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Developing technology together together: consolidated report: an investigation of the metacognitive influences on teachers' use of information and communication technology (ICT) and the implications for teacher professional development

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An investigation of the metacognitive influences on teachers’ use of information and communication technology (ICT) and the implications for teacher professional development

by

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on behalf of all project participants
...Professional development for ICTs in teacher education is ongoing... Successful models for professional development must reflect this dynamic nature by building capacity rather than teaching skills.

An investigation of the metacognitive influences on teachers’ use of information and communication technology (ICT) and the implications for teacher professional development

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…Teachers’ educational beliefs and their personal theories concerning teaching and learning… strongly influence classroom practices… Beliefs are filters that guide teachers during instructional and curricular decision-making. Beliefs thus affect how teachers implement innovations… Educators’ visions of the potential for educational change with new educational technologies underestimate how difficult it is for teachers to implement the changes that will be required in their practices and skills, as well as their educational beliefs…

introduction

BACKGROUND TO THE PROJECT

Professional development of teachers in information and communication technology (ICT) is an urgent educational imperative internationally. Far from being a simple process it necessitates changes in school culture and significant financial and strategic investment. Numerous recent reports\(^1\) have highlighted the:

- limitations of traditional professional development approaches;
- complexity of change associated with ICT integration and learning;
- criticality of school culture in approaching this change;
- importance of whole-school strategies;
- value of fostering collegial dialogue and building learning communities;
- potential of mentoring in supporting teacher learning;
- role of reflection in improving practice and transferring theory to practice and practice to theory; and
- the centrality of school leaders.

Effective ICT professional development requires changes in attitude, values and beliefs that develop confidence for ongoing learning and adaptability to change. It requires teachers to challenge their pedagogical beliefs and practices.

There is a strong case for approaches to professional development that promote life-long learning; where teachers are required to be more self-directed in identifying what they need to learn and in undertaking the actual learning.

Yet in many schools, embedding this culture of acceptance of continual change and the need for ongoing learning represents a significant challenge.

THE PURPOSE OF THIS RESEARCH

This research sought to develop a holistic and flexible approach to ICT professional development for primary and secondary teachers.

Underpinning the research was a focus on developing teachers’ capability – their ability to continue learning and adapting to technological change. In summary, the research aimed to:

- document the metacognitive influences on teachers’ use of ICT within a whole-school context;
- determine the effectiveness of a metacognitive approach in supporting teachers’ ICT learning;
- develop and refine practical approaches to schools’ implementation of the approach;
- understand the role of school executive in influencing teachers’ ICT use; and
- produce professional development resources that could support schools’ implementation of the approach.

The research represented a joint research and development initiative of the Catholic Education Office (CEO), Lismore Diocese and Southern Cross University. It received funding from the Australian Research Council (ARC).

\(^1\) For example Downes et al., 2001; Ertmer, Ottenbreit-Leftwich & York, 2006-7; MCEETYA ICT in Schools Taskforce, 2006; Moyle, 2006; QSITE, 2006; UNESCO, 2002; Zammit et al., 2007.
WHAT IS THE METACOGNITIVE APPROACH TO COMPUTER LEARNING?

‘Metacognition’ refers to ‘thinking about thinking’ or ‘learning about learning’. It involves:

- reflection about what you know and how you think;
- planning and implementing appropriate strategies; and
- monitoring, adjusting and ‘trouble shooting’ your performance.\(^2\)

The metacognitive approach to computer learning involves participants reflecting upon their past and current feelings, attitudes, beliefs and motivations regarding computer use. It challenges them to consider their learning strategies, help-seeking patterns and goal setting behaviours and to develop more effective learning strategies.

The approach encourages teachers to take control over their own learning. At the heart of the metacognitive approach is the process of reflection.

The metacognitive approach to computer learning had been developed through prior research\(^3\) with both pre-service and practicing teachers but had not been applied or tested within a whole-school environment. Recognising that teachers’ learning and ICT integration was most likely to be successful in a supportive learning culture we hypothesised that the full potential of the metacognitive approach could best be realised within a whole-school implementation model.


\(^3\) Phelps, 2002; Phelps & Ellis, 2002a, 2002b, 2002c; Phelps, Ellis & Hase, 2001; Phelps, Graham & Kerr, 2004; Phelps 2007; Phelps, Hase & Ellis, 2005

THE RESEARCH PROCESS

Action research was considered the most appropriate methodology for the project. This involved two research cycles conducted over two years, with seven schools participating in 2005 and nine schools in 2006. Schools engaged in three micro-cycles (one per term), with learning from 2005 built on in 2006.

