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What profiling tells us about ICT and professional practice

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Abstract

There is broad acceptance that Information and Communication Technologies (ICT) should contribute extensively to pedagogical practices in order to address the needs of learners in contemporary society. The rapidly developing imperative to integrate ICT into professional practice has caused an explosion in professional learning around ICT, yet research indicates that many challenges still exist for teachers. The assessment of success in terms of teacher adoption of ICT needs to take into account a multitude of factors including: teacher background, teacher knowledge, professional learning and reflective practice. This paper details the use of a profiling instrument designed to assist in the assessment of teacher achievement in integrating ICT into professional practice, and to indicate areas for further professional development. The responses of four teachers are used to illustrate the information obtainable from the profile. The role of the profiling instrument is then discussed in terms of providing an extensive picture of teaching practice when triangulated with data collected from a teacher portfolio. Recommendations are made for the future development and application of the profiling instrument with particular application for designing ongoing professional learning.

Introduction

The importance of embedding Information and Communication Technologies (ICT) in teaching and learning in the 21st Century is well documented (CEO Forum, 2001; Ministerial Council on Education, Employment, Training and Youth Affairs [MCEETYA], 1999). This has placed increased pressure on teachers to adopt ICT into professional practice (Hancock, 1993); particularly with respect to integration of ICT into pedagogy (Little & Williams, 2001). The need to support educators with appropriate professional development in ICT has been recognised by government systems and teachers themselves (Department of Education, Science and Training [DEST], 2002; McRae, Ainsworth, Groves, Rowland, & Zbar, 2001; Department of Education, Training and Youth Affairs [DETYA], 2000) and significant effort has been focused in this area (McRae et al., 2001).

In Tasmania, the emphasis on integrating ICT into teaching and learning practices has coincided with curriculum reform. A new values-based curriculum model has been co-constructed by curriculum leaders and classroom teachers, promoting a trans-

disciplinary approach with an emphasis on pedagogy (Department of Education, Tasmania [DoE], 2002, 2003). Within this new framework the integration of ICT not only contributes to the creation of a culture that promotes inter-related learning (DEST, 2001) but has the potential to provide an impetus for school-based reform (Fitzallen, 2004a; Heaney, 2004; Kozma, 2003).

The *e-magine* Centre of Excellence in Online Learning was established as part of the *Learning Together: A Vision for Education, Training and Information into the 21st Century* (DoE, 2000) initiative. Objectives of the centre were to provide professional learning for teachers, support online course delivery, and produce online material for classroom teachers. The provision of professional learning opportunities lead to the development of five competency-based ICT Professional Learning Units as a way of recognising the skills development of teachers in ICT. Units 1 – 4 focus on skills-based tasks, such as word processing to produce material for student use, and the creation of PowerPoint presentations. Unit 5, *Embedding Educational Technologies into Professional Practice – Teaching and Learning* (EET), focuses on the ways ICT has been integrated into teaching and learning programs as well as other aspects of professional practice. The EET unit has five elements of competence: Planning, Management and Assessment; Learning, Teaching and the Curriculum; Educational Resources; Professional Learning and Practice; and Creating a Culture. Within each element are four or five specific performance criteria that are used to guide evidence of achieving competence. Evidence is provided by teachers through the compilation of a portfolio. The percentage of teachers in Tasmanian government schools who have gained recognition of accomplishments in utilising ICT in their professional practice is detailed in Table 1.

Table 1:

Percentage of teachers in the Department of Education, Tasmania completing ICT Professional Learning Units (R. Cocker, personal communication, April 7, 2004).

