Southern Cross University
ePublications@SCU

School of Education

2006

The role of reflection and mentoring in ICT teacher professional development: dialogue and learning across the hemispheres

Grete Jamissen
Oslo University College, Norway

Renata Phelps
Southern Cross University

Publication details

Post-print of Jamissen, G & Phelps, R 2006, 'The role of reflection and mentoring in ICT teacher professional development: dialogue and learning across the hemispheres', *Teacher Development*, vol. 10, no. 3, pp. 293-312.
Published version available from:
http://dx.doi.org/10.1080/13664530600921825

ePublications@SCU is an electronic repository administered by Southern Cross University Library. Its goal is to capture and preserve the intellectual output of Southern Cross University authors and researchers, and to increase visibility and impact through open access to researchers around the world. For further information please contact epubs@scu.edu.au.

The Role of Reflection and Mentoring in ICT Teacher Professional Development: Dialogue and Learning Across the Hemispheres

Grete Jamissen
Oslo University College, Norway
grete.jamissen@hio.no

Renata Phelps
Southern Cross University, Australia
rphelps@scu.edu.au

As school-systems internationally seek to improve the models of professional development they are providing for their teachers to support them in integrating Information and Communication Technology (ICT) in their teaching practice, growing opportunities emerge to compare and contrast approaches employed in different cultural contexts and to learn from each other. This paper arose from dialogue between the two writers about ICT professional development approaches being implemented in Norway and one regional area in Australia. Three programs of professional development, which the authors had been involved with, are described and these are compared and contrasted to reveal significant similarities and poignant differences between the approaches. The paper proposes some key success factors in ICT professional development, in particular, mentoring and reflection and goes on to illustrate how the comparative analysis of the approaches being used in different contexts was beneficial in informing further developments in both countries. In particular the paper argues that the processes and substance of reflection are critical to overall success, and that a focus on metacognitive reflection can support continuing professional learning outcomes for teachers.

Introduction

When the principal author arrived in Australia from Norway on 12 months study leave from Oslo University College (OUC) an unexpected and subsequently fruitful opportunity arose. Quite by chance, both authors had been involved in project managing teacher professional development initiatives for teachers to support them in their use of ICT in their classroom practice. It was discovered that there was significant overlap between their research focus and the approaches of their respective projects. This paper presents case studies of three professional development programs which the writers were involved in, explores the similarities and differences between the approaches employed and tells the story of the resultant learning and the opportunities for strengthening each of the models that arose through discussions between the two authors. The paper provides clear recommendations that may be useful for others involved in teacher professional development in ICT. In particular, the processes and structures employed to scaffold and support both reflection and mentoring are explored. The paper begins by briefly describing the context of pedagogy-based ICT professional development in both Norway and Australia. The three case studies are then presented and a summary is provided of their similarities and differences. The paper then explores the role of reflection and mentoring, contextualized through the literature. Six themes are identified and, in comparing the projects in relation to these issues, some key recommendations are made.

The Norwegian and Australian Contexts

Norway has a nationally-administered education system, and the Norwegian government has launched a number of national plans and initiatives related to ICT in education over the last 20 years. The 2000-2003 plan, "ICT in Norwegian Education", involved large investments in infrastructure, combined with research, the results from which show the need for a greater focus on ICT and pedagogy (e.g. Erstad 2004). This plan was recently superseded by "Program for Digital Competence 2004-2008", which encompasses four components: infrastructure; initiatives to increase teachers' skills and confidence; research and development; and digital learning resources, curricula and ways of work (UFD, 2004a). It is relevant that the 2004-08 plan has been launched parallel to a broader reform of the primary and secondary education system that is placing a strong focus on lifelong learning and on educational institutions at all levels becoming „learning organisations'; "Our vision is to create a better culture for learning... Schools cannot teach us everything, but they can teach us to learn" (from *A Culture for Learning,* UFD, 2004b). While Norway has seen a shift of focus from technology access to pedagogical change and school development, teachers and researchers alike continue to argue for the importance of infrastructure. Significant government resources are invested in the distribution of broadband, and the provision of tools to support strategic level implementation of ICT. These initiatives run parallel to several national programs which foster greater ICT integration by teachers. One such initiative, LærerIKT, (*LærerIKT* translates as "TeacherICT", and in Norwegian has the double meaning "richly instructive") differs from traditional skills-based ICT courses in that participants work with a group of 4-6 colleagues over a ten month period, under the guidance of a supervisor, relating assignments to their everyday teaching and producing materials for use with their students.

In Australia, each of the eight states and territories manage their own primary and secondary school system. All have implemented quite different ICT initiatives in schools, including those relating to hardware, curriculum and teacher professional development (Downes et al., 2001; Pearson, 2003). At the national level there have been various strategic policy initiatives (for example, MCEETYA ICT in Schools Taskforce, 2003; 2005) and recently a significant investment in the development of learning objects (The Learning Federation, http://www.thelearningfederation.edu.au). ICT integration has become a high priority in all curricula, and compulsory computer skills assessment for primary and secondary students are in the process of being implemented. While government-run schools are administered at state level, independent or private schools (including Catholic schools) are administered either independently or in smaller geographic areas. Federal funding policies have seen a blossoming of independent schools in recent years, and their flexibility, autonomy and resources have enabled them to trial different approaches to teachers' ICT learning. The initiative discussed in this paper represents collaboration between a Catholic Diocese in a country area of NSW and Southern Cross University.

The "*PI*" Project: A School Development Approach

In 2002 Oslo municipality instigated an ICT initiative known as "InnsIKT" (*InnsIKT* translates as "Insight" and has the double meaning of Initiative for ICT). With substantial financial investment, selected schools received extra funding for one year. Initially the project had a strong technology bias, and funding was allocated to infrastructure, but InnsIKT teachers were also given priority as participants in LærerIKT (described previously). An evaluation (Alfredsen & Jamissen 2003) indicates that, even in the schools with the highest rate of LærerIKT completions, there was still a general lack of focus on pedagogical issues. This evaluation also highlighted the vital role played by supportive school principals. In the second round of InnsIKT (2003-2004), although technical issues remained central, a second phase called *"PI"* was added, focusing on *pedagogical implementation.* Based on an understanding that implementation of ICT in education involves organisational and technological considerations as well as skills and pedagogical innovation, *PI* took an integrated school development approach where the aims were to i) develop computer skills, ii) experience

pedagogical use of ICT, and last but not least iii) reflect on the educational consequences of integrating ICT in the learning processes.