Participants worked closely with University and CEO staff to develop, test and refine the metacognitive approach. The process was facilitated in schools by key staff, referred to as Companion Mentors (CMs), who also played the role of co-researchers.

The research was informed by a wide range of data, including pre- and post-intervention surveys, workshop evaluations, planning and implementation documents, journals completed by teachers, notes from staff discussions, samples of work, observations and critical reflections, as well as interim and final reports written by schools. A focus was placed on triangulation and member-checking of all data, with an emphasis on maintaining the ‘teacher voice’. A Reconnector Workshop held in 2007 with representatives from most schools confirmed data, findings and recommendations in the final project report.

This consolidated report provides a brief overview of the project and summarises the findings of the research. A more extensive report, including detailed information about data collection and analysis methods, findings and recommendations, is available on request.

The process of professional learning being developed through the research became known as Technology Together.
**Computer learning is different to training.** Directive, skills-based training can reinforce dependency and can date in a short period of time. There are benefits in encouraging teachers to embrace strategies consistent with life-long learning, fostering self-responsibility in embracing continual change.

**Computer competency is different to computer capability.** Capable people are those who can operate in unknown contexts and with new problems. While competency is an ingredient of capability the latter is more powerful in contexts of rapid change.

**Adoption and integration of ICT is influenced by teachers’ attitudes, beliefs, values, motivation, confidence and learning strategies.** Encouraging teachers to think about themselves as computer learners and to confront and improve their affects and learning strategies can enhance their use of ICT.

**ICT learning is complex and is influenced by school culture.** There are no single, linear or fail safe approaches that work in every school. Any approach to supporting schools needs to be flexible and responsive while promoting a culture where ICT is valued, embraced and actively discussed amongst staff.

**Outcomes for students are maximised by a whole-school approach.** ICT integration is the responsibility of all teachers, not just specialists. Computer technology is not just a tool to enhance learning and teaching, but a means to transform and revitalise it.

**Leadership is important.** Teachers need to be encouraged, but not pressured, supported but not over-assisted, stimulated with ideas and adequately resourced without forming an impression that resources alone will lead to effective ICT integration.

**How teachers learn is just as important as what teachers learn.** Strategies such as exploratory learning, problem solving and appropriate help seeking can be fostered and taught, with outcomes that are longer-term than a focus on specific skills.

**Good ICT professional development can enhance teacher professionalism and enrich the teaching and learning culture of a school.** It can encourage reflection, professional dialogue and collaborative practice, prompt teachers to link theory and practice and encourage them to document and share their professional learning and achievements.
Through feeling valued in participating in this project some teachers changed the way they view many things about school. With increased confidence they were able to look at most problems around the school with an attitude of “I know there is a solution” rather than “I give up” (School F).
what was the starting point for schools?

Prior to their involvement in the research, schools were characterised by highly diverse ICT contexts.

Some had very adequate infrastructure while others were quite under-resourced with outdated and less functional equipment. Some were moving towards lab environments, and others toward classroom-based hardware. Access to data projectors for classroom use was patchy. Two schools had newly purchased interactive whiteboards.

Of the 14 primary schools, 10 employed a model of all teachers being responsible for ICT use with their class, although four had just moved to this model. Four other schools employed a specialist ICT teacher, with classroom teachers being expected (to varying degrees) to reinforce or integrate ICT. The two secondary schools ran ICT learning programs for year seven students with specialist teachers, although all teachers were expected to integrate (again to varying degrees of success).

Previous professional development approaches also varied considerably. Of the 16 schools, seven mentioned only internally initiated and delivered strategies; four mentioned only externally (CEO) initiated strategies and four mentioned a combination of the two.