ICT Professional Learning Units	Teachers completed (%)
Unit 1: Introduction to computing in education	95
Unit 2: Word processing and publishing in education	86
Unit 3: Internet and e-mail in education	76
Unit 4: Multi-media and web publishing	25
Unit 5: Embedding Educational Technologies into Professional Practice	6

It is, however, evident from the literature that professional learning per se does not guarantee successful translation of ICT into practice (Cox, Preston & Cox, 1999; Williams, 1998), nor does it necessarily enhance the quality of learning outcomes for students (Fitzallen, 2004b; Hennessy & Deaney, 2004; Phelps, Graham & Kerr, 2004; Mouza, 2003; Loveless, 1995). The need to evaluate the success of professional learning in terms of the effect on student learning outcomes is therefore most apparent (Myers & Halpin, 2002; North Central Regional Educational Laboratory [NCREL], 1999). Additionally, evaluation that indicates areas of future professional development would be particularly useful. Clearly, any evaluation is complex and must take account of a variety of factors including teacher background (Preston, 1996), teacher knowledge (Ball & Bass, 2000; Kanis & Nisbet, 1996; Shulman,

1987a; 1987b), teacher beliefs and confidence (Phelps et al., 2004; Albion, 1999; Cox, Preston, et al., 1999), teacher practices (Tubin & Edri, 2004; Kozma, 2003; Watson, 2001) and external factors such as time (Cox, Webb et al., 2003; Mouza, 2003) and access to resources (Norris & Soloway, 2000).

The aim of the research was to assess a profiling instrument as an indicator of teacher achievement, of significant factors identified in the literature for successful ICT integration in professional practice. If deemed appropriate, the profiling instrument may be used to evaluate professional learning programs and indicate possible areas for further development.

The Research Approach

This paper describes the process of constructing and trialling a teacher profiling instrument which would provide rich data concerning teachers' integration of ICT into teaching and learning.

Profiling instruments have been successfully used in other studies to evaluate teacher achievement and teacher needs with respect to implementation of elements of curriculum (Watson, 1998, 2001), and to assess success of professional learning programs (Watson, Beswick, Caney & Skalicky, 2005). They can be designed as either a survey or semi-structured interview. The theoretical basis for these instruments focuses on important elements that influence teachers' classroom practice and provide a valuable starting point for this study.

The featured profiling instrument was adapted from an instrument developed by Watson (2001), which was underpinned by Shulman's seven types of teacher knowledge: content knowledge; general pedagogical knowledge; curriculum knowledge; pedagogical content knowledge; knowledge of learners and their characteristics; knowledge of education contexts; and knowledge of education ends, purposes and values (Shulman, 1987b). Watson's profile was designed to address, either singly or multiply, the knowledge types identified by Shulman, to gather information regarding teacher background and professional development (Preston, 1996) as well as providing for teacher reflection.

A comprehensive consideration of the relevant literature was undertaken to identify key elements influencing adoption and successful integration of ICT into teachers' professional practice. A number of these aligned closely with those of Watson's (2001) profile. Hence, the modified profiling instrument reflects a number of the characteristics of the original. For example, teacher backgrounds (Granger, Morbey, Lotherington, Owston, & Wideman, 2002; Riel & Becker, 2000), professional development (Phelps et al., 2004; Myers & Halpin, 2002) and reflective practice (Phelps et al., 2004; Hiebert, 1999) remain consistent. Teacher knowledge was also maintained being acknowledged as a fundamental component (Shulman, 1987b). However, aspects of the teacher knowledge variables were modified to better reflect the context of the present study, specifically concerning ICT integration. Content and curriculum knowledge (relevant to key learning areas as well as to ICT) were combined into a single variable acknowledging that these were important in providing background contexts in which to integrate the use of ICT (Hennessy & Deaney, 2004;

Roschelle, Pea, Hoadley, Gordin & Means, 2000). Specific inclusion of ICT content knowledge was an added element, as was application of ICT in context (NCREL, 1999) replacing generic pedagogical content knowledge. Knowledge of learners and their characteristics (Hennessy & Deaney, 2004; Riel & Becker, 2000; Roschelle et al., 2000) remained unchanged, with knowledge of education ends, purposes and values (Shulman, 1987b) altered to reflect student learning outcomes (Fitzallen, 2004a). It should be noted that educational purposes and values explicitly underpin the curriculum in Tasmanian schools (DoE, 2002, 2003). General pedagogical knowledge and knowledge of educational contexts were not considered in this present study.