PI was a collaborative project involving faculty from three schools at Oslo University College and the municipal school authority in Oslo. It involved principals, project leaders, a total of 1400 teachers from 30 schools and 15 mentors employed by OUC for the duration of the project. Building on experience from the first year, two new key activities were implemented through *PI*. Firstly, school principals were involved on a strategic level, focusing on the particular challenges they encountered as leaders of an ICT innovation process. The other cornerstone of *PI* was the requirement that schools take part in a structured, systematic reflection process. To facilitate this an external mentor was attached to each school, and a set of scaffolds to prompt and support reflection were introduced, as discussed later in this paper. Other key activities included a number of courses and school-based seminars, although these are not considered in this paper.

The "Metacognitive Approach": Foundations and Further Developments

The approach to teacher professional development which forms the basis of the two Australian case studies arose from a partnership between a rural Catholic Diocese (consisting of 12 secondary schools and 34 primary schools) and Southern Cross University [note that these developments occurred within a broader context of hardware and networking infrastructure development across the Diocese]. In the first phase of collaboration the Diocese was keen to encourage teachers to further study through the provision of ICT learning opportunities providing pathways to accreditation. In partnership with Southern Cross, teachers were offered an opportunity to undertake a course equivalent to one unit at postgraduate level. After an initial pilot of the course with forty teachers (Phelps, Graham & Kerr, 2004) a further four groups of forty teachers (two hundred in total) participated over two and a half years. The aims of this initiative were to i) enhance teachers' personal computer skills; ii) enrich their understanding of how they could integrate ICT in their everyday teaching practice; and (most importantly) iii) support them to develop into capable (as opposed to simply competent) computer users – those who could go on learning beyond the period of the course (Phelps & Ellis, 2002b).

It is not the course, per se, which is the focus of this case study, but rather the pedagogical and theoretical basis of the approach employed. „Metacognition' refers to knowledge concerning one's own cognitive processes, and the active monitoring and regulation of these processes in the pursuit of goals (Flavell, 1976; Papaleontiou-Louca, 2003; Paris & Winograd, 1990). The benefits of metacognitive teaching approaches lie in their ability to transfer responsibility for monitoring learning from teachers to learners and in promoting positive self-perceptions, affect and motivation among learners (Paris & Winograd, 1990). As has been pointed out by Ropp (1997; 1998), in novel situations, an understanding of „how' to learn by using specific cognitive skills and strategies distinguishes expert learners from novices who may have an equal unfamiliarity with the content of the domain. The metacognitive approach to ICT learning, which was developed initially as an approach to pre-service teacher education (Phelps & Ellis, 2002a, 2002b, 2002c), is founded on the premise that adoption and integration of ICT by teachers is influenced by their attitudes, beliefs, motivation, confidence and learning strategies (Higgins & Mosley, 2001; Rudd, 2001). Rather than focusing on directive-style, skills-based training the approach engages teachers in a process of reflecting on what influences their interaction with computer technology, and on developing appropriate learning processes, thus promoting 'life-long' computer learning. The approach has been found to be beneficial in providing versatility in meeting the professional development needs of a wide range of teachers with diverse computer backgrounds and in influencing teachers' approaches to their own and their students' learning (Phelps, Graham and Kerr, 2004). The approach is scaffolded through a print and Web-based resource (described later in this paper) as well as two workshops and ongoing interaction with university staff. The approach has a clear focus on practical (experiential) learning. Aside from developing their own skills, knowledge and confidence

teachers were also encouraged to implement ICT activities in their classroom, thus resulting in real learning outcomes for students. However, the approach is more focused on „process' than it is on „product'. Participants are encouraged to identify individually appropriate mentors, who might be school colleagues, family or friends. Reflecting on the nature and dynamic of this relationship, the strategies that mentors used to support their learning, their own help seeking and problem-solving behaviour, and the changing dynamic between them and their mentor as they gained greater independence and learning confidence, was integral to the approach. As part of assessment the participants kept a learning journal and produced a web-based teaching and learning resource (a website for teachers and/or students).

Current Developments: The "*Technology Together*" Project

While the metacognitive approach proved to have significant potential in supporting even the most technologically-anxious teachers, a formal course, with assessment, was of interest only to a limited group. Those volunteering to participate were already, at least in some way, motivated and prepared to embrace new learning. Furthermore, as a sustainable approach to broad-scale change, the approach both relied on outside facilitation and did not focus on school culture. Funding was sought and gained through the Australian Research Council Linkages scheme, and the *Technology Together* project commenced mid 2004. The primary aim of this project is to develop a whole-school change approach to ICT professional learning – one which supports whole school capability (Phelps, Graham & Thornton, 2006). This three-year action research project is collaboratively involving schools in refining the metacognitive strategies and processes and investigating how they might support teachers' professional learning in a whole-school context. Seven schools were involved in the first cycle (2005) and a further nine schools are involved in 2006. A mentoring structure was instigated, with both principals and Companion Mentors attending an initial workshop. Notably, the timing of this project commencing coincided with the dialogue informing this paper, and the planning and subsequent directions for *Technology Together* were shaped through comparative discussions about our contexts.

Data and Process Informing the Paper: Comparing the Case Studies

Our descriptions and analysis of both *PI* and the original metacognitive course are informed by rigorous data collection processes. *PI* was formally evaluated in two separate reports (Jakobsen & Jensen 2005; Jamissen, 2004), drawing on systematic data from the participating schools, including mentor and teacher reflections from seminars, mid- and end-of-project reports and group interviews. The metacognitive approach has been developed through a series of action research cycles with teachers at both undergraduate and postgraduate level (Phelps, 2002, 2003; Phelps & Ellis, 2002a, 2002b, 2002c, 2003; Phelps, Graham & Kerr, 2004). Data has been collected from participants using multiple methods including pre- and post-intervention surveys, reflective journals maintained by participants, observations made by researchers, online interactions and informal communications.

