

## A model for initial teacher ICT training

**Andrew E. Fluck, University of Tasmania**

*Andrew.Fluck@utas.edu.au*

*http://www.educ.utas.edu.au/users/afluck*

### Abstract

*This paper describes the development of a set of information and communication technology (ICT) competencies for initial teacher trainees. One of its strengths is its integration with a proposed curriculum framework for the use of computers across the curriculum in schools. The full set of competencies articulates with the nationally recognised Graduate Certificate of Education (Computing for Teaching and Learning). The model is arranged into three strands, focussing on:*

- *the teacher as a professional;*
- *pupil learning in the classroom; and*
- *whole-school approaches to ICT planning, infrastructure and management.*

*In the process of gaining their qualifications, initial teacher trainees undertake several innovative work-based and learning tasks. They become 'lurkers' on an e-mail list, distributing well-researched answers to practitioner's questions. They make their own web-sites, and learn how to link these together to make a meaningful composite. And they map the changing complexion of ICT use in the classroom.*

*These 'net-savvy' skills, of downloading ZIP or HQX files, installing applications, managing servers, are now beginning to be part of the essential toolkit for every school. Employment prospects for ICT support personnel in schools are looking rosier, and there is a desperate need for ICT management at a suitable level of power and skill as we come to depend more and more upon these technological devices.*

### Introduction

In December 1999, an APEC (Asia-Pacific Economic Forum) workshop was held in Canada. Entitled "Workshop on the Integration of Information and Communication Technologies (ICTs) through Teacher Professional Development", it gave an overview of pre- and in-service training on this topic in a range of countries (CMEC, 1999). Most of the countries represented had well-structured programs of teacher development, which covered the range from basic operational skills to highly structured schemes for integrating the computer into general classroom learning. Although not represented there, the operational skills model has been used in Estonia, which as a new country has an accelerated scheme to put computers into schools. Training there is based upon the International Computer Driving Licence, which is also available in Australia (ACS, 1999).

The picture of Australian involvement in such activities showed its highly disparate nature around its States and Territories. In the pre-service field, information technology ranges from a compulsory subject to an optional one for student teachers, sometimes has a separate unit, and at other institutions is integrated across the entire degree. For in-service training, there are a number of government schemes, and some on-line courses such as Using EdNA in the Curriculum (RICE, 1999). Teacher registration requirements in respect of this topic vary greatly from state to state, and are sometimes very general. For instance, the Queensland Board of Teacher Registration stated in April 1999 that:

6.11 Teacher education graduates should have an understanding of the implications of learning technology, information technology and communications technology for educational practice.

6.29 Teacher education graduates should have an understanding of and ability to use appropriate technologies:

- to facilitate learning
- for administrative purposes
- for professional interaction

With this broad range in mind, the following paper describes in some detail the development of the analogous course units at the University of Tasmania, and explains the reasoning and local contexts which affected them. The model of professional development integrates with a national award and integrates with a proposed cross-curriculum framework for the use of information technology in schools (Fluck 1997).

### **Information Technology in Education at the University of Tasmania**

As previously mentioned, in some teacher education programs, ICT experiences are integrated throughout the curriculum and are modeled extensively by lecturing staff. However, such a structure is difficult to incorporate into accountability models, and separate unit(s) of study are more usual, without negating efforts to promote and encourage modeling where appropriate. The main disadvantage of separate units of study for ICT, as identified by Moursand & Bielefeldt (1999) is where they concentrate solely upon basic skills such as word-processing. The model described here acknowledges basic skills as an essential building block, but proceeds to build upon this foundation in significant ways.

A unit on the educational uses of information technology has been a feature of teaching degrees at the University of Tasmania for quite some time. Over the last five years, the structure of this aspect has been changed, to harmonise skills and expectations across the various awards, and to become congruent with the in-service training programs offered to practicing teachers in the state service.

