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Profiling Teachers' Integration of ICT into Professional Practice

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Abstract

The increasing availability of Information and Communication Technologies (ICT) presents teachers with exciting opportunities to transform pedagogical practices. The demand on teachers to integrate ICT into their teaching and learning programs is high and places additional pressures on teachers in an already challenging profession. First and foremost, teachers have to increase their own ICT skills and then have to change elements of their practice to utilise ICT with their students. This report describes a part of a study that focuses on the outcomes of ICT professional development completed by teaching staff at a suburban high school. The case of one particular teacher demonstrates that the acquisition of ICT skills does not necessarily translate to the adoption of transformative pedagogical practices, and may not influence teachers' attitudes and perceptions of student use of ICT. The study trialled a modified profiling instrument for providing information about professional practice and informing professional development needs. The profiling instrument played a significant role in providing an extensive picture of teaching practice by triangulating data collected from a teacher portfolio. The results suggest there is a need to explore other methods of measuring the integration of ICT. Implications of this study include suggestions for designing future professional development programs.

Background

Political and Educational Agendas
The pervasive nature of Information and Communication Technologies (ICT) in daily life has made society reliant on systems and tools that provide challenges for the way people think and work. Students entering the workforce need not only to be equipped with the skills to use those new technologies, but also to be flexible, adaptable, and multi-skilled. They need to operate in an information age that requires them to be: information literate, inventive thinkers, and skilled communicators (CEO Forum, 2001). This has placed great pressure on educators to provide students with opportunities to develop the skills required to engage effectively in a progressive society and become life-long learners (Hancock, 1993). There is the need for educators to incorporate those new technologies into their teaching practice for the potential of ICT to be exploited fully for students to achieve these goals. To date this has not been fully realised (Department of Education, Science and Training [DEST], 2002; Reynolds, 2001; Hurd, 2000) and it places an imperative on educators acquiring relevant skills and adopting teaching practices that may challenge their current practices. The application of ICT in education, however, has not reflected the way society has embraced new technologies, with the rate of integration of ICT into teaching and learning programs being out of step with society (Goodrum, Hackling, & Rennie, 2001).

Since the 1980s, with the introduction of the personal computer to education, students' access to computers has grown significantly. A report on Australian schools, *Real Time: Computers, Change and Schooling* (Meredyth, Russell, Blackwood, Thomas, & Wise, 1999) noted that 96% of students at school had regular use of computers, with a student to computer ratio of 15 to one. At the present time in Tasmania, the ratio of students to computers is 4.5 to one (Wriedt, 2004). The increased availability of the Internet, the acceptance by society of computers, and ICT being a part of everyday life, have seen many households connected to the World Wide Web. At a local level, three Tasmanian suburban high schools were surveyed to determine students' access to computers at home. The responses indicated that 75% of the schools' students had access to computers at home. Of these, 75% had access to the Internet. The survey also showed this access was highly underutilised as an educational resource, as 88% of students used the computers to play games most of the time (Department of Education, Tasmania [DoE], 2004).

The 1999 *Adelaide Declaration on National Goals for Schooling in the Twenty-First Century* (Ministerial Council on Education, Employment, Training and Youth Affairs [MCEETYA]) affirmed the purpose of ICT in education and recognised that students need to have the skills to use new technologies, as well as understand how those technologies affect their everyday lives. The *National Goals* focus on improving student outcomes and opportunities for students, however, the agenda for ICT in education has been driven from an economic perspective. *Learning for the Knowledge Society: An Education and Training Action Plan for the Information Economy* (Department of Education, Training and Youth Affairs [DETYA], 2000) states: "The education and training industry produces skilled people, creates knowledge, provides access for the community to the lifelong benefits of online learning and is an enabling force for all other industries."

The aim of the DETYA (2000) report is to provide a framework for the development of strategies that will enable Australia to benefit from participating in an information economy, globally. It targets five action areas: People; Infrastructure; Online Content, Applications and Services; Policy and Organisational Framework; and Regulatory Framework. Of particular interest to this study, is the action area People. The report recognises educators need to be supported with professional development that allows them to develop learning programmes using learning technologies. The primary purpose is to improve learning outcomes. This is further supported in *Learning in an Online World: School Education Action Plan for the Information Economy* (Education Network Australia [EdNA], 2000). This plan sets the scene for providing learning opportunities for online learners in all schools. The aims of the framework reflect the *National Goals* (MCEETYA, 1999) and seek to integrate ICT into school systems.

The Impact of ICT on Teaching
The demand on teachers to integrate ICT into their pedagogy is high and places additional pressures on teachers in an already challenging profession. Initially, teachers have to increase their own ICT skills and then they have to change elements of their practice to utilise ICT with their students. A major report on teacher professional development, *PD 2000: Australia* (McRae, Ainsworth, Groves, Rowland, & Zbar, 2001) identifies the strongest area of self-defined need for professional development by teachers is work related to ICT.

Bennett and Lockyer (1999) suggest that ongoing professional development for teachers is essential to enhance integration, as only 20% of teachers felt competent enough to integrate ICT into their classroom. McRae (2001), Oliver and Hannafin (2000), and Green and O'Brien (2002) also warn that the effectiveness of ICT in the classroom is highly dependent on teachers' computer skills. To ensure long term innovations in education these skills must be maintained to keep abreast with technologies available to and in use by students.

Increasingly, efforts are being made to integrate ICT into the curriculum and researchers are calling for adoption of strategies that will make ICT integral to teaching and learning processes (Little & Williams, 2001). Reynolds (2001) highlights that schools are using ICT as a supplement to classroom activity by accessing existing information and knowledge, rather than as an integral part of pedagogical practice and Ward (2003) goes further to claim that there is limited use of ICT in classroom practices. This suggests the need for teachers to gain an understanding of how ICT can be used to extend students' thinking and problem-solving skills rather than just as a publication and research tool (Green & O'Brien, 2002; White, Au & Taylor, 2002), as a lack of understanding may impact on student outcomes.

The report, *Raising the Standards: A Proposal for the Development of an ICT Competency Framework for Teachers* (DEST, 2002), works on the premise that ICT competent teachers will produce ICT competent students. It goes on to make recommendations for a framework that will support the effective use of ICT in education. The report recommends a structure for a nationally recognised ICT Competency Framework from which teacher standards can be developed. *Raising the Standards* takes a comprehensive view of ICT competence as including "…technical and higher order cognitive knowledge, skills, understandings and attitudes related to professional knowledge, professional practice and professional attributes" (p. 3). This is consistent with the view that teachers' work has many dimensions: content knowledge; general pedagogical knowledge; curriculum knowledge; knowledge of learners and their characteristics; knowledge of educational contexts; and knowledge of education ends, purposes and values (Shulman, 1987b).