Over a period of twelve months we familiarised ourselves with the theoretical, pedagogical and practical aspects of each others' projects. We read relevant reports and papers from each others' study, posed questions to each other about the respective programs and explored similarities and differences between our approaches. The first author was also able to become involved in the early phase of implementation of the Australian *Technology Together* project and this provided a further opportunity to consolidate our collaborative learning and begin to put this into practice. Hence, while the data collection informing the evaluation of each project was done separately, with different methods and without a common research question, our first hand knowledge of the projects enabled us to engage in discussion to compare and contrast the programs and identify points of common learning. It is the discussion of these points which this paper presents as valuable to others, like ourselves, who are involved in developing and/or delivering ICT professional development with teachers. Table 1 summarises some background similarities and differences

identified by the authors in the process. The table is grounded in the data on the programs themselves, and is not (as such) an attempt to impose a theoretical framework. It does, however serve as an overview of some features of the respective projects and a number of these points are picked up in the following sections in relation to mentoring and reflection.

Issue	Norway	Australia	
	***PI* Project**	**Metacognitive-Focused Course**	***Technology Together***
Context	• National public-sector initiative focusing on whole-school.	• Regional Catholic school initiative focused on individuals, sponsored by their employer.	• Regional research project focusing initially on seven whole-schools.
Primary Aim	• School development through integration of ICT in the curriculum.	• To build teachers' ICT confidence and capability and their integration of ICT in their classroom.	• To enhance ICT integration across a whole school.
Infrastructure	• Large investment in technology, centralised operating procedures and LMS prior to *PI.*	• A focus on using infrastructure already available to teachers.	• A focus on using infrastructure already available, and working with school leaders to plan future development.
Teacher Release Implications	• Approx. 1 day/teacher provided to schools by the municipality, and schools were encouraged to redistribute school resources for the duration.	• No teacher release provided. Costs for involvement in the course covered by employer.	• Some release provided (approx. 2 days/teachers) but schools decided on allocation consistent with the metacognitive approach.
Content versus Learning Process	• Focus on promoting reflection on pedagogical consequences of integrating ICT.	• Focus on metacognitive processes and individual learning strategies.	• Focus on metacognitive processes and individual learning strategies. Some schools focusing on specific skill areas.
Goal Setting	• Goals set by a few core people in the school as part of the initial plan. Most schools addressed the issue of sharing and communicating goals.	• Learning goals were set by individuals based on point of readiness.	• Processes implemented in school to engage teachers in setting individual learning goals based on point of readiness.
Reflection	• Reflection was a central component supported by a system of reflection memos and meetings.	• Reflection was a central component. Participants keep a journal documenting their learning.	• Reflection is a central component. All mentors and teachers are encouraged to reflect through various written and verbal processes.
Mentoring	• A formal structure of external mentors selected by central project leader and introduced to the schools as „critical friends'.	• Learners self-selected one or more support people (mentors) who might be family, friends or work colleagues. An informal arrangement.	• A formal structure of Companion Mentors with the role of supporting the metacognitive approach, not providing technical expertise.
Role of Principal	• Close involvement of principals in the project with an emphasis on managing change. Some principals participated directly.	• Principals encouraged teachers to „sign up' but no ongoing involvement. Some principals did elect to participate directly.	• Close involvement: supporting the Mentors' work with teachers, encourage participation, oversee project, facilitating change etc
Practical Products	• Closely connected to own teaching and the development of teaching material.	• Teachers implemented at least one classroom initiative and developed a web-based teaching resource.	• Dependent on schools and individual teachers' goals.
Accreditation	• Planned accreditation for mentors, although not currently implemented.	• Completion of course deemed equivalent to one unit at postgraduate level.	• Key project participants are co-researchers and have the option of pursuing accreditation pathways.

Table 1: Comparative background features of the three case study projects.

It might, again, be emphasised that the *Technology Together* project had commenced at the time of Grete's visit, and so it is included in Table 1 and discussed in a comparative sense throughout this paper. However, during the 12 months of Grete's visit *Technology Together* was (and continues to be) influenced and informed by these comparative discussions. Hence, in many respects *Technology Together* represents a hybrid between the other two approaches.

The remainder of this paper will compare and contrast in some detail two common aspects of these projects, namely reflection and mentoring, before some key recommendations are made. We focus particularly on these themes because they not only represent the uniqueness of the three programs, but also characterise the discovered overlap between the projects. It is in these areas of reflection and mentoring that, we believe, these models provide valuable learning to others involved in pedagogically-focused ICT professional development.

The Context of Reflection in ICT Professional Development

An important prerequisite for experience-based learning is the existence of structures and routines for sharing experience and reflecting (Kolb, 1984). While reflection is a widely-discussed aspect of adult learning, and teacher learning in particular, it has not assumed a prominent position in the literature surrounding ICT professional development. One reason for this may lie in the tradition of directive, skills-based training approaches in computer education; approaches which favor addressing immediate and specific needs of computer users in particular contexts. Such approaches, while widely used, have been criticised on the basis that technology is too diverse and evolves too rapidly for teachers to be reliant on training approaches (Melczarek, 2000). Reflective approaches to ICT learning, such as the approaches advocated by Ropp (1997; 1998) and Ertmer et al., (Ertmer, Conklin, Lewandowski & Osika, 2003; Ross, Johnson & Ertmer, 2002) and the narrative approach of Ferdig (1998; 2004), hold significant potential for fostering lifelong learning and learner independence. As yet, few examples of reflection being used in a structured and conscious way in pedagogically-focused ICT teacher professional development have been described in the literature. The Norwegian and Australian projects, however, provide tangible examples of such approaches.

Reflection was seen as integral to *PI's* whole school approach; as a way to build each school as a learning organisation (Senge 1993). The main scaffold introduced was a system of reflection meetings (a minimum of three), involving the mentor and representatives from the school. Prior to each meeting the school project leader presented a „reflection memo' to the mentor. Project leaders were encouraged to involve their colleagues as much as possible in contributing to the memos, thus hoping to engage as many teachers as possible in the processes and keeping focus on issues of importance and relevance to them. The memos were expected to relate to each school's defined goals and address issues such as:

- What is working well? Why?
- What is not working? Why?
- Is this something you want to change? If so, how?
- Is our pedagogical practice changed in any way after introducing ICT? How?
- How can we communicate our success as an inspiration to ourselves and others?

