian Curriculum' is in the development phase (Bartlett, 2007; Department of Education, Tasmania [D*o*E], 2007). With its inception the integration of ICT into each of 7 key learning areas will be mandated. Furthermore, there is an intention to assess students' ICT competence, to ensure that this integration has been successful, through skills testing in Year 6 and Year 10. The change in the Tasmanian curriculum will place increased pressure on teachers to adopt ICT into professional practice. These demands on teachers have been recognised previously (Hancock, 1993; Little & Williams, 2001) as has the need to support educators with appropriate professional development in ICT ((Department of Education, Science and Training [DEST], 2002; McRae, Ainsworth, Groves, Rowland, & Zbar, 2001; Department of Education, Training and Youth Affairs [DETYA] 2000).

The Tasmanian Department of Education has been relatively pro-active in supporting teachers' use of ICT. Initiatives have included the creation of a Centre of Excellence for on-line learning (*e*magine), and the development of a framework of educational computing competencies. These initiatives were supported with professional learning and significant on-line resources for teachers, including a dedicated *e*Centre. Provision of infrastructure to teachers and schools has also received considerable financial support. The on-line learning objects created by TLF have been made available to schools through the *e*Centre.

The Tasmanian Case Study of Science, ICT and Mathematics conducted in 2005 touched on teachers', students' and parents' perceptions about use of ICT in learning programs (Beswick & Brown, 2006). The main concerns voiced were those of access and reliability, particularly to the internet – supporting the 'digital divide' phenomenon in regional and rural areas reported elsewhere (Finger et al, 2006; Roblyer, 2004). Students also made reference to the need for quality learning experiences, particularly with a view to on-line learning needing to be supported by face to face teaching.

The 2005 Case Study also made recommendations with respect to professional learning. Firstly, the likelihood that teachers in rural and remote areas are less experienced and have less access to mentoring was raised, suggesting a greater need for professional learning for these teachers than those elsewhere. It was also recognised that 'models effective in urban contexts are often inappropriate for rural and remote locations' (Beswick & Brown, 2006, p. 86). Sourcing relief teachers and time constraints involved in travelling to attend sessions were two specific issues cited in the report. Use of visiting experts who provided on-site professional learning either during school hours or after school, and over consecutive days was a model suggested to be effective.

The project

This project was conceived by the Tasmanian hub of SiMERR and aimed to take into account the findings of the SiMERR National survey (Lyons et al., 2006) and the Tasmanian Case Study data collected in 2005 (Beswick & Brown, 2006). The underpinnings of the project lie at the intersection of the concerns discussed above – the need to embed ICT into teaching and learning and the need for access to quality

teaching and learning experiences in Science, ICT, and mathematics for rural and regional students.

Providing rural and remote teachers with professional learning around TLF on-line Learning Objects (OLOs) was seen as an opportunity to enhance teaching and learning in Science and Mathematics, as well as providing an example of meaningful integration of ICT into the curriculum. Envisaged to start in Term 3, 2006 (the final term of the Tasmanian school year), the project was designed specifically to assist teachers in the implementation of the OLOs in 10 remote and very remote schools in Tasmania. Incorporating the use of an interactive whiteboard was a deliberate strategy to model other ICT devices and applications for teaching and professional practice.

The project was designed to provide the services of a visiting consultant (with experience in developing the learning objects with TLF and a former Principal Education Officer for the D*o*E), to visit the schools for up to three days each. During these visits, he was to work with teachers introducing and demonstrating the use of the OLOs with students. Some relief was to be provided to teachers over the three days for planning the integration of OLOs into their classrooms. To address possible problems with access, preliminary work was planned to ensure that the technology required for easy access of the OLOs was available in each school.

The project, as conceived therefore tried to address some of the recommendations of the SiMERR National survey:

- improving access to professional learning (by changing the professional learning model);
- incorporating cross-sectoral cooperation (in this case University, D*o*E/Learning Federation);
- dissemination of strategies to address student diversity in relation to teaching science, mathematics and ICT (range of learning objects); and
- use of compensatory ICT resources and curriculum resources (in this case the introduction of on-line learning objects, with back up access via a local cache system).

(Lyons et al., 2006).

It was further recognised that the professional learning for this project needed to be very much focussed on the learning objects themselves, particularly due to the short period of time that was possible for interaction with the teachers. The framework of Fitzallen and Brown (2006) was used as a reference point for planning. Given the restrictions of time available for professional learning, it was decided to concentrate on aspects of:

- 'Teacher knowledge' (in this case of ICT content - the OLOs and how they linked to the Tasmanian curriculum);
- 'Teacher disposition' (increasing teacher confidence in use of ICT in the classroom context, through allowing time to get to know the OLOs and OLO platform and then having access to in-class support when trialling them); and:
- 'Accessibility' of the on-line resources.