A survey completed by most teachers prior to the project revealed that:

- Significant differences existed between selected schools in relation to frequency of teachers’ ICT use, frequency of use with students, attitude toward ICT, anxiety, reflection and metacognition, learning independence, pedagogical beliefs and confidence in skills.
- Schools selected in 2005 and those selected in 2006 exhibited statistically significant differences only in relation to level of anxiety.
- Overall, teachers reported low levels of confidence for independent learning. They were more confident learning with maximum direction, but were also willing to engage with independent learning if support was readily available.
- Teachers who were confident with computers were most likely to employ exploratory learning strategies, enjoy new challenges, learn independently and regularly set goals.
- Teachers who perceive colleagues as a good support were less likely to be confident in their computer use, indicating that inappropriate support for less confident teachers (i.e. doing it for them) diminishes confidence and that more ICT confident teachers were not gaining support from less experienced colleagues.
- Reflection in itself was not associated with enhanced confidence, independence or frequency of use, however it was associated with encouraging collegiality and goal setting, both of which were associated with confidence, independence and frequency of use.
- The majority of teachers were engaged with a very basic and restricted range of ICT activities and only a small number made diverse and innovative use of ICT.
- Time was cited as the biggest factor impacting on teachers’ own use of computers, followed by internal factors (confidence/self-doubt/fear).
One of the frequently discussed aspects of ICT in the classroom was the retelling of disastrous lessons or failed strategies. These were excellent opportunities for mentors to discuss problem solving and the learning which did occur as a direct result of the mishap or failure. Often teachers would begin to realize that failure and adversity provide rich opportunities for collaborative problem solving (School P).

**KEY FINDING**

Schools with stronger implementation, consistent with the metacognitive approach, were more likely to record more positive evaluative feedback.
Through the action research process schools were required to develop, adapt, trial and evaluate strategies.

**FACILITATING THE PROCESS**

In most schools the identified team of CMs involved one member of executive (typically the Assistant Principal, but in some cases the Principal) and 1-3 other teachers, usually drawn from different stages. CMs were not necessarily the most ICT competent teachers but were generally chosen for their ability to motivate and work with other staff. CMs did not necessarily do all the ‘mentoring’ but were facilitators of learning and coordinators of the process.

**GOAL SETTING STRATEGIES**

A successful strategy was for mentors and small groups of teachers (sometimes a grade or stage) to meet and talk through goals. Print and online resources guided teachers to set individual goals, integration goals, personal/ recreational goals, metacognitive goals and leadership goals and teachers were strongly encouraged to move outside their comfort zone. A number of schools found it useful to have a focus on individual goal setting for one term, so teachers could concentrate on their own learning needs, followed by a term focusing on classroom integration

**MENTORING AND SUPPORT STRATEGIES**

In some instances formal structures were put in place, where a mentor was allocated regular time to meet with staff, either on a roster or by request. In other schools more emergent processes were employed, with teachers being prompted to choose their own partnerships.

Such flexibility allowed individuals more control over their learning process, with some teachers choosing an ‘expert-novice’ model and others a ‘like-to-like’ mentoring dynamic.

**REFLECTION, DISCUSSION AND CELEBRATION STRATEGIES**

The majority of schools allocated regular time in the first 5-20 minutes of staff meetings to focus on Technology Together. A variety of reflection and discussion scaffolds were trialled and refined, including journal booklets. While responses from teachers to the journals were mixed and highly influenced by school culture and implementation strategy, CMs and school executive generally viewed them as valuable, particularly when preceded by structured discussion.

The degree to which schools’ implementation of Technology Together was consistent with the foundational principles of the metacognitive approach varied considerably and was influenced by a range of practical and cultural factors.

<table>
<thead>
<tr>
<th>Level of Consistency of Schools’ Implementation with the Metacognitive Approach</th>
<th>Number of Schools</th>
</tr>
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<tbody>
<tr>
<td>Weak</td>
<td>2</td>
</tr>
<tr>
<td>Weak-Medium</td>
<td>1</td>
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<tr>
<td>Medium</td>
<td>1</td>
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<tr>
<td>Medium-Strong</td>
<td>7</td>
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<tr>
<td>Strong</td>
<td>2</td>
</tr>
<tr>
<td>Very Strong</td>
<td>0</td>
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</tbody>
</table>
More staff members are suggesting strategies to others to help solve their problems… Teachers do not feel isolated - there is always someone to talk to regarding ICT. (School E)

KEY FINDING

Comparison of pre- and post-intervention data revealed that overall means for most factors increased across most schools but statistically significant increases were most likely to be recorded in schools where implementation was most consistent with the metacognitive approach. Statistically significant increases in skill confidence were recorded at 12 of the 16 schools.
Technology Together has broadened my understanding of ICT. It has challenged me to try new things, complete more professional reading and to persist when I have problems. I have learnt that I can achieve two great things: extend my own abilities and extend the abilities of my students all at the same time! (Teacher, School I).