Meetings were kept confidential in the hope that the participants would feel free to engage in open and constructive discourse. After each meeting the mentor summarised the discussion and sent a „response memo' back to the school, highlighting issues and encouraging schools to communicate specified aspects of their reflections to the other schools via a discussion forum in the common learning Management System (LMS). In the hindsight, and based on the evaluation (Jamissen 2004), the reflection processes may have benefited from a more theory based approach to reflection, but this was not present from the outset.

The metacognitive approach is also firmly founded in reflection, utilising it as a means of developing computer learners who „use the knowledge they have gained of themselves as learners, of task requirements, and of specific strategy use to deliberately select, control and monitor strategies needed to achieve desired learning goals' (Ertmer & Newby, 1996, p.1). In the metacognitive course reflection was scaffolded through the initial workshop and a print-based „Thinking' module which guided teachers through a process of identifying their feelings, motivations and beliefs about their use of computers, and issues such as encouragement, support, perceived usefulness, attitudes, feelings/anxiety, attribution and motivation. By reflecting on the characteristics and learning strategies of an identified „ICT role model' participants identify the importance of specific learning strategies, including exploratory learning, help-seeking and problem solving and the inevitable importance of lifelong learning. Teachers then focus on identifying specific goals. As participants engage in the practical aspects of the course, and in their day-to-day interaction with technology, they are encouraged to keep reflecting on these metacognitive issues and to record personal insights in their journal. Greater detail in relation to the theoretical underpinnings and educational design of the print and online resources which scaffold the metacognitive approach have been detailed elsewhere (Phelps & Ellis, 2003; Phelps, in press)

The more recently commenced *Technology Together* project is trailing the use of the metacognitively-based reflective approach in a whole-school context. As a research undertaking, principals and mentors have been asked to trial various processes, such as the use of both written and verbal reflective scaffolds as part of staff meetings or meetings with mentors. Several schools have been eager to engage all teachers in a journaling process, particularly where key players had experienced the benefits of the journaling process themselves.

Hence, in *PI*, reflection was scaffolded through group discussion facilitated by school leaders and mentors, while in the metacognitive course it was scaffolded primarily through print-based reflective prompts, which formed a basis for ongoing written reflection by individuals. *Technology Together* is encouraging dialogue and verbal discussion across the whole school, while maintaining a focus on individuals as computer learners.

The Context of Mentoring in ICT Professional Development

Mentoring has long played an important role in teacher learning but has traditionally been associated with either beginning teachers or career advancement (Russell & Adams, 1997; Stewart, 1999), usually involving a more senior or experienced person (the mentor) helping a junior or less experienced person (the mentee or protégé) (Russell & Adams, 1997). This understanding of mentoring has much in common with concepts such as coaching or counseling, which imply seniority on behalf of the "helper". Contemporary definitions of mentoring, however, place more focus on providing support, building self-confidence and competencies and improving working relationships. Mentoring is increasingly seen as a valuable tool for day-to-day teacher professional development (Kerka, 1998) and a means of supporting change and transforming rather than reproducing school culture (Howard, 1999). Several papers describe ICT mentoring in higher education (for instance, Franklin, Turner, Kariuki & Duran, 2001), while a smaller number report on mentoring as a form of ICT professional development in schools (Chuang, Thompson & Schmidt, 2003). Regardless of the context, mentoring in ICT is likely to be different to traditional mentoring models since, within computer contexts; it is not uncommon for a younger or more junior person to mentor an older and more experienced professional. Mentoring also has the potential to provide a whole-school framework for ICT professional development; one consistent with experiential learning and the development of a „learning organisation'; "Prior research has shown that one-shot workshops without ongoing individual technology support often fail to meet the specific needs of most educators; instead one-on-one technology mentoring models show promising results" (Chuang, Thompson & Schmidt, 2003).

Both *PI* and the *Technology Together* project were explicitly structured around a mentoring framework, while in the metacognitive course mentoring arrangements were informally arranged by individuals. The mentors in *PI* were selected, prepared and supported by OUC, primarily through three seminars focusing on both ICT-related issues and their role as process counselors. The first seminar focused on the mentor's role, making mentors conscious of their own competencies, developing listening skills and a session on Web-based learning to provide ideas for school based seminars. The second seminar focused on sharing and learning from each others' experience and „practice based counseling'. In the third seminar mentors focused on their own learning, reflections and reporting. In *PI,* the role of mentors was specifically to promote reflection related to teaching practices with ICT and school development issues, both by individual teachers and collectives. This was done by providing structures and scaffolds at scheduled meetings and posing challenging questions to the group. In *Technology Together* Companion Mentors were selected (or self-selected) from schools as those already familiar with, or at least receptive to, working with the metacognitive approach. The first workshop prepared this group not only as mentors but as co-researchers. An overview of the nature of action research was provided and a detailed exploration of the metacognitive approach was provided, with role playing of various scenarios and how they would approach these as mentors. Issues surrounding the role of mentors, school culture and change were also explicitly included. The *principals* and mentors then engaged in planning processes, continuing this back in the school in consultation with the whole-school staff. In *Technology Together* the role of mentors was to motivate, engage and provide opportunities for teacher learning, as well as to actively build support structures, encourage teachers to experiment with exploratory learning strategies, promote sharing of successes and achievements across the school, and to act as a sounding board for individuals when things didn't go to plan. Again, their mentoring activities were focused on metacognitive support (values, attitudes, beliefs and learning strategies) and not just skill development.

Key Learning from Each Others' Experiences

Having described the approaches taken to reflection and mentoring in the three case studies, this section will present the key „themes' which emerged from our discussions and comparisons of the two contexts. Through this discussion we propose a number of findings about what we see as critical success factors in ICT professional development. It is argued that these findings are directly relevant and valuable to others who are considering implementing ICT professional development initiatives involving reflection and/or mentoring.

The Value of Building the Whole School as a Learning Organisation

In the initially instigated metacognitive course whole-school issues were not a focus. While individual teachers were acknowledged as learning within a rich organisational and personal context, with multiple sources of support, and a myriad of factors impacting on their attitudes, values and ultimate use of ICT, the approach did not focus on affecting change in schools more broadly. The strength of both *PI* and *Technology Together* lie in their focus on whole-school structures and issues. Both projects recognise that for teachers to effectively integrate ICT in learning and teaching, the culture of their school needs to be supportive, not only in resourcing technology access, but in encouraging teachers to continually learn and experiment. Leadership within the school is, of course, critical. The Norwegian study showed that strategic and managerial/administrative issues had a significant impact on ICT implementation. Principals played a very important role in *PI* by voicing an expectation that everybody take part and being very clear about the overall goals. However it was also beneficial when principals acknowledged the challenges experienced by teachers, with what one mentor described as "a combination of force, humor and engagement".