In developing an ICT Competency Framework, consideration must be given to how achievement of the competencies can be measured. Watson (2001) suggests a performance measure needs "…to include Shulman's (1987b) knowledge variables as well as specific information on teacher background and professional development in order to encourage positive teacher reflection" (p. 309). Presently, both Queensland and Western Australia state education systems rely on self-evaluation of professional practice by teachers. Finger, Jamieson-Proctor, and Watson (2003) note this should be supported by "student and teacher interviews, sampling student work and observations" (p. 16) to provide a comprehensive view of a teacher's use of ICT. This is further supported by Shulman's (1987a) suggestion that assessment of teacher performance requires several methods including written assessment and observation of teaching practice, as examples.

Background Summary
The value, purpose, and intentions for the use of ICT in education are well documented and articulated in the aforementioned documents. They have clearly stated that ICT in education is a way of transforming teaching and learning, and improving learning outcomes. To facilitate this there has been an emphasis on providing professional development for teachers to gain the confidence, skills, and knowledge to integrate ICT into their daily practice. This has lead to discussions on how this is reflected in teaching and learning programs and has raised the issue of the need for a nationally recognised ICT Competency Framework for teachers. Further, it is noted that a performance measurement needs to be developed to complement the ICT Competency Framework.

Context of the Study

ICT in Schools - Tasmania
The emphasis on integrating ICT into teaching and learning practices in Tasmanian schools has coincided with curriculum reform. As part of a consultative process with the people of Tasmania, the Department of Education, Tasmania, has developed a new curriculum model, The *Essential Learnings Framework 1 & 2* (2002, 2003). The *Essential Learnings* promotes a trans-disciplinary approach (DoE, 2003) and fosters the notion that many key learning areas and major subjects can be utilised together in the learning experience. As a result, there has been a trend towards integrating ICT into the curriculum in the middle school years. This integration of ICT into education has the potential to generate school reforms that effect: student learning, teacher professionalism, the roles of teachers and students, and the creation of a culture that promotes inter-related learning (DEST, 2001).

Learning in an Online World (EdNA, 2000), in conjunction with *Learning Together: A Vision for Education, Training and Information into the 21st Century* (DoE, 2000) led to the establishment of *e*-magine Centre of Excellence in Online Learning, in Tasmania. One of the main purposes of *e*-magine is to "Transform teaching and learning through the integration of ICT and online learning approaches" (Travers, 2002, p. 3). The provision of professional development for teachers in ICT is one of the activities *e*-magine undertakes to achieve this goal. A current model of professional development in ICT has been the development of the Competency-based Professional Learning Units 1 – 5 (http://www.e-magine.education.tas.gov.au). Units 1 – 4 focus on skills-based tasks, such as word processing, to produce material for student use, and creation of PowerPoint presentations. Unit 5 originated as "Integrating ICTs into Teaching and Learning". In 2003, the unit was redeveloped and became "Embedding Educational Technologies into Professional Practice – Teaching and Learning" (EET). This 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.

To demonstrate competency in the EET unit teachers have to develop a portfolio that is representative of their practice. The assessment of the portfolio is based on recognition of current competencies and is evidence-based. The competencies for Units 1 – 4 can be satisfied by demonstrating the competencies of the EET unit

portfolio. This has meant that teachers do not have to complete the units in a sequential order but can be accredited for the five units concurrently. Many teachers have, however, used the units to demonstrate the development of their ICT skills over time and have gained recognition for one unit at a time.

R. Cocker (personal communication, April 7, 2004) stated that 6% of teachers in Tasmanian government schools have gained recognition of their ICT competencies with the EET unit. Considering the potential for ICT to transform teaching and learning practices (Cuttance & Stokes, 2000; MCEETYA, 1999), the large investment in providing the infrastructure and resources necessary to implement ICT in schools (Meredyth et al., 1999), and the ubiquitous presence of ICT in schools, the number of teachers who have gained recognition for their skills and knowledge to integrate ICT into their pedagogical practice in Tasmania is low. This may be due to a number of factors and is beyond the scope of this study. The percentage of teachers having gained accreditation for the ICT Competency units is detailed in Table 1.

Table 1.
Percentage of teachers completing ICT Competency Units in Tasmania (personal communication, R. Cocker, April 7, 2004).

ICT Competencies 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

The Local Context
One of the suburban high schools, which is a curriculum consultation school for the development of the *Essential Learnings* (DoE, 2002, 2003), is using the integration of ICT into teaching and learning as a means of reform. As part of the introduction of the new curriculum, the school has made a large investment in developing ICT practices as a culture of learning. This has been used to complement other reforms within the school that target student needs and individualise learning programs for students.

The teaching staff at this particular school has been involved in a number of ICT professional development programs to support teachers to change their teaching practices, with the aim of creating a "virtual school" (http://www.e-magine.education.tas.gov.au). All of the teaching staff participated in the "Innovations Online Project" (www.discover.tased.edu.au), which provided professional development on the use of: WebCT, webquests (www.web-and-flow.com), online forums, online resources available at EdNA and *e*-magine, as examples. Other opportunities for professional development have been made available for teachers in specific learning areas. These include "Science Webquests and the Essential Learnings" (DoE, 2004), and "Project Based Learning using Multimedia" (DoE, 2004).

As a result of the professional development programs, teachers were encouraged to gain recognition of their achievements in integrating ICT and be accredited with the EET unit. To date, of the 45 teaching staff at this school, 18 teachers have gained accreditation for their EET unit. This is a 40% participation rate compared to 6% state wide. Some of the portfolios produced will be evaluated, as a component of a broader research project, to determine the extent those teachers have integrated ICT into their teaching and learning programs. This report details the case of one of the participant teachers.

The Research Approach

Research Aims
The overall study, from which the case study in this report is taken, is designed to investigate in what ways teachers have integrated ICT into their teaching and learning practice, and the factors that influence the extent they have done this. It explores the attitudes and perceptions of teachers towards the way they integrate ICT. A profiling instrument (Appendix A) is trialled as a useful model for profiling quality teaching in the area of integrating ICT. This is supported by teacher interviews and evidence of professional practice in a teacher portfolio.