In line with research findings, three further categories were subsequently included. Confidence, previous success, and enjoyment can influence a teacher's willingness to adopt the use of ICT into their teaching practice (Phelps et al., 2004; Brooker, 2003; Cox, Preston et al., 2003; Albion, 1999). Similarly, engaging in the practice of working in a community of learners, with colleagues and/or students has been shown to be influential (Dexter, Seashore & Anderson, 2002; Granger et al., 2002; Riel & Becker, 2000, Roschelle et al., 2000; Peneul & Means, 1999). Finally, external influential factors such as time - for professional learning, preparation and reflection (Cox, Webb, et al., 2003; Mouza, 2003; Watson, 2001) and access to resources (Fitzallen, 2004a; 2004b; Granger et al., 2002; Norris & Soloway, 2000) were acknowledged.

In order to organise an analysis matrix, these key elements were extracted as organisers and grouped into three interconnected categories:

- **Teacher knowledge** - Content and Curriculum Knowledge; Knowledge of Learners; Evaluation of Student Learning Outcomes; ICT Content Knowledge; Application of ICT in Context
- **Teacher dispositions** – Confidence, Previous Successful Experience and Enjoyment; Engagement in a Community of Learners; Engagement in Reflection
- **External factors** - Background and Professional Learning; Time and Access

A goal of the researchers was to increase the internal validity of the study. This was achieved by ensuring that each of these variables could be addressed in multiple sections of the profiling instrument. Consequently, each section was designed to provide a context for teacher responses that could address these identified key elements. The resulting matrix is presented as Table 2. Table 2 also provides details of the topics covered under each section of the profiling instrument.

In order to trial the profiling instrument, a pilot study was designed and implemented. Actual responses from teachers were matched with the matrix prepared by the researchers. This was to ascertain whether the profiling instrument was able to elicit responses according to the key organising elements. Furthermore, consideration of individual responses was undertaken to assess usefulness of the profiling instrument for indicating areas for ongoing professional learning.

The Context of the Pilot Study

It was determined that the pilot study should focus on teachers who had undertaken significant ICT related professional learning and who were using ICT in their classroom teaching. This was to ensure that the profiling instrument could be used to assess past and indicate future professional learning. It was also decided to draw teachers from the same school to gain some consistency of context.

The chosen school was a suburban secondary (7-10) school in Tasmania. The teaching staff of this school had previously identified that there was a need to improve learning opportunities for disengaged students and used the implementation of the reform-based curriculum (DoE, 2002, 2003) to enable change. Part of the change process was the adoption of the creative tools of ICT to improve the motivation, engagement, and learning outcomes of students (Fitzallen, 2004a). The school invested heavily in providing the infrastructure and resources to support the reform agenda as well as supporting teachers to develop the skills and understanding to incorporate ICT into their teaching and learning programs. All the teaching staff participated in a number of professional learning programs including the use and application of WebCT, webquests, online forums, and online resources. The teachers in this study also completed a course on using multi-media in project-based learning (DoE, 2004). Additionally, one teacher in the school provided mentoring support for the other teachers to assist them to develop teaching resources inspired by the professional learning programs.

As a result of the professional development programs, teachers were encouraged to gain recognition of their achievements in integrating ICT by gaining accreditation for completion of their ICT Professional Learning Units. The portfolios produced by the teachers were assessed, by the DoE, as recognition of their current ICT competencies. Of the 45 teaching staff at this school, 18 teachers gained accreditation for their EET unit. This was a 40% participation rate compared to 6% statewide (R. Cocker, personal communication, April 7, 2004).

Pilot Study Participants

The participants in the study were four secondary Mathematics/Science teachers who met two selection criteria to be involved in this study. Firstly they were accredited for the EET unit and secondly they demonstrated a willingness to participate in the study. All the participants were female.

Instruments

Two data collection instruments were utilised in this study: a teacher profiling instrument (as outlined above) and teacher portfolios. The profiling instrument was administered as an interview, with teachers invited to give extended responses if desired. The use of portfolios was to provide a demonstration of how ICT was applied in the classroom which could be used to triangulate data collected through the

interview process, therefore increasing the internal validity of the study. It has been recognised portfolios are more valuable than other modes of evaluation that simply require a recall of classroom instructional practice (United States Department of Education, Office of the Under Secretary, Planning and Evaluation Service, Postsecondary, Adult, and Vocational Education Division, 2000).