An important learning from *PI* was the importance of ownership, empowerment and explicit involvement of teachers themselves in the change process. Where teachers were involved in

developing the goals and defining the challenges in their own contexts they also tended to become more engaged in following up on initiatives and taking part in reflection meetings (Jamissen 2004). This was certainly carried over to the *Technology Together* project, where a clear focus was placed on school culture and issues of change. In many respects metacognition itself provides a framework for supporting this empowerment of teachers. Our observations would suggest that for ICT to be effectively integrated in schools, teachers need to be encouraged, but not pressured, supported but not over-assisted, stimulated with ideas and be adequately resourced without forming an impression that resources alone will lead to effective ICT integration. An over-focus on specific technology is unlikely to prompt long-term, whole school change. Rather, we propose that it is critical to address teachers' values, attitudes, beliefs and motivations, and to build a culture where learning processes in themselves are valued and supported; where new ideas are embraced and risk taking is encouraged, not just by school leaders but by the very culture of the school. By explicitly acknowledging the complex factors that impact on individuals' use of technology, and particularly the rapid rate of change and the need for lifelong learning, a whole-school culture can potentially be built that accepts and adapts to this environment. Such is the culture of the learning organisation described by Senge (1993), and reflection is key.

The Importance of Mentor Selection and Role Clarification

The metacognitive course had provided numerous examples of circumstances where the most computer-literate people did not, in fact, make the best mentors, as illustrated in the following reflective journal extract:

> …I consulted the computer co-ordinator for help. He went so quickly with his explanation … and then proceeded to do it himself while I watched. I knew he wouldn't be the ideal mentor for me. I was looking dejected and confused when the Teacher's Aide walked in, and in no time she said sat with me and we worked through the process step by step at my pace. I knew then I had found a soul mate as a mentor.

It is our belief that the selection of mentors, and the conceptualisation and presentation of their role, can have a major impact on project dynamics and outcomes. In *PI* mentors were drawn from outside the school. They had been involved as supervisors in the earlier project LærerIKT where their selection was based on their experience integrating ICT in their own teaching. In *Technology Together* the initial groups of Companion Mentors were from within schools, selected in consultation between the university staff, principals and CEO. They were not necessarily „ICT experts', and although some may be said to be so, several were selected because they were perceived by their peers as inspirational, having recently (through their involvement in the metacognitive course) embraced ICT and become more confident and prepared to try new things. The focus was on identifying people already holding the trust and respect of their colleagues, and the ability to support collaboration and reflection were perceived as critical.

Whether mentors are external or internal to the school, clarifying their role is important. *PI* mentors were introduced as peers rather than experts, and their key role was as an inquisitive, interested external „friend' who was expected to ask „difficult questions' and thus prompt reflection. However, as we have both found, defining the role of the mentor entails more than providing schools with a detailed description. Rather, it involves an ongoing process of negotiating and renegotiating expectations between mentors and mentees. In a supporting and motivating role, rather than a technical one, the mentor needs to be skilled in encouraging and facilitating the reflection and change process, both in individuals, teams and whole schools. They also play a key role in keeping the projects on track.

> (The) Mentor has, through his inspiration and inputs, ensured that the project has had a solid foundation in the staff. The function of the mentor has contributed to achieving our goals and it has represented a quality assurance of the progression throughout the school year (*PI* school report).

As experienced in the Australian metacognitively-focused course, the opportunity for participants to select a mentor gives a better basis to establish the mutual trust necessary in a mentor/mentee relationship where we want to confront change resistant school cultures. Being challenged may enhance both motivation and focus (Forster 1998) providing it's done in a setting of trust. Also, the chosen mentor will often be close to, or at least familiar with, the mentee's context, and thus have a better understanding of the background and the framework in which they operate. There are, of course, advantages and disadvantages inherent in the everyday presence and availability of the mentor. An externally appointed mentor may find it easier to discover dysfunctional patterns in a team, and have less to lose by challenging the participants' understanding of the situation. Furthermore, being involved at defined, structured points may foster more disciplined processes of reflection. However, to be able to perform this role the external mentor needs to work professionally on establishing a state of mutual trust and expectations. He or she also need to invite the schools to expect and accept honest feedback.

The Norwegian study concluded that participating schools and mentors need to negotiate a commonly understood role and mentoring model in order to build their confidence in guiding their colleagues in their reflective ICT learning. The metacognitive scaffolds developed through the Australian study may prove a valuable resource for future Norwegian mentors. The importance of building mentors' facilitation skills, as was a focus in *PI,* became an important learning for the Australian project. It is only through strong mentoring and leadership that schools will become self-sustaining learning organisations.

The Importance of an Action Learning Framework and Concrete Reflective Scaffolds

Just as it is necessary to have a common understanding of the mentor's role, so too it is important that projects have an explicit theoretical foundation in action learning. In *PI* the Moxnes (1981) framework was introduced to mentors at the third seminar. This model moves from describing concrete experience (What happened?) to analysis (Why? What does it mean?), then evaluation, abstraction, generalisation (What conclusions can be drawn?) followed by ongoing planning (How can I use what I learned? What will I do differently?). In *Technology Together* the action learning framework was introduced to principals, mentors and whole-schools (through staff meetings) from the outset and was conceived as a fundamental part of the metacognitive approach. The plans which the schools developed were thus firmly founded on action research principles (Kemmis, 1985), with all schools conceptualising at least two to three macro-cycles, and supporting teachers to engage in micro-cycles in their day-to-day practice. The late introduction of the action learning framework in *PI* did result in some shortcomings, and the early embedding of such a framework would be a key recommendation for future projects.

Reflection is an integral component of action learning, and in our respective projects we have found it critical to introduce concrete scaffolds to support teachers in their reflection. Such scaffolds not only promote learning and collaborative communication among participants, but also serve to enhance accountability and document project outcomes. From a metacognitive perspective such scaffolds place a strong focus on learning *process* rather than just learning *outcome*, and they also play an important function in acknowledging the importance of problem solving and affirming goal achievement.