Design of the Study
This research utilises the case study as a strategy of inquiry. Considering Stake's (1995) three categories of case studies – intrinsic, instrumental and collective - this particular study is an instrumental case study. The instrumental case study allows the researcher to examine a case to extend understanding of phenomena, looking for commonalities or differences. It allows the researcher to identify the elements of best practice that highlight the possibilities and opportunities for improving the utilisation of ICT in teaching and learning programs, rather than to determine what common practice is.

Participants
The participants of the larger study, from which the case study in this report is taken, were five secondary Mathematics/Science teachers, teaching in a suburban high school in Tasmania. The teachers' experience ranged from beginning teachers, with 2 years experience, to experienced teachers with 18 years as practicing teachers. Teachers had to meet two selection criteria to be involved in this study. First, they had to have gained accreditation for their EET unit and second, they had to demonstrate a willingness to participate in this study. All the participants were female. The ratio of female to male Mathematics/Science teachers at the school was four to one. The two male teachers at the school could not be included in this study as they were relatively new to the school and had not participated in the professional development that provided the context for this study.

Instruments
The evidence for the study was collected using three data collection instruments: teacher profiling instrument, teacher interviews, and teacher portfolios. The use of three data collection instruments increased the internal validity of the study (Stake, 1995; Miles & Huberman, 1994; Yin, 1994), as information about the case is

examined from three perspectives, each contributing to building an overall picture of the case. Each will be discussed in turn.

First, a teacher profiling instrument (adapted from Watson, 2001) that identifies the factors related to integrating ICT into teaching and learning was used to gather data that are both descriptive and quantitative. The profiling instrument (Appendix A) was designed to be used as a survey or as a semi-structured interview for an area of the Mathematics curriculum: Chance and Data. It was adapted to reflect the content, curriculum and teaching practices associated with the integration of ICT into the curriculum but maintains the structure that reflects characteristics of professional practice, that is, professional development, reflective practice, and teachers' backgrounds (Watson, 2001).

Second, the interview is used as a data collection instrument as it provides insights that are valuable and goes beyond the information collected through everyday conversation (Kvale, 1996). Fontana and Frey (2000) suggest that a semi-structured, ethnographic interview process should provide a depth of data, adding to the descriptive nature of qualitative research. This is the method of interview adopted for this research. The questions in the interview protocol were designed to provide information about teacher professional development, school support structures, teachers attitudes, and to promote reflection.

Third, the use of a portfolio as a data collection instrument provides extensive information about the technological skills and ability to apply and adapt technology to a specific learning situation. It provides a much better demonstration of how ICT is applied 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).

Procedure
Teachers compiled their EET portfolios over a period of twelve months, March, 2003 – March, 2004, as part of their commitment to their own professional development and the goals of the school to create a culture of learning with ICT. The teachers who expressed a willingness to participate in this study and had completed their portfolios were invited to complete the teacher profiling instrument (Appendix A). The teachers were given the choice of making written responses to the profiling instrument or using the instrument as a semi-structured interview protocol. The latter was the preferred option.

The teachers were interviewed individually and were audio-taped. The first section of the interview used the format of the profiling instrument (Appendix A) to guide questions, followed by the interview protocol. The interview provided an opportunity for teachers to discuss the portfolio in detail and reflect on their teaching experience with ICT. For the purposes of this report the results from the teacher profiling instrument and the teacher interview will be referred to collectively as the "teacher profile".

The teacher portfolios were evaluated using an evaluation sheet, "Teaching and Learning with ICT: A Self Evaluation Guide", developed by the Department of

Education and Training, Western Australia [DET] (2003). The guide was developed to give teachers a tool that could be used to gain a sense of the individual's current skill and understanding of teaching and learning with ICT. It was a framework that took into consideration the level of skills developed and in what areas. The structure of the guide is an assessment rubric that uses six Dimensions of Practice: 1. Facilitating Student Learning, 2. Assessing Student Learning Outcomes, 3. Engaging in Professional Learning, 4. Participating in Curriculum Policy and Program Initiatives, 5. Forming Partnerships within the School Community, and 6. Teachers' ICT Skills and Knowledge. A list of the dimensions is given in Table 2 and it should be noted that Dimensions of Practice 1 and 6 have sub sections. The items of evidence in the portfolio were then evaluated against each dimension, and rated according to the level of increasing competence of developing ICT enriched teaching and learning opportunities from Pre-Entry, Phase 1 through to Phase 4. Within each phase are specific descriptions related to the six dimensions. An example of one of the Dimensions of Practice with its corresponding Phases of Development, and descriptions of practice is detailed in Table 3.

Table 2.
Description of Dimensions of Practice (Department of Education and Training, Western Australia, 2003).

Dimensions of Practice
1 Facilitating Student Learning
1.1 Connection to Curriculum Framework
1.2 Student Application of ICT
1.3 Attitude
1.4 Teacher as Orchestrator
1.5 Repertoire of Teaching Strategies
1.6 ICT Access and Use
2 Assessing Student Learning Outcomes
3 Engaging in Professional Learning
4 Participating in Curriculum Policy and Program Initiatives
5 Forming Partnerships within the School Community
6 Teachers' ICT Skills and Knowledge
6.1 Peripherals
6.2 Applications
6.3 Online Services

Table 3.
Example of Dimension of Practice (Department of Education and Training, Western Australia, 2003).

Phase of Development	Dimension of Practice
	2. **Assessing student learning outcomes**
Pre Entry Teachers engage their students in purposeful and appropriate learning experiences without the use of ICT.	Assessment strategies do not include the use of digital media.
Phase 1 Teachers engage their students in sequences of purposeful and appropriate learning experiences and use ICT to increase student productivity and engagement.	Some assessment portfolios contain digital learning experiences.
Phase 2 Teachers meet diverse student learning needs through consistent application of a wide range of effective teaching, learning and assessment practices that include the use of ICT to provide opportunities for demonstration of learning outcomes.	Digital assessments valued by teachers and students to demonstrate achievement
Phase 3 Teachers are innovative in the use of highly responsive and inclusive teaching, learning and assessment practices that effectively meet the specific learning needs of individuals and groups of students using ICT to transform learning opportunities.	Assessment tasks produce products of value to the student, teacher or broader audience that demonstrate evidence of using ICT. Assessments are comprehensive and utilise a diverse range of digital media.
Phase 4 Teachers are proactive in the application of online teaching, learning and assessment strategies to provide customised and responsive learning opportunities.	Students, teachers and parents use eLearning systems to monitor, evaluate and report about learning.