Before involvement with Technology Together teachers were in denial about what they could and couldn’t do and they were struggling with ICT. . . it is easy for people to hide what they don’t know. The process built communication that is open and honest and put an emphasis on moving places. . . There is a sense that the school now realises that it can’t become dust collectors (School J).

Outcomes for teachers and schools

Interim and final reports from schools documented a range of positive outcomes. These included practical initiatives, as well as more subtle changes in teachers’ attitudes, values and day-to-day practice. The focus on teachers setting and pursuing goals that were personally challenging led to a diverse range of initiatives being implemented including:

- Class or school newsletters
- Homework grids
- Class web pages
- Video editing such as production of news reports (including bloopers and commercials)
- Composing digital music using eJay
- E-Pals with neighbouring and overseas classes
- Webquests
- Using data projectors, interactive whiteboards and slates
- Digital year books
- Swish, Claymation and Stop Motion Pro
- Digital photos and graphics manipulation
- Inspiration and Kidspiration
- Online encyclopaedia
- Photostory
- Kid Pix
- Participation in Mathletics
- Enhancing efficiency of Web searching
- Participating in Collie and Quizzard of Oz
- Clicker 4
- Geoboard
- Using Learning Objects
- Using Google Sketch Up
- Electronic programming
- Excel for record-keeping
- Virtual narrated stories using PowerPoint
- Creation of databases
- Exploratory lessons with students.
Across most schools, observations such as the following were made:

- laptops are being brought in and out of school much more;
- people are wearing their USB sticks and moving documents between home and work;
- data projectors are being used a lot more (one school said ‘worn out’!);
- teachers are pointing out if hardware or the network isn’t working;
- teachers are experimenting on their own at home;
- teachers are helping each other out when problems arise, whereas previously they would report problems for someone else to solve;
- teachers have realised that computers afford alternative literacy activities for children who aren’t interested in reading;
- teachers are not frightened to try things with their class;
- people are enthusiastic about sharing their own personal insights and achievements; and
- ICT is no longer an issue in its own right. Now the focus is on educational issues and how ICT might support other outcomes.

Schools also reported outcomes for teachers in relation to their values, attitudes, beliefs and learning strategies. Schools indicated that Technology Together prompted teachers to:

- realise the importance of practising skills in order to retain learning;
- ask questions, make mistakes and get curious;
- admit that they don’t know how to do things and get help instead of giving up;
- be less fearful of being judged;
- persevere more when they encounter challenges;
- be willing to learn with and from their students;
- realise that although a program may be slightly different, the process they need to follow will be very similar;
- realise they don’t need to know everything to have a go;
- be more willing to explore or turn to ‘help’ functions;
- recognise that they have the capacity to solve a computer problem themselves;
- develop a more positive, open attitude towards ICT and the potential it offers; and
- display growing enthusiasm and willingness when we talk ‘technology.’

**KEY FINDING**

The Technology Together process can have significant outcomes for individual teachers. Aside from the development of specific skills and integration ideas, the process can increase confidence to learn, can lead to changes in values, attitudes and beliefs about technology and can improve learning strategies.
Most schools indicated that *Technology Together* was substantially different to ICT professional development approaches previously implemented in that it:

- reached greater numbers of staff;
- prompted people to get involved and to try new things;
- acknowledged that each teacher was starting at a different place;
- encouraged identification and pursuit of personally relevant goals;
- put teachers in charge of their own learning;
- gave teachers choice over their learning strategies and support people;
- prompted more discussion and sharing about technology;
- built confidence by encouraging novices to teach each other;
- allocated time on the basis of expressed need;
- broke down perceptions of one person as expert;
- emphasised the value of reflection and acknowledging feelings;
- built collegiality and collaboration;
- actively prompted celebration of achievements; and
- formalised ICT professional learning.

The ‘non-finite’ nature of the process was seen as positive and many schools indicated that they wanted to continue aspects of *Technology Together* in following years.

**KEY FINDING**

For most schools *Technology Together* represents a significantly different model of ICT professional development. The approach had the potential to change school culture, particularly levels of collaboration, enthusiasm, attitudes to professional learning and relationships between staff.
Teachers are recognising that to be an effective ICT user, one does not have to, and indeed cannot, know it all. However, the key to success in this arena is the willingness to experiment, problem solve and ‘have a go’ (School D).