The Importance of Fostering Deep Reflection and Overcoming Resistances

Learning from experience and confronting change are challenging and require a high level of consciousness. Resistance to deep reflection has been discussed widely in the literature on reflection (Borkowski, Carr, Rellinger & Pressley, 1990; Boud, Keogh & Walker, 1985; Ixer, 1999). Reflective processes inevitably meet with resistance, opposition and denial, whether it be declared or silent, conscious or subconscious (Argyris & Schön, 1996, Argyris, 1999; Senge, 1993; Whitaker 1993). Willingness to learn and a commitment to developing professional practice are vital for

effective reflection, as is the presence of problematic and perplexing circumstances and experiences which present „felt difficulty' (Dewey, cited in Ixer, 1999). A key issue in both case study contexts was how to support teachers to engage in *deep* reflection.

Fostering deep reflection, and overcoming resistances to this process, has certainly been an explicit part of the development of the metacognitive approach (Phelps, 2002). While many teachers participating in the course found the process of keeping a reflective learning journal liberating, empowering and affirming, the process did meet with some resistance:

> I sense some of the teachers at the workshop felt the course moved in a direction they were unsure of – away from purely practical application of ICT to a model involving thinking, reflection, use and application. The „click and go' teachers wanted the skills now and feel the journey is not as important as the destination. I look forward to the journey, the hills and the valleys…

As McGill and Weil (1989, p.248) point out, facilitators „play a key role in enabling learners to reflect critically on their experience'. In *PI* and *Technology Together* reflection was and is very dependent on the skills of the mentor, and the culture within the school. The fact that *PI* mentors were drawn from outside the schools impacted both positively and negatively on their ability to facilitate reflection. While several schools reported positive experiences from being challenged by the mentors, it was quite common for the mentors to report uncertainty when facing school representatives who indicated that "everything is working perfectly". With the reflective scaffolds and prompts offered by the metacognitive approach, Norwegian mentors might have found it easier to encourage deeper reflection and invite schools to make the reflection meetings move beyond reporting and describing to transforming.

The Importance of Conscious Goal Setting – Individually and Collaborative

In *PI* goal setting and project direction was driven at the school level as part of the initial project application process when schools competed to become involved. In line with the announcement from the municipality, these goals were often related to technical infrastructure and achieving concrete outcomes such as „all year seven students shall produce at least one project report using ICT'. Most schools also described their planning process as being hurried, involving mostly managers/executive and one or two ICT pioneers. As a consequence there was less of a focus on individual involvement and ownership of goals. This framework did not encourage development of learning-oriented goals, a fact that probably contributed to the reflection meetings focusing more on achieving practical results than learning outcomes and pedagogical issues. Several of the schools and mentors in *PI* later stated that the mentors were introduced too late in the project, and that their support in the goal setting process would have been beneficial.

The metacognitive approach emphasises the importance of *individuals* establishing and embracing learning goals. Structures, processes and scaffolds are introduced to support goal setting, with an explicit acknowledgement that teachers „don't always know what they don't know'. The value of ambitious but individually appropriate goals, related not only to professional but personal interests, is seen as important in fostering motivation and personal commitment. For instance, research on the metacognitive approach (Phelps, Graham & Kerr, 2004) had documented instances where teachers were motivated to learn to use PowerPoint for a family reunion or a digital camera to take photos of a new born or synchronous communication to chat with an overseas son or daughter. Learning in these recreational contexts challenged teachers' perceptions of themselves as poor computer users, and provided stimulus to reflect on volition and time usage in ICT learning. Through a focus on learning processes and reflecting on growing independence, teachers realised that they could employ exploratory learning strategies, and hence gain more confidence to try out new technologies in their classroom. The *Technology Together* project is aiming to further refine goal setting processes in a whole-school setting. While involved schools may have overall goals, such as „increase use of classroom computers by teachers' or „greater integration across the curriculum' the

setting and hence ownership of goals by individual teachers is being maintained, with processes being trailed by which mentors can facilitate and support this process.

The Need for an Explicit Focus on Constructivist Pedagogy

An interesting „chicken and egg' debate is currently being played out in the ICT education literature. Do constructivist teachers adopt ICT more readily than objectivist teachers *or* does the use of ICT lead teachers to become more constructivist? The research does not yet provide any clear answers. Snoeyink & Ertmer (2001, p.85), for instance, state that "although the constructivist approach can be effectively implemented without technology, the use of computers appears to encourage many teachers to teach, and their students to learn, in a very different manner". Lloyd and Yelland (2003) comment that "teachers who hold the transmission view of teaching will not 'adapt' to technology in classrooms because of the power it gives directly to students. It is not a fear of technology; it is a fear of losing who and what you understand a teacher to be". Norwegian research (Ludvigsen & Østerud, 2000) indicates that, where schools combine the introduction of ICT with educational change in a constructivist direction, both initiatives gain. While the jury is out, it is unquestionable that orientation to pedagogy is something which needs to be examined as a part of ICT professional development as "some educators experience intense inner conflict because the new approaches required by technology sharply contrast with their beliefs about classroom management, curriculum, collaboration and other educational issues" (Faison, 1996, p.57).

Discussion between the two authors led us to realise that our respective approaches would benefit from a greater emphasis on the connection between ICT integration and constructivism. This was certainly perceived as a key omission in the metacognitive course. While a constructivist approach was modeled in the course delivery, constructivism was not explicitly introduced, and the reflective scaffolds did not challenge teachers to reflect on their own teaching orientations. While *PI* had a much stronger focus on pedagogy (in terms of classroom practice) Grete also reflected that *PI* relied on teachers to „discover' this connection in their reflection processes. There may have been benefits in making this more explicit as one part of introducing a framework and giving the reflection process a more theoretical basis. In designing and developing *Technology Together* our discussions led to constructivism being a more explicit component of the metacognitive process, with teachers being encouraged to challenge their own values and beliefs in relation to pedagogy. Again, a key learning is the value of introducing these ideas early in the project and embedding them in a reflective framework.