The data analysis was undertaken in two phases. The first analysis was performed by organising teacher responses under the matrix presented in Table 2. This was to demonstrate whether the profiling instrument was capable of eliciting responses under each of the key element organisers. Once clustered under the key element organisers, a further analysis of responses was performed. Qualitative exploration of the responses scoped evidence of successful implementation from both the profiling instrument and the portfolio. This analysis was also used to provide an indication of further professional learning needs.

Results

The preliminary analysis of the data categorised responses under each of the key element organisers. The results presented in Table 3 indicate that the profiling instrument did elicit responses for each as intended. Analysis of individual responses under each of the key element organisers was then performed to provide a more descriptive picture of the data.

Table 3: Teacher Responses to Key Elements

Teachers	Types of Teacher Knowledge				Teacher Dispositions			External Factors		
	Content and Curriculum Knowledge	Understand Learners' Characteristics	Evaluation of Student Learning Outcomes	ICT skills	Application of ICT in context	Confidence Previous Experience/Enjoyment	Engaging in Communities of Practice	Employment of Reflective Practice	Background/Prof Development	Time/Access to ICT
Ashley	➤	➤	➤	➤	➤	➤	➤	➤	➤	➤
Joanna	➤		➤	➤	➤	➤	➤	➤	➤	➤
Kerry	➤		➤	➤	➤	➤		➤	➤	➤
Lynda	➤		➤	➤	➤	➤		➤	➤	➤

Background and Professional Development

The profiling instrument provided the opportunity for the teachers to detail their previous experience and their teaching expertise. Ashley, Joanna, Kerry, and Lynda collectively have a wealth of teaching experience. At the time of the study, they were teaching Mathematics and Science, however, two of the teachers taught an additional subject each. Kerry was the only teacher with significant experience with ICT having studied Computer Science at university, and continued with Computer Science as a teaching area specialisation. Lynda, the least experienced of the group, was the only

participant to have studied the application of ICT in education as part of her teacher training.

Additional to this the teachers provided information about professional development they had already undertaken and their future professional development needs. The teachers identified that they needed limited assistance learning new applications and would like to have more time to develop resources, so that they could implement new practices into their teaching. Lynda expressed a desire for professional development to include examples of student work. She felt that this would best demonstrate the benefits of ICT for students. Kerry saw the benefits of having access to an 'expert' when difficulties arose. None of the teachers favoured large-scale professional development programs that involved all the teachers from the school, preferring programs that would cater for their individual needs. Joanna requested that time to develop resources be incorporated into professional learning programs. Previously, the demands at school prohibited her from developing elements of professional learning into everyday practice.

Content and Curriculum Knowledge

Many sections in the profiling instrument provided the opportunity for the teachers to discuss issues related to their content and curriculum knowledge. In answering the section on planning a lesson the teachers detailed the resources they used, activities, and links with curriculum documents. This ranged from use of the Internet (for researching a topic, collecting resources and providing relevant information for students) through to using pre-tertiary Mathematics subject courses to guide planning. Joanna specifically looked for simulations and interactive activities to enhance her students' understanding of concepts studied using examples of their application in Science. Ashley stated, "To be creative with ICT I like to circumnavigate [the Internet] and get heaps of ideas from here, there and everywhere, and then put them together in a unique way." All of the teachers, however, stated that they had not used curriculum documents specific to the application of ICT and were not necessarily targeting ICT outcomes when designing activities. Yet, they recognised that they had to provide opportunities for students to learn how to use new applications and planned for this to happen within the classroom. The evidence in the teacher portfolios regarding curriculum only referred to the Essential Learnings Framework (DoE, 2002, 2003).