Following completion of the data gathering process the teacher profiles were transcribed and cluster analysis (Miles & Huberman, 1994) was used to determine emerging themes. Issues that emerged from the teacher profiles were contrasted and compared with the results from the teacher portfolios.

Results

The results for one teacher, Kerry (pseudonym), are presented here. They were collected using three data instruments: teacher profiling instrument, teacher interview, and teacher portfolio. For this case, the data collected from the teacher profiling instrument and the teacher interview are presented collectively and referred to as the "teacher profile".

Teacher Profile
Kerry is a Mathematics/Science teacher at a suburban high school in Tasmania. She has been teaching for 10 years and during that time has taught students from Grade 4 to Grade 10, in many different subject learning areas. These have included Japanese, Studies of Society and the Environment, Health and Physical Education, and Computer Science. At the present time, she teaches Grade 9 Mathematics and Science. She studied ICT at tertiary level for two years as part of her Bachelor of Science degree and continued with Computer Science and Science as teaching area specialisations for her Diploma of Education.

Kerry has participated in a number of professional development programs involving ICT. She completed the "Innovations Online Project" with the whole school teaching staff, and the "Project Based Learning with Multimedia" as the representative of the Grade 9 teaching team. Kerry also attended a summer school professional development workshop, "Educating Online", at *e*-magine in January, 2003. This workshop focused on integrating ICT in an online environment and the promotion of online methodologies utilising WebCT. She has also participated in professional development for the use and application of graphing calculators. Kerry completed her EET portfolio in April, 2003, and was the first teacher at the school to be accredited with her EET certification.

Section 1: Significant factors for integrating ICT into teaching and learning
Kerry noted two factors as significant for integrating ICT into the curriculum. First, she raised the issue of time. Kerry felt that her teaching work load and professional commitments did not allow her to dedicate enough time to develop as many teaching and learning programs as she would like. Second, she was not satisfied with the access to computer labs for her classes. She stated "…I can get one class into the computer labs but I can't get the other classes in as there are permanent bookings in Book-It on the lines when I have the other classes." Kerry goes on to say "…I just haven't bothered doing much this year because I can't get into a computer lab on a regular basis."

Section 2: Preparing to integrate ICT into the curriculum
Kerry discussed the way she integrated ICT into the curriculum in general terms and did not give specific examples to illustrate the procedure. She did, however, outline the process involved when she was developing a unit of work associated with a Tasmanian Secondary Assessment Board (TASSAB) course. Kerry described how she would consult the curriculum documents to determine: how much time she had to run the unit, what content had to be covered, and what requirement for technology was stated in the document. She would then work out how many lessons she would have for the unit and fit the content into the lessons for that time frame.

Section 3: Preparing to teach a lesson using ICT
Kerry described a typical lesson for her Mathematics class when students would be using graphing calculators. She said she would "…stand up in front of the class and give a demonstration of what to do and go through a couple of examples." Kerry anticipated this would take five to ten minutes depending on what the specific activity was. The lesson would then progress with "…the students just having a go and working out for themselves how they worked." Kerry indicated that she had used graphing calculators with classes on a number of occasions and her students always responded favourably to the experience. She said "…they always seem to enjoy using them and like trying to work out how to use them."

Section 4: Teaching practices
Kerry stated that she had a WebCT unit on chemistry developed but had not run the unit this year due to the lack of regular availability of computer labs. The unit was designed for Grade 9 students with the whole unit being run online for the duration of the course, usually 15 hours. She said she enjoyed running the unit as the students were more engaged and it gave them an opportunity "…to do some real chemistry." She highlighted that the WebCT environment kept the students more engaged,

improved behaviour management and made the teaching of a topic difficult to teach in the regular classroom, easier. Kerry did, however, caution that increased student engagement did not translate to increased student achievement, declaring "Some of them just play the games and don't get on with the work. They don't do any better than if we were in the Science lab." Kerry did reflect on the learning experience and said she would structure the unit differently the next time she ran it, so that the students did the work first and then played the simulation games later. On the issue of student difficulties, Kerry mentioned again that students have difficulty staying on task and further discussed the need to scaffold student learning in the web environment. As for students' ability to access information on the Internet and produce their work on computers, Kerry said that very few of the students experienced difficulties, with most of them having good computer skills.

Section 5: Advantages of using ICT in teaching
Kerry indicated that she did not think that the computer environment contributed to improving student learning outcomes. She said it was her experience that students help each other much the same if they are in the computer lab or the regular classroom. This also applied to the quality of student work and the development of higher order thinking skills. Kerry said "…it is about the same whether they are on computers or not." She did, however, feel that computers helped to create better-looking products than the students could do just using pen and paper, prompting students to complete work out of class time and edit and refine their work on computers. She indicated, however, that this was to only a "…moderate benefit."

Section 6: Introducing a new computer application
Kerry chose the example of introducing graphing calculators to a class for the first time, as an example of how she would introduce a new computer program. Her responses were similar to those given for Section 3, with Kerry adding "…sometimes I show them what to do to get started, then we just learn what to do together." The intention was for Kerry to select an ICT program or application that was not discussed previously. This was not conveyed adequately to Kerry and the opportunity to gather data about a different application of ICT was lost.

Section 7: Confidence
This section of the profiling instrument focused on activities related to integrating ICT into teaching and learning. Kerry indicated the highest level of confidence for: teaching new applications, developing effective scaffolding resources, reflecting on learning experiences for students and modifying resources based on student learning needs, planning collaboratively with other teachers and ICT support staff, providing opportunities for students to work collaboratively within the school and beyond, and modelling ethical use of material from the Internet or other digital resources. Her responses for confidence in being able to: choose activities that facilitate the development of stated learning outcomes for students, customise digital resources to meet the individual needs of students, and provide authentic activities and experiences in ICT, were all the same being slightly lower than the highest confidence.

Section 8: Objectives for Using ICT with Your Students
Kerry indicated that she mostly used ICT resources and applications for students to master skills just taught, finding out about ideas and information, and giving students the opportunity to work independently. She does not often aim to use computers for

students to improve computer skills or express themselves in writing. A moderate usage rate was indicated for remediation of skills not learned well, with slightly higher responses given for: communicating electronically with other people, analysing information, presenting information to an audience, and learning to work collaboratively.