Conclusion

It has been a valuable exercise for us to discuss the similarities and differences, strengths and weaknesses and resultant learning from our respective projects. As a result we have been able to refine and reshape our professional development activities, building on the strengths of each others' programs. We believe that these insights into what has worked well and not so well in our respective projects, and our discussion of how we now aim to strengthen our approaches to ICT professional development should have direct value to others seeking to incorporate reflection and mentoring in their professional development programs. Too often teacher professional development for ICT integration is seen as a technical exercise, and there is a temptation to focus on specific technologies and skills. Through our discussions we have strengthened our resolve regarding the importance of building a culture consistent with the „learning organisation' and the longer-term benefits of life-long learning, mentoring and reflection. The focus on values, beliefs, attitudes, motivations and learning strategies embedded in the metacognitive approach would seem to hold relevance in both cultural contexts. Our comparative discussions have provided key insights into the importance of an action learning framework and reflective scaffolds and prompts (such as those related to metacognitive concerns) to support deep engagement and ongoing improvement in practice. Good mentors are essential and their selection, preparation and ongoing support is vital, requiring considered planning at the inception of any professional development initiative. A whole

school approach, one in which there is a shared vision of the importance of reflective learning, and a sense of ownership and individual commitment to tangible but every-changing goals is also vital. In summary, we propose that these case studies, drawn from the Norwegian and Australian environments, provide valuable insights into critical success factors in developing schools as „ICT learning organisations'.

References

Alfredsen, A. og Jamissen, G (2003): *LærerIKT som skoleutvikling?* Evaluering av LærerIKT i Oslo 2002-2003, HiO-rapport 2003 nr. 22. (Oslo: Oslo University College).

Argyris, C., & Schön, D. (1996). *Organizational Learning II: Theory, Method and Practice*. Reading, Massachusetts: Addison-Wesley.

Argyris, C. (1999). Double Loop Learning in Organisations. *Harvard Business Review*, 115-25.

Borkowski, J., Carr, M., Rellinger, E., & Pressley, M. (1990). Self-regulated cognition: Inter-dependence of metacognition, attributions and self-esteem. In B. Jones & L. Idol (Eds.), *Dimensions of Thinking and Cognitive Instruction* (pp. 53-92). Hillsdale, NJ.: Lawrence Erlbaum.

Boud, D., Keogh, R., & Walker, D. (1985). Promoting reflection in learning: A model. In D. Boud & R. Keogh & D. Walker (Eds.), *Reflection: Turning Experience into Learning* (pp. 18-40). London: Kogan Page.

Chuang, H., Thompson, A., & Schmidt, D. (2003). Faculty technology mentoring programs: Major trends in the literature. Available: http://www.public.iastate.edu/~mstar/mentor/Technology_mentoring0128.htm [accessed 18th August 2004].

Downes, T., Fluck, A., Gibbons, P., Leonard, R., Matthews, C., Oliver, R., Vickers, M., & Williams, M. (2001). *Making Better Connections: Models of Teacher Professional Development for the Integration of Information and Communication Technology into Classroom Practice*. Canberra: Commonwealth Department of Education, Science and Training.

Erstad, O. (2004). *Piloter for skoleutvikling : rapport for forskningen i PILOT 2000-2003*. ITU skriftserie ; rapport 28, Forsknings- og kompetansenettverk for IT i utdanning : Oslo Unipub, 2004

Ertmer, P., Conklin, D., Lewandowski, J., & Osika, E. (2003). Increasing preservice teachers' capacity for technology integration through the use of electronic models. *Teacher Education Quarterly*, Winter, 95-112.

Ertmer, P. A., & Newby, T. J. (1996). The expert learner: Strategic, self-regulated and reflective. *Instructional Science*, 24, 1-24.

Faison, L. (1996). Modeling instructional technology use in teacher preparation: Why we can't wait. *Educational Technology*, 36(5), 57-59.

Ferdig, R. (1998). Teaching a teacher about technology: A narrative approach. Paper presented at the Society for Information Technology and Teacher Education 1998. http://ott.educ.msu.edu/tec/R&D/SITE98/site98ferdig.htm

Ferdig, R. (2004). Teaching technology through story: Learning to make sense of the story developer. *Journal of Technology and Teacher Education*, 12(4), 475-490.

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), *The Nature of Intelligence* (pp. 231-235). Hillsdale, NJ: Erlbaum.

Forster, J. (1998). *Think about Mentoring*. Hawker Brownlow Education, Victoria, Australia

Franklin, T., Turner, S., Kariuki, M., & Duran, M. (2001). Mentoring overcomes barriers to technology integration. *Journal of Computing in Teacher Education*, 18(1), 26-31.

Higgins, S., & Mosley, D. (2001). Teachers' thinking about information and communications technology and learning: Beliefs and outcomes. *Teacher Development*, 5(2), 191-210.

Howard, S. (1999, November - December 1999). Mentoring - Transforming school cultures. Paper presented at the AARE, Melbourne. http://www.aare.edu.u/99pap/how99257.htm

Ixer, G. (1999). There's no such thing as reflection. *British Journal of Social Work*, 29, 513-527.

Jakobsen, M. & Jensen, M. (2005): InnsIKT-2 - kimen til en mer inspirerende skolehverdag. Telenor FoU, R 5/2005

Jamissen, Grete (2004) Stolt og begeistret! Evaluering av pi– Pedagogisk implementering, InnsIKT 2 skolene i Oslo 2003-04. HiO Report 2004, No. 29 (Oslo: Oslo University College).

Kemmis, S. (1985). Action research and the politics of reflection. In D. Boud & R. Keogh & D. Walker (Eds.), *Reflection: Turning Experience into Learning* (pp. 139-163). London: Kogan Page.

Kerka, S. (1998). New perspectives on mentoring. ERIC Digest No. 194. Available: http://80-gateway.ut.ovid.com.ezproxy.scu.edu.au/gw1/ovidwed.cgi [2004, 18th August].

Kolb, D. A. (1984). *Experiential Learning: Experience as the Course of Learning and Development*. Englewood Cliffs: Prentice Hall.

Lloyd, M., & Yelland, N. (2003). Adaptation and avoidance: Observations of teachers' reactions to information and communications technology in the classroom. *Change: Transformations in Education*, 6(1), 81-96.

Ludvigsen, S.R. og Østerud, S (2000). Ny teknologi – nye praksisformer. Teoretiske og empiriske analyser av IKT i bruk. ITU skriftserie, rapport nr. 8, Pedagogisk Forskningsinstitutt, Unipub forlag.
http://www.itu.no/Filer/fil_ITU_Rapport_08.pdf (accessed 31 March 2004).