As with other areas of the teacher training curriculum, this subject has to compete for time and resources. Since a degree takes from two to four years to complete, and reviews leading to structural change are about every five years, there can be radical technological improvements before students graduate with skillsets appropriate to the current state of the art. Also, it seemed inappropriate to plan training for the use of computers in the absence of clearly articulated policies from the major local employer, or any framework for the integrated use of ICT (information and communication technology) across the curriculum.

The latter was therefore developed by a group of staff and computer literate students with the vision and time to develop approaches. It is a credit to members of this group that four years afterwards, the personal web-sites of three members occupy seven of the 20 most popular areas on the Faculty server. The framework created by this discussion group for the use of computers across the curriculum was called the Key Information Technology Outcomes (KITOs, or see <http://www.educ.utas.edu.au/KITOs>). Training within the Bachelor of Education, Bachelor of Teaching, Bachelor of Education (in-Service), and several Master of Education units was planned around the framework. Requests to use, modify and adapt the framework by schools around Australia continue to be approved regularly.

### **The move to competency based ICT training**

The overall framework for the training is shown in Table 1. This shows the three strands through which students can progress, and in our experience the skills represent coherent stages of development. Attitudinally we have found that teachers are not confident in supporting student computer use until they have mastered it for their own personal and professional purposes. Likewise, the formulation of school-wide policies does not come easily unless a teacher has implemented the new strategies for encouraging learning in their own classroom. In many ways the

emphasis shifts as Table 1 is traversed, from the teacher him/herself, to the classroom, and finally to the entire learning institution.

**Table 1**

Strand	Personal and Professional Focus	Teaching and Learning Focus	Management and Organisation Focus
Emphasis	<i>The teacher:</i> using the computer to carry out professional tasks.	<i>The classroom:</i> using the computer to enhance student learning.	<i>The school:</i> using the computer to establish school-wide systems.

Currently within the pre-service education degrees, most learning is done within the Personal and Professional Focus, but it is envisaged that this may soon be relegated to an initial competency test, and valuable contact time will be concentrated on the Teaching and Learning Focus. This year, graduating teachers can elect to return to study to master the Management and Organisation focus.

Deciding the award context for the ICT component of the courses has been interesting. When marks were not attached to the unit, students generally avoided it if possible. When it was integrated in an introductory education unit, there were difficulties splitting marks, because to do so would mean some students might graduate without mastering the ICT skills regarded as so vital by employers. Simultaneously, a proportion of the student body expressed the desire to have a greater degree of tutorial contact time. With limited resources, it was put to the students as a whole that contact time might be varied according to self-rated prior knowledge, and this was accepted.

Because of these factors, the Personal and Professional Focus was made into a competency-based unit, which students had to master to achieve a pass in the base Education unit of the Bachelor of Education. Under the current arrangements, students are given access to the on-line material, and are asked to examine the competencies. After reflection, they opt into a tutorial stream that runs weekly, fortnightly or monthly. All students have to correctly complete competency testing embedded in the tutorials to verify learning, and two semester-end practical tests that culminate the unit. Work in the Teaching and Learning Focus is largely optional and reserved for later years of the course to ensure content is more topical for graduates.

## **Course content**

### **Personal and Professional Focus**

Within this focus, students have the opportunity to master the basics of word-processing, e-mail, Internet searching and similar skills. Each set of workshop notes includes a small task to demonstrate topic mastery. For the end of each semester, students prepare a tri-fold brochure, a personal web-site, and a spreadsheet. A longer-term project asks students to subscribe to an e-mail list relevant to education. In the subsequent list discussions, they find a posted query, and identify a resource on the Internet that contributes to an answer to this query. They review it in 200-300 words, and post the review and answer back to list. This scheme introduces students to the protocols of listservs, without annoying the regular list users with a bombardment of student queries. To ensure students really have mastered all the sub-skills, they are required to perform some actions in a supervised testing situation, such as inverting a digitised photograph, linking web-pages together, or spreadsheet manipulations.