Section 9: Teacher Skills

Kerry's responses for confidence in her ability to use computer applications and tasks associated with those applications, ranged from medium skills for: graphics applications, multi-media presentations, and database management applications to responses at the highest skill level for word processing applications, email and the use of search engines. She indicated her confidence to use spreadsheet and desktop publishing applications were at the middle of this range. Additional to the list provided, Kerry declared her WebCT skills to be medium high and her use and application of graphing calculators to be high.

Section 10: Teacher Background

The information from this section was used to provide the details of Kerry's teaching experience and personal details described at the beginning of the Results.

Section 11: Professional Development

To provide learning activities and resources for her students, Kerry indicated that she used state curriculum documents; the Learning, Teaching and Assessment Guide website; and the Department of Education, Tasmania web site at http://www.discover.tased.edu.au. She also used those resources to develop her own resources for teaching and learning activities. Kerry went on to say she supplemented this information with CD ROMs, videos, texts, and professional development notes.

Kerry outlined the extensive professional development activities she had been involved in that contributed to the description of her professional activities at the beginning of the Results. Commenting on these activities, Kerry stated that she did not always find the professional development useful as "…I have more skills than the instructors at *e*-magine." She went on to say that she would benefit from an "expert" whom she could contact when having difficulties, as she felt she had the confidence to learn new applications on her own, but recognised the advantages of having expert help when needed. She suggested professional development that would cater for her could be an individual pursuit as an online tutorial or organised on WebCT. These options would provide easy access to the "expert". Kerry expressed a desire to learn how to use the graphics application, Flash.

Teacher Profile Summary

Kerry's primary purposes for using ICT appeared to be greater student engagement and improved student behaviour. She did, however, recognise the advantages of access to resources on the Internet for students as it provided resources and information that schools could not possibly supply. Kerry demonstrated a great enthusiasm for using ICT in her classes and was disappointed that she was unable to provide more opportunities for her students. The school structure with computer labs being permanently booked out for some classes was denying equitable access for her students. Kerry did not articulate the learning benefits of ICT for her students and on a number of occasions stated that her students "…do not learn any better on computers

than in the regular classroom." Another issue highlighted by Kerry was lack of time to develop resources and learning programs. She expressed concerns that this was limiting the way she used ICT in her teaching practice.

Teacher Portfolio

The teacher portfolio was comprised of ten items of evidence. These items were teacher resources that provide evidence of the teaching and learning experiences organized for students by the teacher and were intended to include: lesson plans, unit plans, student worksheets, assessment tasks, assessment assignments, online resources, and student work. Some items were made up of a number of these teacher resources. Each item was evaluated using the "Teaching and Learning with ICT: A Self Evaluation Guide (DET, 2003)*,* to determine to the level of achievement that contributed to the Phase Level assigned. These are summarised at the end of the section.

Chance Unit – Grade 7

This item included a unit overview and a student worksheet for the Grade 7 Mathematics strand, Chance and Data. The unit overview gave a brief outline of the unit to be taught. It included the number of lessons, suggestions for activities, an outline of an assessment task, and website addresses to online resources. The online resources were two interactive sites that simulated the results of chance events. The activities were an adequate use of ICT for the promotion of understanding of Chance and Data concepts but the activities appeared to promote a "guess and check" strategy to achieve a result, and the students were directed to use this strategy.

The student worksheet provided was a checklist for students to use when compiling a Chance and Data unit of work for assessment. As part of the unit, the students had to use MS Excel to construct graphs from authentic data collected from their class.

Algebraic Modelling

Algebraic Modelling was a unit plan that focused on the use of graphing calculators. It was made up of 25 lessons and gave an outline of the concepts to be taught in each lesson. Graphing calculators played a major role in the achievement of the learning objectives for this unit.

Class List

A MS Excel spreadsheet, which was essentially a class list, was provided as an item of evidence. The names of students on the list were downloaded from a database, which was accessed from the school intranet. Kerry indicated that she used the class list to record student attendance and results.

Business Maths

This item included an assignment, assessment task, and student work. The assignment required students to use online resources to solve the problem of where to invest money for the best return. The activity gave the students the opportunity to be self-directed and to select a range of technologies to solve the problem. It involved research on the Internet, presentation of results and the analysis of results to make an informed decision.

The assessment task included as part of the Business Maths item required students to use MS Excel to present information in a table and to construct a graph of the information. The completed work produced by students for this unit was submitted by email.

Grade 9 Physics
Research on the Internet was the main use of ICT targeted in this item. It was an assignment designed to give students the opportunity to explore Physics concepts through inquiry. It centred on five construction challenges with specifications given for each challenge. Students were given limited materials to make the constructions. As an example, one challenge required the students to construct a paper aeroplane that would fly 20 metres. The students were to make the constructions, explain the learning process, describe how they made it work, and explain the physics concepts associated with each challenge.

Wildlife Websites
This student worksheet required students to access nominated websites to determine the accessibility and appropriateness of information given. The students were to become critics and give the sites a rating from 1 – 10. The purpose of the activity was to model how to critique a website.

Useful Rocks
Useful Rocks was an open-ended task where students were required to collect information about a type of rock of their choice, describe its purpose, determine alternatives to the rock if it was no longer available, and explain the impact of the rock on life today. A particular focus of this unit was the ethical use of information from the websites. Students had to provide a bibliography when they made their final presentation and had to ensure all images used were allowed to be copied.

My Maths List
Kerry has developed a website on the school intranet to be accessed by her students. The website had a collection of links to Mathematics games and Science simulations. The website provided resources that were used to support Kerry's teaching program.

WebCT – Chemistry
WebCT-Chemistry is a Grade 9 unit of work that Kerry developed at the professional development workshop, "Educating Online". The unit was accessed through the information management system, WebCT, and students could access the unit externally from the school. The unit contained a variety of activities and information including: games, simulations, comprehension tests, assessment criteria, research projects, and experiment instructions. WebCT-Chemistry utilised images and graphics to provide an interesting learning platform.