MCEETYA ICT in Schools Taskforce. (2003). Learning in an Online World: Research Strategy. Carlton South, Melbourne. http://icttaskforce.edna.edu.au/documents/taskforce_report_mceetya03.PDF

MCEETYA ICT in Schools Taskforce. (2005). *Learning in an Online World: Pedagogy strategy*. Carlton South, Melbourne. http://icttaskforce.edna.edu.au/icttaskforce/webdav/site/icttaskforcesite/users/root/public/learning_online_pedagogy_05.pdf

McGill, I., & Weil, S. W. (1989). Continuing the dialogue: New possibilities for experiential learning. In S. W. Weil & I. McGill (Eds.), *Making Sense of Experiential Learning* (pp. 245-275). Buckingham: The Society for Research into Higher Education and Open University Press.

Melczarek, R. J. (2000, 6-9 July). Technology education for teachers: A more self-directed approach. Paper presented at the ACEC2000: Learning Technologies, Teaching and the Future of Schools, Carlton Crest Hotel, Melbourne. http://www.cegv.vic.edu.au/acec2000/paper_ref/p-chandler/paper26/index.htm

Moxnes, P. (1981). *Læring og ressursutvikling i arbeidsmiljøet*. Moxnes, Oslo.

Papaleontiou-Louca, E. (2003). The concept and instruction of metacognition. Teacher Development, 7(1), 9-30.

Paris, S. G., & Winograd, P. (1990). How metacognition can promote academic learning and instruction. In B. Jones & L. Idol (Eds.), *Dimensions of Thinking and Cognitive Instruction* (pp. 15-51). Hillsdale, NJ.: Lawrence Erlbaum.

Pearson, J. (2003). Information and communication technologies and teacher education in Australia. *Technology, Pedagogy and Education*, 12(1), 39-58.

Phelps, R. (2002). Mapping the Complexity of Computer Learning: Journeying Beyond Teaching for Computer Competence to Facilitating Computer Capability. Unpublished PhD, Southern Cross University, Lismore.

Phelps, R. (2003, October 18-21). Developing online from simplicity toward complexity: Going with the flow of non-linear learning. Paper presented at the NAWeb 2003: The Web-based Learning Conference, Frederickton, NB, Canada.

Phelps, R. (in press). The metacognitive approach to computer education: Making explicit the learning journey. Accepted to *AACE Journal* for publication 2005-6.

Phelps, R., & Ellis, A. (2002a, 3-6 December). Helping students to help themselves: Case studies from a metacognitive approach to computer learning and teaching. Paper presented at the International Conference on Computers in Education (ICCE 2002), Auckland, New Zealand. http://icce2002.massey.ac.nz/

Phelps, R., & Ellis, A. (2002b). A metacognitive approach to computer education for teachers: Combining theory and practice for computer capability. Paper presented at the Linking Learners: Australian Computers in Education Conference (ACEC2002), Hobart, Tasmania. http://www.pa.ash.org.au/acec2002/

Phelps, R., & Ellis, A. (2002c, December 8-11). Overcoming computer anxiety through reflection on attribution. Paper presented at the Winds of Change in the Sea of Learning: Charting the Course of Digital Education: Australian Society for Computers in Learning in Tertiary Education (ASCILITE) 2002, Auckland, NZ. http://www.unitec.ac.nz/ascilite/

Phelps, R., & Ellis, A. (2003). From page turning to deep learning: A case history of four years of continual development of an ICT course. Paper presented at the Interact Integrate Impact Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education, Adelaide, Australia.

Phelps, R., Graham, A., & Kerr, B. (2004). Teachers and ICT: Exploring a metacognitive approach to professional development. *Australian Journal of Educational Technology*, 20(1), 49-68.

Phelps, R., Graham, A., & Thornton, P. (2006). *Technology Together:* Getting whole schools involved with ICT through a metacognitive approach. *The Australian Educational Leader, 28*(1), 22-24.

Ropp, M. M. (1997). Exploring individual characteristics associated with learning to use computers and their use as pedagogical tools in preservice teacher preparation. Unpublished PhD, Michigan State University. http://www.educ.msu.edu/homepages/ropp/Dissertation/PrelimPages.html

Ropp, M. M. (1998, 1st June). A new approach to supporting reflective, self-regulated computer learning. Paper presented at the Society for Information Technology and Teacher Education 98. http://www.educ.msu.edu/homepages/ropp/SITE/SITE.html

Ross, E., Johnson, T., & Ertmer, P. (2002). Technology integration and innovative teaching through collaboration, reflection and modelling: Research results from implementation of a staff development model. Available: http://www.edci.purdue.edu/ertmer/docs/AECT02.pdf.

Rudd, P. (2001). School improvement through information and communication technology: Limitations and possibilities. *Teacher Development*, 5(2), 211-.

Russell, J., & Adams, D. (1997). The changing nature of mentoring in organizations: An introduction to the special issue on mentoring in organizations. *Journal of Vocational Behavior*, 51, 1 - 14.

Senge, P. (1993). *The Fifth Discipline: The Art and Practice of the Learning Organisation*. New York: Random House.

Snoeyink, R., & Ertmer, P. (2001). Thrust into technology: How veteran teachers respond. *Journal of Educational Technology Systems*, 30(1), 85-111.

Stewart, E. (1999). Learning together: the use of mentoring for faculty development in the integration of technology. *Journal of Computing in Teacher Education*, 16(1), 15 - 19.

UNESCO. (2002). Information and Communication Technologies and Teacher Education. Paris: UNESCO. http://www.eldis.org/static/DOC10100.htm

UFD (2004a). Program for digital kompetanse [Programme for Digital Competence] Oslo: Ministry of Education and Research.
UFD (2004b). Kultur for læring [Culture for learning]. Oslo: Ministry of Education and Research. Norwegian fulltext available at http://odin.dep.no/ufd/norsk/dok/regpubl/stmeld/045001-040013/dok-bn.html (Accessed 16.06.06) English summary available at http://odin.dep.no/ufd/english/doc/handbooks/045071-120012/dok-bn.html (accessed 16.06.06).
Whitaker, P (1993). *Managing Change in Schools*. Open University Press, Buckingham.