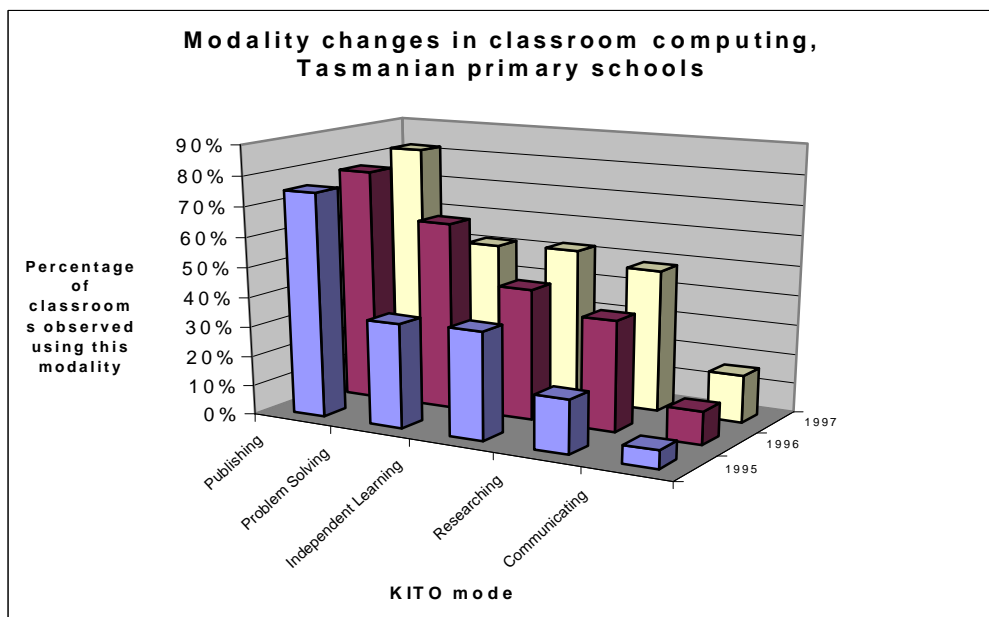
### **Teaching and Learning Focus**

Moving on to an emphasis on classroom learning, students look at the five modes of computer use in the KITOs:

- Publishing
- Communicating
- Researching
- Problem-solving
- Independent Learning

Looking at all these modes, students examine software and classroom contexts in which they can be applied for most age-ranges. To ensure a critical approach, they are asked to describe in detail the educational experiences they would provide to enable students to achieve all the outcomes that are, or should be, in 5 contiguous KITO framework cells. Since competence in the classroom use of computers is expected upon completion of the unit, students demonstrate this with a piece of curriculum software. They also prepare a critical evaluation of a piece of software and illustrate its integrated use in a scheme of work, both of which are written up as a web-page and linked into the KITO's web-site. As part of their school practicum, they observe the types of computer use in classrooms, and have built up a picture of broadening modalities in Tasmanian Primary schools (Figure 1):

**Figure 1**



The course combines food for thought about the role and industrial implications of integrated learning systems with practical skills such as the identification, location, downloading and installation of curriculum software from the World-Wide-Web. Practical and theoretical issues such as LOGO, motivation, the effects of ICT upon student learning and social relationships are also covered. To ensure students are exposed to likely futures, they also examine lesson plan databases, the role of authoring software, and current exemplary practice.

### **Management and Organisation Focus**

This Focus area is divided into three strands:

- Pedagogy
- Infrastructure
- Planning

Since the purpose of this optional or post-graduate unit is to prepare teachers to take a significant school-wide role in the development of information technology, the theoretical underpinning forms the basis. Participants join a supportive e-mail list prior to the course, and this can be used to exchange information about current policy initiatives even when face-to-face contact has finished. Stimulating discussions argue the role of ICT in education; whether it is to support or enhance the curriculum. We look at stages of technological innovation, physical classroom layouts and the health/safety aspects of computers therein. Students master the essentials of networking, including protocols and wiring. Practical exercises permit the creation of NT or Linux servers, and introductory server management & administration. ICT Planning, data security, copyright/left, staffing issues, and budgeting are all covered in ways related to participant's own backgrounds.