Forensic Science
A student's MS PowerPoint presentation was given as an item of evidence together with a supporting email, written by Kerry. The presentation was a scenario of a crime and how the crime was solved using Forensic Science. Images and written text were used to tell the story of the forensic investigation. The email provided details indicating that the piece of work was only completed when the student was

encouraged to use a multimedia presentation, as it would not have been done otherwise.

Teacher Portfolio Summary

Kerry provided evidence of utilising ICT in both her learning areas of Mathematics and Science. There was a diverse range of activities and the evidence given demonstrated clearly Kerry's ability to create, retrieve, select, and publish online resources. The majority of the activities are teacher directed and give little flexibility for students to extend themselves beyond gathering and learning information. This demonstrated that most of the ICT activities played a supporting role in assisting students to understand concepts being taught. For these reasons, the items in Kerry's portfolio were evaluated in most areas as being at Phase 2 of development, according to the Dimensions of Practice (Table 3). Some of the items had elements that were evaluated at Phase 3 but as there was a lack of identification of the learning outcomes that the ICT activities provided, Phase 2, in the most part, had been achieved.

The exception to this was the Useful Rocks item. This item was evaluated at Phase 3, as it was open-ended and allowed students to be responsible for their own learning. In so doing, more opportunities were made available for ICT to be an integral part of the learning experience, thus moving it beyond a supporting role.

The evaluation for Dimension of Practice 1.6 ICT Access and Use was determined to be at Phase 1 of development. This was due to the structure of the school and was not a reflection of Kerry's preferred use of computers. Kerry's school positioned most of its computers in lab situations and she did not have access to classrooms with computers. This did not make it possible to access computers on a "just-in-time' basis. The teacher portfolio did not provide any items of evidence for the Dimensions of Practice: 4. Participating in Curriculum Policy and Program Initiatives and 5. Forming Partnerships within the School Community. A summary of results from the evaluation of the teacher portfolio is given in Table 4. The notations used in the table are: PE–Phase Entry, P1–Phase 1, P2–Phase 2, P3–Phase 3, and P4–Phase 4. A full description of the phase levels is detailed in Table 3 (left hand side).

Table 4.
Summary of Teacher Portfolio Evidence, Dimensions of Practice and Phase Levels

Evidence	Dimensions of Practice												
	1.1	1.2	1.3	1.4	1.5	1.6	2	3	4	5	6.1	6.2	6.3
Chance Unit - Grade 7		P2	P2	P2	P3	P1	PE					P2	P2
Algebraic Modelling	P1	P2	P2	P2	P3	P2	P2	P2			P1	P2	
Class List												P3	P2
Business Maths	P1	P2	P3	P1	P2	P1	P2					P1	
Grade 9 Physics	P1	P2	P2	P2	P2	P1	P1					P2	
Wildlife Websites		P1	P2	P2	P2	P1							P2
Useful Rocks		P3	P3	P3	P2	P1	P3					P3	P3
My Maths List		P2	P2	P2	P2	P1							P2
WebCT - Chemistry	PE	P2	P3	P2	P2	P1	P1	P1				P3	P4
Forensic Science	PE	P2	P2	P2	P2	P1	P2				P1	P3	

Discussion and Implications

This report details how one teacher, selected from a larger study profiling five Mathematics/Science teachers, has integrated ICT into her pedagogical practices. The results are discussed in relation to the aims of the larger study. Specifically, how the teacher has integrated ICT into her teaching practice, and her attitude and perceptions towards integrating ICT. In addition, the role of the teacher profiling instrument as a qualitative research instrument together with its intersections with the teacher portfolio is presented. This is followed by a discussion of the educational implications gleaned from this part of the study.

How the teacher has integrated ICT into her teaching practice
In this case, the promise of ICT transforming educational practice has not been fully realised. Kerry has made considerable steps towards integrating ICT into her teaching practice, and the extent to which she uses it across her curriculum areas, is commendable. She has, however, not reached the stage where it could be considered that ICT has transformed her pedagogical practice. She demonstrates her skill as a technology user without translating this to innovative learning experiences for her students. Kerry uses ICT to supplement her classroom practice but it has not become an integral part of the learning process. Despite engaging in many ICT professional development activities, they do not appear to have facilitated a shift in her teaching methodology. Kerry has used ICT technologies as a platform to publish student resources that are essentially teacher directed, and for the publication of student work. Activities such as the Business Maths assignment, WebCT – Chemistry, and Grade 9 Physics provide the opportunity to extend students' thinking and develop higher order thinking skills; however, Kerry does not appear to have recognised these opportunities. The types of activities Kerry does with ICT would be just as easily served without it. She has failed to harness the global communication capacity of ICT, the opportunities for inquiry and discovery it holds, and the chance it offers for students to be self-directed and responsible for their own learning.

The teacher's attitude and perceptions towards integrating ICT
Kerry is undoubtedly keen and enthusiastic towards using ICT activities in her classroom. She feels it is good for establishing improved motivation and engagement for her students, and wants to include more ICT activities in her teaching repertoire. Kerry has made a great commitment to extend her own ICT skills and has created ICT activities in most areas of her teaching. She does, however, appear to be limited by her perception that it does not improve learning outcomes for her students. This perception seems to inhibit her ability to recognise opportunities for improved learning and so fails to exploit the chance to do so. It is understandable that Kerry does not believe ICT promotes improved learning outcomes for her students as she gives the impression she has not used ICT in her teaching to its full potential. She firmly believes that the students learn just as much without the use of ICT. This is possibly due to the nature of her chosen activities being predominantly teacher directed thus restricting the opportunities for development of higher order learning.

Kerry has great confidence in her own ability to: design ICT activities, scaffold student learning in a technology environment, provide opportunities for students to work collaboratively, learn ICT applications quickly and easily, and continue to build

on these skills. At present, it does not appear that this is of any great advantage for her students but it does position Kerry favorably to be able to develop her practice further.

The role of the teacher profiling instrument as a qualitative research instrument together with its intersections with the teacher portfolio

The teacher profiling instrument played a vital role in this part of the major study, from which, one teacher's practice was evaluated. It provided information that captured details about Kerry's experience as a teacher, the school environment in which she works, professional development she has attended, and her classroom practices, which were not provided in the teacher portfolio. In particular, Kerry indicated in the teacher profile that she worked collaboratively with other teachers to design and create learning programs. This was not evidenced in the portfolio. It is suggested that Kerry may not have used the collaborative work in her portfolio and focused her evidence on her own practice.