Understand learners' characteristics

Sections 1-7 of the profiling instrument provided opportunities for the teachers to give details about their understanding of the characteristics of learners and discuss how they considered these features when designing activities. In general, the teachers used ICT because it was engaging and provided additional motivation for some students. Mostly, the teachers' comments on what ICT provided for students were discussed in general terms and specific details were not given. Two of the teachers in this study said that the use of ICT helped students to develop critical thinking, problem-solving and analysing skills but these comments were not supported with specific examples and the activities outlined in the portfolios provided little evidence of higher order thinking skills being the targeted learning outcomes. Lynda described how it allowed students to transform information easily and facilitated individualised learning opportunities. Her examples demonstrated the use of MSExcel to transform data to a

graphical representation and the use of MS PowerPoint for students to present their work.

One teacher recognised the possibilities for using ICT applications as a basis for social constructivist learning. This was the only direct reference to models of learning theory or their specific application.

All teachers agreed that ICT was a motivating and engaging environment for most of their students. This contradicted other comments made by the teachers in relation to student behaviour management. All teachers expressed concern that students were often off-task and they encountered difficulties managing students in the online environment. Kerry proposed that she should leave the 'fun' activities until last so that the students do the work first.

Evaluation of Student Learning Outcomes

Although the profiling instrument elicited responses to this element, the comments made by the teachers regarding evaluation of student achievement related to their inability to determine achievements attributable to the use of ICT. Lynda expressed the desire to be able to look at examples of student work that would demonstrate student learning. She stated "I need to see an example of something someone has devised and the results. What did they [students] produce?" Ashley commented that the work she had previously designed for her students was "pretty low level stuff" but was striving to change her practice to elicit higher order thinking skills from the activities she assigned to using ICT. Kerry was the only teacher to express the view that that she did not think that the computer environment contributed to improving student learning outcomes stating, "...it is about the same whether they are on computers or not."

ICT Skills

The teachers all rated themselves quite highly with respect to their individual ICT skills, which were supported heavily by documentation in the portfolios. The teachers had all created online courses using the learning management system, WebCT. This involved designing web pages, creating worksheets with MS Word, inserting web links, and incorporating animations and software games into the activities. Additionally, the teachers used ICT in many ways to support the administrative aspects of their teaching practice. The reporting process they used required them to create spreadsheets in MS Excel and then merge this information into reporting pro-forma. None of the teachers used multi-media software, such as Flash.

Application of ICT in Context

The teachers were able to incorporate the use of ICT into all their teaching areas; this was evidenced through the interview and portfolio. Joanna used a webquest activity for an investigation into the use of water as part of a trans-disciplinary unit of work and Lynda was in the process of designing activities that utilised GPS devices for Geography. Kerry used animations of reactions of metal in acids as part of a Chemistry unit. Ashley had her students create MS PowerPoint presentations to present information gleaned from information found on the Internet.

Confidence and Positive Previous Experiences

The section on Confidence in the profiling instrument focused on activities related to integrating ICT into teaching and learning. All the teachers in the study were

extremely confident in using ICT in their teaching practice. They felt they could develop resources, provide authentic learning experiences, teach new applications, and provide opportunities for students to work collaboratively. Joanna was, however, the only teacher to give an example of developing collaborative learning experiences for students.

In relation to teacher confidence levels to choose activities that facilitate the development of stated learning outcomes for students the teachers rated themselves from being moderately confident to highly confident on a Likert-type scale. Lynda, however, contradicted this by adding that her aim was to target higher order thinking skills as outcomes for her students but she lacked the confidence to be able to identify activities that provided the opportunities to do so. Lynda was not confident that she was designing the right things or that the activities were supporting the learning outcomes that she targeted. Ashley expressed great confidence that the use of ICT would bring something extra to educational learning programs. She did not, however, feel this had been accomplished yet. Ashley was also confident that as she evolved as a teacher the value ICT would become evident in her practice.

All teachers recounted positive experiences in using ICT in their teaching and learning. They believed it to be motivating and enjoyable for the students. They also unanimously expressed their own enjoyment in exploring the possibilities for ICT use.