As such, it needed to be assumed that teachers had the necessary mathematics and science content, and pedagogical content knowledge to identify the purposes and supporting pedagogical strategies necessary for teaching the concepts incorporated in

the demonstrated learning objects. It should be noted, however that this was not necessarily true for all teachers. However, the consultant did make explicit links between the OLOs and the Tasmanian curriculum as well as emphasising how the OLOs could be used to complement other teaching strategies.

The overarching research component of this project was planned to gain evidence to determine whether the use of the OLOs, when supported by in-school professional learning can enhance students' learning in Science, Mathematics and ICT. Hence, the project was designed around the following research questions:

> RQ1: Are the remote and very remote schools able to access the online learning objects on a consistent and reliable basis using local caches?
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> RQ2: Do teachers believe online learning objects make a useful contribution to student learning in Science and Mathematics?
>
> RQ3: Over time, what impact do online learning objects make on student achievements of Mathematics and Science learning objectives?
>
> RQ4: What are good strategies for teachers to use to integrate online learning objects into classroom practice successfully?
>
> RQ5: How effective is the professional learning model employed in this project?

The project is currently in the data analysis stage with this paper reporting only on the implementation phase of the project, with particular emphasis on research questions one and five. In essence, it begins to evaluate the factors identified by Finger and co-researchers (2006), infrastructure and technical support, together with provision of professional learning for teachers in the rural and regional context.

Methods

The subject of the research was a real-world problem – how best to deliver professional learning in e-learning to rural and isolated schools. The methodology adopted therefore had a pragmatist underpinning (Creswell, 2003) and utilised a mixed methods approach. Consistent with this methodology, data was collected from a number of sources in order to understand the problem from the perspectives of different stakeholders, in this case school personnel, researchers, and the consultant.

Quantitative data, in the form of descriptive statistics was used to provide a picture of the geographical location and demographics of the schools in the study. Qualitative data was gathered in two ways. The investigators recorded details of the initial arrangements for the professional learning program, together with logistical arrangements for school visits. Reports written by the consultant and the research assistant following each school visit provided a rich source of qualitative data, including teacher comments. To promote consistency of data collection, a pro forma was produced to prompt the writer to address each of the research questions.

Qualitative data from the organisational records and school reports were analysed thematically. To obtain an overall picture of the data, all entries were read through in their entirety prior to being listed and categorised (Miles & Huberman, 1994). This process also allowed identification of common concerns and areas of success

consistent with Patton's (1990) 'content analysis', and grounded theory techniques of analysis (Glaser, 1992).

Recruitment
Schools in isolated geographical areas (two hours away from a major centre, or requiring air or sea travel) were invited to participate in the project. A positive response was received from 10 schools from each region of Tasmania (South, North and North-West) and included all island-based schools (Table 1). These schools represented ranged in size from small primary schools to District High schools. All participating schools fell into either the Provincial or Remote area class according to the MCEETYA Schools Geographic Location Classification (MCEETYA, 2001). One school was from the Catholic sector, the remainder being State schools.

Table 1.
Demographic summary of participating schools

School	Number of staff	Approximate Travelling Time from Hobart (nearest major centre)	Travel consider-ations	Another school within 1 hour's travel	Accommod-ation available
Mount Direction	26	4 hours (3hrs)	-	Yes	Yes
Sandhill Primary	6	4.5 hours (3hrs)	-	Yes	Yes
Roundhill Primary	4	4.75 hours (2hrs)	-	Yes	Yes
Bay Island	7	2.5 hours (2.5hrs)	Vehicular Ferry	Yes	Yes
Kingfisher Island	23	1 day (2.5hrs)	Plane	No	Yes
Copper Bay Island	3	1 day + (1 day)	Plane and Plane	No	Only private
Fisher Island	12	1 day (2.5hrs)	Plane	No	Yes
St. Jerome Primary	14	4 hours (3hrs)	-	Yes	Yes
Redwood District	15	5 hours (2hrs)	-	Yes	Yes
Somerton Primary	9	2 hours	-	Yes	Yes

Results

Analysis of qualitative data on the implementation phase of the Professional Learning program yielded a number of issues falling into five broad categories. These were:

- Recruitment
- Scheduling of visits
- Organisational issues (including travel and accommodation)
- Preparation and delivery of sessions
- Technical Support

Recruitment
Schools in rural and regional areas were approached in the middle of the school year and asked to consider involvement in this project. All schools approached by the researchers expressed interest in the project. However, once a start date was proposed (following completion of administrative procedures and gaining of ethics approval) the timing of this proved less than ideal for schools. This date was around the middle of the final school term (October/November).