## **A National ICT Award**

Whilst the University was moving to establish a clear path to operational ICT competencies for pre-service teachers, the state Department of Education began a process to specify training for teachers to integrate computers into classroom practice. A skills analysis was conducted, and a consultation committee involving University staff convened. This culminated in the Graduate Certificate in Education (Computing for Teaching and Learning) being approved by TAREC (Tasmanian Accreditation and Recognition Committee) and placed on the National Register of Training (Teacher and School Development Branch, Tasmanian Department of Education, 1999).

It was apparent from this process that the in-service training previously conducted in the state school system would be superseded by the new Graduate Certificate. This marked a change from introductory courses in operational skills, to a training scheme that focussed upon the teaching and learning process. The modules cover:

1. Teaching and Learning
2. Implementing Good Practice
3. Professional Activities
4. Learning Environments
5. Management and Access
6. Leadership Practices
7. Research and Development
8. Evaluation and Review
9. Collaboration and Communication

To gain the award, students complete seven modules, including the first two essential modules. Since the award falls within the Australian Qualifications Framework, people can transfer their training to other institutions and to other parts of the country and receive credit for training already undertaken.

## **Further Cooperation**

With these developments signposting the path, there was further cooperation between the University and the state government in relation to the system adopted for student administration. The School Administration Computing System (SACS) was donated to the University, and included in the Personal and Professional Focus courses for pre-service teachers. This meant that students were able to practice the use of a management system widely used in Tasmanian schools for student records, attainment recording and report generation. This kind of cooperation helps in practical ways to ensure pre-service teachers have some understanding of current school systems, and helps employers to promote their choice of administration software.

## **Conclusion**

The model of professional development described here is not the only possible one. However, there may be benefits to having a model that spans a full range of the skills needed if information technology is to become an accepted part of educational practice, and if it is to deliver structural change. The acceptance of a generic course into the national database covering Educational Computing for Teaching and Learning in the absence of a national curriculum framework for information technology for school students marks an interesting development. An essential element for all these strategies to work will be a nationally developed framework for the use of computers in education, similar to the structures devised for the 8 Key Learning Areas.



Table 1: A model of professional development for teachers using information technologies in education (ITIE).

This model can support student learning outcomes based upon the Key Information Technology Outcomes (KITOs).