Engaging in communities of practice

Although this was explicitly addressed in the profiling instrument, Joanna was the only teacher to give an example of working with other teachers in the planning process. As part of a teaching team for Grade 7 she felt it was her responsibility to ensure that one activity for a trans-disciplinary unit should incorporate ICT. However, the planning time spent together for these units was mostly for the allocation of duties that each teacher undertook on their own. There was no mention of sharing experiences to facilitate the effective use of ICT nor was there instances described where the teachers could collectively reflect on past experiences. Ashley's comments in this area were related to the sharing of resources. She felt it was important that teachers share the work they develop to ease the burden for other teachers. Ashley had created units of work using an online planning database so that other teachers could access the units of work she designed.

Only one teacher gave an example of fostering communities of practice amongst students. A second specifically stated that she did not encourage students to work together.

Employment of Reflective Practice

Many of the comments related to past experiences and the teachers often provided alternatives to problems they had encountered. In addition to the opportunities for reflection afforded during administration of the profiling instrument, most of the teachers were able to provide evidence of reflective practice. Ashley had provided annotations on her portfolio that described problems and successes she had had with students. Kerry was able to look critically at the way she used ICT in the classroom, commenting that the computer environment did not contribute to improving student learning outcomes. She did not, however, describe if she had altered her practice as a result of her observations.

Time and Access

The issues related to time and access for these teachers had a strong presence in the data collected. Kerry felt that her teaching work load and professional commitments prevented her from developing as many teaching and learning programs as she would like, whilst Ashley, Joanna, and Lynda found the development of ICT related learning experiences for their students, required them to work at home, to enable them to produce teaching resources.

Access was highlighted as an issue for all four teachers. This was described in a number of ways. For the students problems associated with not remembering passwords impeded their access to resources, and the high demand for good literacy skills to be able to engage with the resources on the World Wide Web also denied some students access to the full value of those resources. For the teachers themselves the issue of school structures was highlighted. The booking system whereby computer labs were permanently booked for ICT dedicated subjects posed problems. This issue was compounded by timetable constraints resulting in some classes having little or no access. Additionally, the number of computers and computer labs in the school did not accommodate the high demand for student access and resulted in some teachers not being assured of getting their classes into the computer labs when needed. All four teachers expressed disappointment at not being able to give their students more experiences using ICT. Kerry stated, "...I just haven't bothered doing much this year because I can't get into a computer lab on a regular basis." Ashley, also felt restricted by not being able to access resources on the school intranet from home.

Discussion and Implications

It is clear that for teachers to adopt and successfully integrate ICT into their professional practice a number of elements must be addressed (Brooker, 2003, Mouza, 2003; Granger et al., 2002; Myers & Halpin, 2002; Roschelle et al., 2000; NCREL, 1999) Gaining of ICT skills and experience of applying ICT has been a major focus of professional learning (Phelps et al., 2004; Tubin & Edri, 2004; McRae et al., 2000). However, in isolation these are not sufficient to bring about transformation in teacher practice (Fitzallen, 2004b, Phelps et al., 2004). The consideration of Shulman's (1987b) teacher knowledge variables remains relevant in order to ensure application of ICT promotes the development of curriculum concepts and is making connections between the content and the learner and is meeting appropriate student learning outcomes. Additionally, factors of teacher confidence and beliefs impact heavily on the strategies teachers apply with respect to technology integration (Norris & Soloway, 2000; Albion, 1999; Cox, Preston et al., 1999).

The profiling instrument was trialled to ascertain whether it elicited responses that demonstrated teachers' application of ICT and could inform further professional learning needs. It is clear from the preliminary results that the profile is able to elicit responses under each of the identified key element organisers. The descriptive nature of the responses provided a rich source of data which described in a detailed fashion how teachers were using ICT, what factors impacted on their use of ICT, and where they believed they needed further professional learning. Analysis using the key element organisers also exposed areas of professional practice which could be further developed to promote more effective integration of ICT.