When schools were contacted to schedule consultant visits, many were constrained by end-of-year activities that required a heavy input from staff. These constraints would not be atypical of any school at this time of year. However, in schools in the more

isolated areas, where there is only a very small pool of relief teachers to call upon, there were insufficient relief teachers to support both extra-curricular activities and professional learning. This was reported as being problematic in the majority of the invited schools and has been reported previously in rural Tasmanian schools by Beswick and Brown (2006) and those elsewhere in Australia (Aldous, Barnes, Clark, White & Morony, 2006).

The prospect of entering into professional learning in term three did raise another issue which appears to be highly contextual to remote schools. One school in particular was reluctant to enter into professional learning at this time as a high proportion of the staff in the school were transferring at the end of the year and it was "worthless to implement training this late in the school year". High staff turnover in remote or provincial areas is well recognised (Lyons et al., 2006; MCEETYA, 2005b; NSW Public Education Council, 2005). On a more positive note, several schools with an identified high turnover of staff indicated that they would be much more receptive to professional learning in Term 1 when the new staff had taken up their appointments. One school, however, did indicate a level of reluctance to commit even in the new school year. This was due to the recognition that new staff, a number of whom would be graduates, might be overloaded if the project occurred too early in the school year. After some negotiation and rescheduling, this school did take part in the project.

Scheduling professional learning

Remote schools frequently have very few staff, and even fewer relief teachers available to access. Thus scheduling of professional learning can be very difficult to arrange, especially when the principal with whom one is negotiating is often the relief teacher of choice. This appeared to the external researchers or research co-ordinators as disorganisation, but in fact showed a school doing the best it could with scarce resources. As outlined in *Recruitment,* whole school activities (the school drama production, the cross-country, the swimming carnival) had to be taken into account, especially when trying to schedule for participation at each end of the week to facilitate travel. This problem was exacerbated by attempts to schedule visits to schools in similar areas in the same week. As a means to overcome some of these restrictions, it was negotiated with schools to conduct some whole staff professional learning after school hours, with in-school support (the consultant working with teachers in classrooms) occurring without the need for relief.

For financial and temporal efficiency, particularly to maximise utilisation of the consultant, it was desirable to attend two remote schools each week. In order to overcome the problems we had identified, we initially asked schools to nominate suitable days without restriction. As soon as one school in a potential geographic pair offered some dates, we rang the other to see if the remainder of the same week was feasible. This opportunistic approach helped to rapidly fill the calendar, but stretched the resources of the consultant. This required the research team to incorporate a second presenter (a classroom teacher) to work with the consultant. After co-presenting in several schools, the second presenter was able to deliver the professional learning in schools where the consultant was unavailable. This proved to be a very effective way to meet the needs of the schools in a timely fashion.

Co-location for whole-staff introductory professional learning (introduction to the learning objects) was considered, but rejected since school IT contexts were found to be often completely different. These differences included: different platforms, use of Macintoshes versus PCs; different authentication regimes; and intranet availability compared to 'shared drives' for public data access. Working with familiar contexts is particularly important for teachers as professional learning needs to be tailored to less confident users of ICT (Fitzallen & Brown, 2006), therefore introducing non-familiar platforms could be confusing and discouraging.

Organisational issues (including travel and accommodation)
Travel to remote areas brings with it additional issues, not normally encountered when travelling between major centres. In this project scheduling of visits to one of the off-shore islands necessitated travel via the mainland. This resulted in both extra (unscheduled) expense, and a greater expenditure of time for travel, which needed to be considered in budgeting and scheduling of visits. A second issue that proved problematic was arranging suitable accommodation close to the schools involved. In the more remote areas accessing meals with accommodation was not always possible, in one case food needed to be carried in by the presenter.

Preparation and delivery of sessions
A general introduction to the OLOs was planned for all staff at the schools in the project. The philosophy behind this was to engage staff and interest them in the possibilities offered by the OLOs, and give teachers some confidence to work (in conjunction with the consultant/teacher) with their students in the classroom the following day. This was to reflect an important feature of successful professional learning identified by Hawley and Valli (1999) – the need to involve teachers in the identification of what they need to learn. It was very important at these sessions to carefully select OLOs that offered a high quality learning experience and were appropriately pitched at the correct level for the students of the participating teachers. Consequently, the consultant and teacher-presenter spent time to select particular OLOs that would complement the teaching program using an organiser as detailed below (Table 2).