Examination of the teacher portfolio provided evidence of how Kerry utilised ICT in her classrooms and the extent it is used in her teaching programs. This information was easily gleaned from the teacher portfolio, however, looked at in isolation the teacher portfolio may have given the impression that Kerry valued ICT highly as a learning tool and environment. It was the teacher profiling instrument that provided the opportunity for Kerry to be reflective about her practice and to reveal that she felt ICT did not improve learning outcomes for her students.

The teacher profiling instrument and the teacher portfolio provided a broad picture of Kerry's teaching practice but not a complete picture. Evidence provided in the teacher profile, such as Kerry's confidence to scaffold student learning in a technology environment and provide opportunities for students to work collaboratively were not evidenced in the teacher portfolio. This suggests that further triangulation of data is required to have a comprehensive view of a teacher's practice. Classroom observations would provide evidence to support the teacher profiling instrument and the teacher portfolio as well as assist in identifying strategies that teachers may use to promote student learning, not articulated in interviews, or documented in teacher portfolios. This supports suggestions from Finger et al. (2003) that the evaluation of the integration of ICT into teaching and learning practices needs to come from a number of different perspectives.

Educational implications

The results of the case study of one teacher indicate there are educational implications that may be significant for the developers of professional development programs. The results from the larger study will provide further evidence to inform the use of ICT in teaching practices.

To date, most professional development in ICT has focused on the teacher and the development of effective ICT skills. This case study suggests the focus needs to shift. Woodrow, Mayer-Smith, and Pedretti (2000) state:

> Educational change occurs when the underlying frameworks of established classroom practice are changed. Technology may be a catalyst to produce desired classroom change but technology alone will not effect significant change unless teachers are open to re-examining and challenging their beliefs about what constitutes good teaching and

learning, willing to experiment with new teaching practices, and given support during the change process (p. 38).

This sends a clear message to developers of professional development programs that they need to provide opportunities for reflection and critiquing of current practices to challenge teachers. It is suggested that by challenging current practices teachers will be willing to seek from ICT the characteristics of teaching and learning that may not be present in the way they use ICT at the present time. Ward (2003) recognises that teachers need a wider range of skills and abilities to integrate ICT effectively into teaching practices and supports the notion that professional development needs to move beyond the provision and acquisition of skills. Brandt (2001) also contends that a wider perspective to learning needs to be adopted to ensure teachers are extended from the development of ICT skills to applying ICT to promote the effective use of information, in a learning environment. This applies to teachers and students.

Finally, the evaluation of how teachers integrate ICT into teaching and learning practices needs to focus on what students do (Finger et al., 2003). It may also be argued that professional development programs need to come from this perspective. This calls for these programs to move beyond a skills-based focus relevant in previous decades, to a focus that is informed by research demonstrating the potential of ICT to enhance student learning. Until teachers can identify the learning outcomes that are supported by ICT, they cannot maximize the opportunities for learning presented by technology.

Future research will need to devise, test, and evaluate ways of measuring the integration of ICT in teaching practice. In this study, the teacher profiling instrument, supported strongly by the teacher portfolio, provided an extensive view of a teacher's practice. It was, however, found that these instruments, although effective research tools, did not provide a complete picture of professional practice. It is important that the appropriate use of other methods of data collection, such as classroom observations, be explored.

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Appendix A

TEACHER PROFILE: Integrating ICT into Teaching and Learning
(Space for written responses has been removed.)

Significant Factors for Integrating ICT into Teaching and Learning

The questions throughout this survey are an attempt to identify factors, which are significant for the Integration of Information and Communication Technologies (ICT) into Teaching and Learning.

BEFORE you go further, please brainstorm and write down what aspects you think might/should be included in a survey of this type. It may help you to consider:

- Factors which you consider influence the integration of ICT into your professional teaching practices.
- Factors which you would look for in employing a teacher to teach across the curriculum with ICT.

Some factors may be particular to integrating ICT, while others may be general factors in teaching that you feel have a significant impact on your capacity to integrate ICT into professional teaching practices. Feel free to write your answers in point form or any form you wish.

AFTER you have completed this survey, please return to this page, and write below any aspects which you would like to include which are not present in your list or our survey, or any aspects which you think are under-represented.

Preparing to integrate ICT into the curriculum (1)

If you were preparing to teach a unit (or sequence of lessons) that uses ICT (to a grade level which you teach), how would you go about preparing?
Consider the following:

- What resources would you refer to?
- Would you consult anyone else? Whom?
- How long might you spend to prepare the overview of a unit plan?

Briefly brainstorm ways that you might integrate ICT into the unit. Just spend a few minutes, and do not bother to consult other resources.
Arrange these topics into a rough overview plan to show the sequence of topics in the unit, noting how you would use ICT with your students.

Preparing to teach a unit of work using ICT (2)

Now focus on a unit of work that you think is important.
Briefly outline how you might teach it. Considering the following:

- How would you introduce the topic?

- What resources or materials would you use?

- How much class time would you spend?

- What teaching methods and groupings of students would you use?

- What lessons might precede or follow the topic?

Have you ever taught this topic?

If yes, did you enjoy teaching this topic and how did your students respond?

Teaching Practices

Do you currently teach any topics utilising ICT?

- ☐ **No**, because:
- ☐ **Yes:**
  - Which Topics?
  - Which grades?
  - About how many hours or lessons?
  - Do you enjoy teaching with ICT? Which activities?
  - With which activities do students have the most difficulty?
  - Which activities do your students enjoy the most?
  - What do you do when students have these difficulties?
  - What resources do you or your students use to support an ICT activity?
  - o Graphing Calculators?
  - o Databases?
  - o Software?
  - o Computers, laptops?
  - o Tutorials?
  - o Websites?
  - o Performance Rubrics?
  - o PDAs ?
  - o Projectors?

Introducing a new computer program

Now focus on introducing a new computer program or application to a class for the first time.
How might you teach a new application to a class – eg. Graphing in Excel?
Briefly outline how you might teach it. Consider the following:

- How would you demonstrate the particular features of the application?
- What resources or materials would you use?
- How much class time would you spend?
- What teaching methods and groupings of students would you use?
- What lessons might precede or follow the topic?

Have you ever taught this topic?

If, yes did you enjoy teaching this topic and how did your students respond?

Advantages of using ICT in teaching

Listed below are some statements concerning beliefs or attitudes about integrating ICT into teaching and learning. Please mark your level of agreement with each statement.
You are free to place a mark anywhere on the scale to indicate your level of agreement.