In the pilot study, the profiling instrument was able to clearly recognise the successes of past professional development undertaken by the teachers. The teachers had developed a high level of personal ICT skills and had embraced the use of ICT as an educational tool for their students by providing new and creative learning experiences involving ICT. Whilst the purpose and use of ICT varied from teacher to teacher, the teachers all demonstrated their ability to develop digital resources, publish those resources on the school intranet and communicated with other professionals by email. They displayed positive attitudes toward the classroom use of ICT in terms of confidence, enjoyment and recognition of positive previous experiences. The profiling instrument also recognised that the teachers employed reflective practice.

In terms of recognising key elements that required further development, the profiling instrument highlighted; Understanding Learners' Characteristics, Evaluation of Student Learning Outcomes and Engaging in Communities of Practice. Only one of the teachers referred to any underpinning learning theory that informed her teaching and learning practices with ICT. An understanding of learners and learning is seen as an essential consideration to successful implementation of ICT into teaching and learning (Granger et al, 2002; Riel & Becker, 2000). Professional learning opportunities need to allow teachers to develop an understanding of the connections between the learner, the curriculum and the content, and the characteristics of ICT that can be attributed to improving learning outcomes for students (Fitzallen, 2004b).

Engagement in professional learning communities is well documented as positively contributing to the capacity for transformation in both organisations, such as schools and in individual teachers (Tubin & Edri, 2004; Dexter, Seashore & Anderson, 2002). The use of communities of practice was shown to be limited in this study and could be a recommended strategy for these teachers as discussions about technology and teaching pedagogies may enhance their understanding of the role of ICT in the classroom (Mouza, 2003).

The ability to evaluate student learning outcomes from activities undertaken with ICT and further planning of activities that give students the opportunities to engage in higher level learning could be argued as a crucial measure of success of any teaching and learning program. Whilst ICT is acknowledged as being able to interest, motivate, improve content and promote engagement of students (Cox, Preston et al., 1999) this does not necessarily correlate with student learning outcomes. Until teachers can identify the learning outcomes that are supported by or attributable to the use of ICT they cannot maximise the opportunities for learning presented by technology (Fitzallen, 2004b). The teachers in this study identified that this was an area where they were continuing to develop their practice.

The profiling instrument also allowed teachers to detail their own reflections on areas for further development. Through their commitment to their own professional learning, good ICT skills, and willingness to use ICT the four teachers in this study have positioned themselves favourably to develop their pedagogy further. In this study the teachers included comments on the structure of professional learning. Individualised professional learning to target specific needs – 'just in time' technical support for the use of applications, was one suggestion that concurs with the findings of Granger et al. (2002). Other suggestions including time to develop resources fully

within professional learning programs, opportunities to access exemplars and to share resources and practice, again were well supported by other research findings (Tubin & Edri, 2004; Riel & Becker, 2000; Hiebert, 1999). Although two teachers identified that they were not fully realising the potential of ICT to develop higher order thinking for students, only one identified this as a professional learning need.

It is pertinent to now consider the role of the teacher profiling instrument as a source of data in assessing professional practice. Whilst it builds a rich picture of practice in context, the importance of multiple data sources should not be underestimated. In this study, the teacher profile responses were considered in conjunction with a teacher portfolio. The use of a teacher portfolio provided extensive information about the teachers' technological skills and abilities to apply and adapt technology to a specific learning situation. There were several examples where teachers' assertions were not supported by portfolio evidence. This is important as an indication that triangulation of data using a portfolio or other source is necessary to give a comprehensive view of teaching practices. This supports suggestions from Finger, Jamieson-Proctor, and Watson (2003) that the evaluation of the integration of ICT into teaching and learning practices needs to come from a number of different perspectives.

Conclusion

A profiling instrument has been developed to identify key elements of teacher professional practice. The profiling instrument was used in conjunction with a demonstration of practice, in this case a portfolio, in a pilot study to assess its ability to evaluate teachers' implementation of ICT into professional practice, and highlight areas for future development. The profile was successful in eliciting responses, which could be analysed against identified key elements for successful ICT integration. The qualitative nature of the data gathered gave a useful picture of where professional learning had been successful and highlighted directions for the future. However, the importance of data triangulation, particularly using a demonstration of practice is noted.

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