{PRIVATE}	Personal and Professional Focus	Teaching and Learning Focus	Management and Organisational Focus
CORE MODULES  KITO mode	<p align="center"><u>P1 Operating Skills</u></p> <p>Switch on the computer. Input, process, and output(print) information. Identify hardware, software and liveware. Fix simple faults. Copy, cut &amp; paste: text, pictures, movies, active objects within and between applications.</p>	<p align="center"><u>T1 Software Evaluation</u></p> <p>Can identify software and its source. Matches digitised resources with teaching and learning needs. Makes judgements about software usability for student learning.</p>	<p align="center"><u>M1 Pedagogy</u></p> <p>Examine how different approaches to teaching and learning affect the selection and use of electronic technologies. Explore the effects of electronic technologies in terms of theories for curriculum development, teaching methodologies, learning processes and assessment strategies.</p>
<b>Publishing</b>	<p align="center"><u>P2</u></p> <p>Produce paper-based learning materials. Create a web page. Develop multi-media presentations.</p>	<p align="center"><u>T2</u></p> <p>Develop student self-confidence and accuracy through presentation tools, word processors, graphics and CADD packages to access, extend, transform and share ideas and information.</p>	<p align="center"><u>M2 Planning</u></p> <p>Prepare strategic plans for the application of electronic technologies for educational purposes. Identify, encourage and support change agents within the school, and incorporate the community in change processes. Network management and security. Legal requirements (health and safety, privacy, copyright etc).</p>
<b>Communicating</b>	<p align="center"><u>P3</u></p> <p>Send and receive e-mail. Participate in desk-top video-conferencing. Initiate on-line dialogue through IRC etc. Participates interactively using telnet and MOO-type clients.</p>	<p align="center"><u>T3</u></p> <p>Identify and use e-mail based learning resources for his/her students. State appropriate rules of netiquette. Examine the social and political implications of ITIE. Use ITIE to participate in co-operative and collaborative investigations and undertake shared tasks.</p>	
<b>Researching</b>	<p align="center"><u>P4</u></p> <p>Search CD-ROM based information sources. Use web and intranet search engines effectively. Create a personal file of bookmarks. Set up and use a student records database.</p>	<p align="center"><u>T4</u></p> <p>Enable students to access information from a variety of sources, and to think critically about their veracity, credibility, distortions and self-developmental effects. Also enable students to synthesise researched information and ideas into new concepts and practices.</p>	
<b>Problem Solving</b>	<p align="center"><u>P5</u></p> <p>Set up a simulation of a local situation using a modelling, spreadsheet or analysis package and use it to predict future events. Display factors using imaging software. Collect and analyse data from the real-world.</p>	<p align="center"><u>T5</u></p> <p>Encourage students to explore the consequences of theories and practices using simulation and modelling software. Enhance models with data from the real world. Guide them to apply these techniques to existing information and projected scenarios. Students determine the action of a programmable device (such as an electronic toy or LOGO turtle).</p>	<p align="center"><u>M3 Infrastructure</u></p> <p>Integrate electronic technologies into teaching and learning across the curriculum (so they become transparent). Organise software resources on computers and servers. Allocate dataspace to members of the learning community. Organise teaching spaces to use information technology effectively. Arrange for technical support and maintenance as required.</p>
<b>Independent Learning</b>	<p align="center"><u>P6</u></p> <p>Manage an independent learning system. Create content for framework software such as expert shells. Create inter-active multi-media tutorials.</p>	<p align="center"><u>T6</u></p> <p>Facilitate independent student learning using computerised teaching packages such as drill and practice, tutorials etc. Use diagnostic software to assist in the determination of student learning needs. Use generic tools to transfer learning to different contexts and situations.</p>	

## References

- ACS (Australian Computer Society) (1999) *International Computer Driving Licence* on-line at <http://www.acs.org.au/icdl/icdl-index.htm> on 29<sup>th</sup> January 2000.
- Council of Ministers of Education (CMEC, 1999) *APEC Workshop Integration of Information and Communication Technologies (ICTs) through Teacher Professional Development* December 1-3, 1999 Toronto, Ontario, Canada or on-line at <http://www.cmec.ca/international/forum/> on 31<sup>st</sup> January 2000.
- Fluck, A. (1997) A model of professional development for teachers using information technologies in education, on-line at <http://www.educ.utas.edu.au/~Andrew.Fluck/pdmodel.htm> on 31<sup>st</sup> January 2000.
- Moursand, David & Bielefeldt, Talbot (1999) Will new teachers be prepared to teach in a digital age?, International Society for Technology in Education & Milken Exchange on Education Technology, U.S.A.
- RICE (Research in Computer Education) (1999) *Using EdNA in the Curriculum - Teacher Professional Development on The Internet*, Deakin University, Curriculum Corporation, Melbourne. On-line at <http://rice.edn.deakin.edu.au/CurrCorp/Currcorp.html> on 31<sup>st</sup> January 2000.
- Teacher and School Development Branch, Tasmanian Department of Education (1999) *Graduate Certificate in Education (Computing for Teaching and Learning)* on-line at <http://www.ec.tased.edu.au/gradcert.htm> on 29<sup>th</sup> January 2000.