Advantages of using ICT

❒_____|_____❒
Strongly   Neutral   Strongly
Disagree   Agree

❒_____|_____❒	Students create better-looking products with computers than they could do with just writing and other traditional material.
❒_____|_____❒	Computers provide a welcome break for students from more routine learning activities.
❒_____|_____❒	Students help one another more while doing computer work.
❒_____|_____❒	Students take more initiative outside class time when they use computers – doing extra research or polishing their work.
❒_____|_____❒	Students are more willing to edit and refine their work when they use computers.
❒_____|_____❒	Students produce quality work when using computers.
❒_____|_____❒	Students develop higher-order thinking skills when they use computers.

❒_____|_____❒
Strongly   Neutral   Strongly
Disagree   Agree

Confidence

Listed below are some of the activities related to integrating ICT into teaching and learning. Please mark your level of confidence in your ability to implement them within your teaching practice.

You are free to place a mark anywhere on the scale to indicate your level of confidence.

My Ability to use ICT for Teaching and Learning

❐_____❐ ❐
Low Confidence   High Confidence   Would not be using ICT in this manner

❐_____❐ ❐   To teach new applications.

❐_____❐ ❐   To develop effective scaffolding resources, such as Tutorials and Webquests.

❐_____❐ ❐   To choose activities that facilitate the development of stated learning outcomes for students.

❐_____❐ ❐   To customise digital resources to meet the individual needs of students.

❐_____❐ ❐   To provide authentic activities and experiences in ICT for students.

❐_____❐ ❐   To reflect on learning experiences for students and modify resources based on student learning needs.

❐_____❐ ❐   To plan collaboratively with other teachers and ICT support staff.

❐_____❐ ❐   To provide opportunities for students to work collaboratively within the school and beyond.

❐_____❐ ❐   To model and teach ethical use of material from the internet or other digital resources.

❐_____❐ ❐
Low Confidence   High Confidence   Would not be using ICT in this manner

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Objectives for using ICT with your students

Listed below are some objectives for integrating ICT into teaching and learning with your students.
Please mark your level of use for your students with each objective.
You are free to place a mark anywhere on the scale to indicate your level of use.

My Objectives for using ICT

❒_____❒   ❒
Low Use   High Use   Would not be using ICT in this manner

❒_____❒   ❒   Mastering skills just taught.

❒_____❒   ❒   Remediation of skills not learned well.

❒_____❒   ❒   Expressing themselves in writing.

❒_____❒   ❒   Communicating electronically with other people.

❒_____❒   ❒   Finding out about ideas and information.

❒_____❒   ❒   Analysing information.

❒_____❒   ❒   Presenting information to an audience.

❒_____❒   ❒   Improving computer skills.

❒_____❒   ❒   Learning to work collaboratively.

❒_____❒   ❒   Learning to work independently.

❒_____❒   ❒
Low Use   High Use   Would not be using ICT in this manner

Teacher Skills

Listed below are some computer applications.
Please mark your level of confidence in your ability use the computer applications and
to perform the tasks associated with the applications.
You are free to place a mark anywhere on the scale to indicate your level of
confidence.

My Ability to use ICT applications and perform computer tasks

❏_____❏ ❏
Low Skills   High Skills   Would not be using ICT in this manner

❏_____❏ ❏ Word Processing applications,
                                        eg MS Word.

❏_____❏ ❏ Spreadsheet and data analysis
                                        applications, eg MS Excel.

❏_____❏ ❏ Multi-media technology
                                        presentation applications, eg
                                        MS PowerPoint.

❏_____❏ ❏ Database Management
                                        Applications, eg MS Access.

❏_____❏ ❏ Desktop Publishing
                                        applications, eg MS FrontPage.

❏_____❏ ❏ Graphics applications, eg MS
                                        Paint, Flash.

❏_____❏ ❏ Email.

❏_____❏ ❏ Search Engines, eg Google.

❏_____❏ ❏
Low Skills   High Skills   Would not be using ICT in this manner

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Teacher Background

- Sex: ☐   Female
          ☐   Male
- How many years have you been teaching?
- Which grade levels have you taught in that time?
- Which grade levels are you currently teaching?
- Which subject areas did you study during your teacher training?
- Which subject areas are you currently teaching?
- What other subject areas have you taught?
- During your teacher training or other tertiary study, did you study any courses which included topics in ICT?
    - ☐ No
    - ☐ Yes: what sort of course?
        - ☐   Computer Programming   ☐   Computer Applications
        - ☐   Operating Systems   ☐   Physics
        - ☐   Database Management   ☐   Mathematics
        - ☐   Other: ………………………………
    - About how many years ago was this study?
    - How much time did the ICT subjects take?
        - ☐   A few hours   ☐   A few weeks
        - ☐   A   semester   ☐   More than one year
- Do you have any other qualifications?
    - ☐   No
    - ☐   Yes: what sort of course?
- Do you have any other work experience that assists you with your teaching?

Professional Development

Have you seen the following documents in your school?
Have you read parts of any of them?
Have you used any ideas from them in your classroom?

	Not Seen	Seen	Read	Used
State Curriculum Documents	❒	❒	❒	❒
National Statement on Technology for Australian Schools	❒	❒	❒	❒
Technology - A Curriculum Profile for Australian Schools	❒	❒	❒	❒
Learning, Teaching and Assessment Guide website at: http://www.education.tas.gov.au/ltag/	❒	❒	❒	❒
Department of Education, Tasmania web site at http://www.discover.tased.edu.au/	❒	❒	❒	❒
Texts, CD ROMs, or other sources (please list):	❒	❒	❒	❒

- Have you participated in any professional development related to ICT?
  - ❒ No
  - ❒ Yes   If so, please detail:
  - Organised by school, university, e-magine, or other body?
  - Participated with others from school, own initiative, etc?
  - How long did it last (hours, days)?

- What type of professional development would benefit you the most in your teaching with ICT? Examples might include:
  - School-based sessions
  - A university course, e.g. Graduate Certificate
  - Personal reading
  - School-based sessions

- In your opinion, who would be best to lead professional development? Examples might include:
  - Another teacher at my school
  - A school-based ICT facilitator
  - An outside "expert"
  - A subject-based curriculum officer

- Do you have any other specific comments about professional development in relation to integrating ICT into the curriculum?