Table 2.
Example of a summary of an OLO

Area	TLF object numbers	Name of object	Why this is good for starting?
Mathematics/ numeracy	120-135	Decimaster	Covers fractions over a wide range – therefore users can start at an achievable level and more able student can rapidly experience progression

In practice, it was not always possible for all staff to attend a general introduction session. In some schools introduction was done to individual or small groups of staff. This had mixed success as it certainly allowed enthusiastic staff to explore a number of OLOs in a supported setting. There were some teachers however, who did not agree to look at the OLOs. One primary science teacher refused to look at the objects expressing a need for lesson plans with 'good experiments … not boring plants or the

environment'. Other teachers agreed to look at the OLOs when examples from learning areas other than mathematics and science were shown.

In schools where an introductory session was completed before the OLOs were introduced in the classroom, it was not always possible for teachers to try them on their own. A particular example was the creation of hyperlinks. This was covered in the introductory session and supported with written instructions, yet some teachers did not have the opportunity to gain personal experience and confidence in during the time available. The need to allow time for teachers own trial of the objects was noted to be important, especially where teachers were not confident users of ICT. In one school an additional session was scheduled for teachers prior to moving to the in-classroom phase to address this.

Modelling of the OLOs in the classroom setting was undertaken with considerable success in all schools. The OLOs were used for whole class (in conjunction with the electronic whiteboard), for small group and individual activities. In some cases the OLOs were supplemented with written extension. There were a number of learning objects that proved to be very engaging in both Science and Mathematics. One class worked through the 'Evaluation of a Frog Pond Habitat', completing the report in pairs, and giving them a significant sense of achievement. In mathematics, a class who had just completed work on area of rectangles using concrete materials completed complementary OLOs. The teacher expressed a wish that she had known about the OLOs previously.

The whiteboard was very successful in allowing the students to become immersed in the activity, allowing the consultant or teacher to stand back and allow them to take ownership. In one class the whiteboard froze, which proved very disappointing to the class, however they were keen to continue using the keyboard. The principal of one school commented that "usually not all of the students are on task and involved as much as they were for the two sessions." He was very pleased with both the level of engagement and the outcomes of the learning.

Technical support

Technical support is vital for a professional learning program such as this. In Tasmania, schools are generally very well supported in IT, with a universal Standard Operating Environment and relatively good bandwidth internet connections. Having said that, the standard environment has local flavours, for example those of student desktops, staff desktops and staff laptops. The schools in this study reflected this general picture. Although all schools had computers, the configuration (in classrooms or hubs), the level of access (intranet and/or internet connectivity) and type of software loaded onto the machines could vary within the school. In one case, necessary software for running the OLOs was only loaded on to some of the schools' machines – this caused some problems when the consultant was attempting to demonstrate the learning objects.

With respect to accessing the OLOs, there were several ways this could happen – via a DVD; through the *e*Centre (internet) or via the school's intranet. When choosing to access online learning objects, principals were mindful of the costs of different approaches. Thus a DVD which could be mounted on an intranet was preferred over the cost per byte received over the internet. In the case of the D*o*E schools involved in

the project, initial agreement was reached that these remote and very remote schools would be pilots for trial implementation of a learning object repository local cache. However, as the project unfolded, demands by central D*o*E staff to address other technical issues (such as a centralised student reporting system being introduced statewide) over-shadowed this approach. General web-content caching and comprehensive data DVDs from TLF replaced this approach.

The general preference by schools for accessing the OLOs via the DVD overcame problems other than cost. Accessing through the eCentre and the student freeway (student access to the eCentre) proved problematic for a number of teachers and students. In one case a teacher logged on as herself on multiple computers to facilitate student use. There was also a noticeable frustration in several schools with speed and 'tediousness' of access through the eCentre. In one school there was no interest in using the internet because it routinely doesn't work. These findings are entirely consistent with issues of internet speed and reliability identified in rural and regional areas found by other researchers (Afamasaga-Fuatai et al., 2006; Finger et al., 2006).

In addition to these technical issues, staff confidence with ICT was also variable amongst teachers in this project. Nevertheless it was noted that individual school cultures could have a significant impact in reducing the anxiety of these teachers. Where staff with less ICT experience were happy to ask their colleagues for assistance, the school as a whole saw the possibilities of the OLOs as a resource for enhancing their teaching program. This was exemplified by this quote from a participating teacher; 'I'll give it a do because Shelley will help out if I ask her'.

Interestingly, in some of the schools visited, staff had very little idea of what the school ICT resources were and how they could be accessed or used. In one school teachers were unable to set up either the data projector or the school's interactive whiteboard. The consultant needed to spend over an hour sorting through and labelling cords, despite this the full complement of cords for the whiteboard were unable to be located. At a second school a teacher confided that she didn't use the data projector because it 'doesn't always work' and she did not know what to do if there were problems.

The use of the interactive whiteboard used to demonstrate the OLOs was exceedingly well received by both staff and students. It was seen to add another level of engagement from the data projector and allowed students to become more involved and take a greater sense of ownership of the activity when they were in front of the class. After the visit one school decided to buy their own whiteboard, and the students were keen to contribute to fundraising.

Discussion and Recommendations

From the implementation phase of the Online Learning Object project, it was clear that individual school contexts impacted on delivery of professional learning. These contexts affected recruitment, scheduling and organisation of visits, preparation and delivery of sessions and had implications for technical support. As a result of this project, we have a series of recommendations for future conduct of this type of professional learning model.

- *Recruitment and scheduling of visits:* Contact the remote school by ground post about one month beforehand with brief details of the proposed training and associated support. Follow up with a phone call about three days after the letter should have arrived to receive a verbal indication of whether or not to and get verbal approval to proceed and to negotiate further details of the program. At this stage, the possibilities of linking visits with neighbouring schools should be raised. This gives a shared understanding of the complexities of arranging the visits, and allows for possible between school negotiations by principals of neighbouring schools. The outcome of these negotiations should be summarised in a second letter.

  Planning to stay in the rural and remote area for two to three days allows the school to schedule sessions after school, or in designated planning time and reduces the need to source multiple relief teachers.

  If possible there should be more than one consultant/presenter to allow for difficulties in meeting dates of school availability. This also provides a back up presenter if one is unexpectedly unavailable, with rescheduling in rural and remote schools being particularly problematic.

- *Organisational issues***:** When preparing budgets for on-site professional learning account must be taken of particular travel and accommodation issues. This may require conversation with school or Department personnel or local travel agents or tourism authorities. It should not be assumed that access to shops or restaurants is available.

- *Preparation and delivery of sessions:* A presentation to all staff is a good way to initiate local ownership of the innovation. A very small number of staff who are less confident users of ICT may benefit from private one-on-one introductory sessions following the introduction. Working alongside teachers in the classroom is excellent, when the engagement of pupils with the materials can be demonstrated in a supported environment. This also alleviates the need for large numbers of relief teachers. If some relief is needed to allow for teachers to observe classes or to plan with the consultant, then this can be short term – with the classroom teacher remaining in the school and close by.

  Choice of high quality examples that have been matched to the level appropriate to teachers attending the introductory session is vital. This means that attention needs to be paid to the content and pedagogy contained in the object as well as the engagement factor and technical competence. The message that the ICT object is a resource to complement teaching programs is also one that is vital to convey.

- *Technology:* Despite consideration of technical issues at the inception of this project, technical difficulties still arose. Having multiple ways to access the ICT-based material was effective, but did require some input from school technical staff. In this case: a working internet connection; workstations to have correct browser plugins; and to ensure equipment met system requirements with respect to installed software.

Providing the school with details of computer system requirements several weeks prior to the visit and requesting local technical support be in attendance for the first hours of the activity is advised to address some of the technical issues. It may be possible to involve the IT support personnel in negotiations to ensure they are aware of what is required and facilitate a smooth visit from the technical point of view.

The portable interactive whiteboard proved very attractive in schools, which had not previously seen this technology, and was an excellent match to introduce the online learning objects.

Conclusion

Notwithstanding some technical and organisational issues, the professional learning program succeeded in introducing a large number of staff in rural and regional areas to the OLOs. The professional learning model utilising on-site visits by a consultant/teacher reduced the need for large numbers of relief teachers and allowed an important opportunity to work with teachers in classrooms. By using a DVD and intranet system, some teacher reluctance to use an unreliable internet was overcome and teachers could experience how these on-line objects could be used in the classroom context. There was a clear pattern of engagement by students, and correspondingly quick uptake by students in accessing the resources without teacher guidance.

Future work in this project will analyse the post-visit survey of teachers to determine their response to the professional learning model and subsequent adoption of the online learning objects into classroom practice. We will also be developing a collection of example lesson plans by participating teachers that will have been developed by the teachers themselves – and be available broadly to other teachers in a cascading model of sharing practice. It is envisaged these will illustrate strategies for integrating the objects into ordinary teaching within everyday constraints of equipment and infrastructure

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