Willingness to take risks is highly influenced by school culture and leadership. Teachers need to be prepared to take risks with their own learning and embrace ambitious goals. They also need to be prepared to expose to their students their lack of confidence, knowledge or skill with ICT. In schools where Technology Together was most successful the notion of learning with and from students was explicitly discussed with the whole-school community, and teachers were encouraged to share their experiences of trying new things with their class. Promotion of risk-taking was most effective when it was strongly reinforced and/or modelled by executive staff.

Help-seeking and problem solving do have an impact on effective ICT use and can be acculturated. Hesitancy to problem solve and seek help appropriately was evident within many school contexts. Schools that explicitly discussed help-seeking and problem-solving did evidence changes in teacher attitudes; in their willingness to problem-solve themselves, but also not to be afraid to seek help if needed. Making exploratory learning strategies explicit, modelling, prompting and providing tips all proved beneficial.

While pedagogical change remains a central goal, readiness for change must be taken into account. Integral to the metacognitive approach is a focus on perceived usefulness and motivation, with the evident goal of enhancing teachers’ use of ICT in their classrooms, and supporting innovative pedagogy. The research highlighted a readiness issue, with some teachers expressing an overriding need to focus on their own skills first. This reinforced the need to retain the focus on personal and recreational goals. A cyclical process of reflecting on pedagogy and skills was felt to be most beneficial.
The timeline for implementation (i.e. three terms) proved too short for most schools. An 18 month period would have enabled involvement of all staff in pre-planning prior to whole-school implementation across four school terms.

It became clear that simple mentoring models were not consistent with the metacognitive approach. Using alternate terms such as ‘learning partners’ and/or building the concept that all teachers were supporting each other was more consistent with the metacognitive approach. This reinforced the idea that no one knows everything and that the process is about learning together.

Successful implementation of Technology Together was dependent upon identifying the right people to facilitate and lead the process. There were benefits in involving less technological-literate staff in key roles. Where CMs were ICT confident, active engagement of less confident staff in sharing, demonstrating and supporting others resulted in most positive outcomes.

In larger schools most success was experienced by involving CMs from each stage or grade in key roles, but with an overall coordinator who facilitated the process across the school.

Many CMs experienced significant outcomes in terms of their own leadership development. The role provided experience in managing and leading change, working with and coordinating staff, facilitating professional development and leading short and long term planning. Such experiences are valuable preparation for management roles and concord with the qualities sought by teacher accrediting bodies such as the NSW Institute of Teachers.

External accountability (perceived to be provided by the University researcher) was viewed as a critical success factor by some schools, but was downplayed by others. Most schools agreed that an external facilitator was important in providing fresh perspectives, revitalising and challenging schools, as well as transferring ideas between schools. A visit once a term was seen as essential.
**Introductory workshops** were seen as very important for mentors and it was essential that members of the school’s executive attend. Outside the research context a whole-school workshop, supplemented with other forms of preparation for CMs, might provide an alternative implementation model.

The metacognitive approach is founded on teachers setting their own learning goals within a scaffolded and supported environment. Resources to assist teachers to identify ‘what they don’t know’ and what they want to try were strengthened through the project. The resultant ‘Orange booklet’ was viewed very positively by CMs, as was the notion of meeting staff at their point of need.

While teachers’ repeatedly claim that their ICT use is limited by time, **provision of release** is not, in itself, a solution. Much learning occurred in Technology Together schools outside the context of release and teachers needed encouragement to take release even when it was available. That said, teachers did highly value release time and its provision was essential in conveying that the process was valued and supported. Release was most effective when managed within the structures of the Technology Together process (i.e. goal setting, mentoring, reflection on strategies and showcasing achievements). Time allocation was essential for the effective planning by project leaders.

Staff and stage meetings were undoubtedly the preferable place for routine reflection and discussion to occur. A range of strategies were suggested and participating schools were encouraged to try approaches appropriate to their own context.

**In many of the 2006 schools, reflection became associated with journal writing, even though both written and verbal, individual and group strategies were suggested. Notable differences existed between schools in their receptivity to journaling. For some it was approached positively, while for others it was a significant source of tension. Stronger encouragement to vary approaches may have minimised these problems.**

It was never intended that the metacognitive approach would be reliant on level of school infrastructure, but rather a philosophy of ‘making the most of what we have’. There were, however, times when lack of basic hardware did hold teachers back from pursuing challenging goals. Availability of some financial resources can better encourage risk taking and ambitious goal setting.

Ultimately, the successful implementation of the metacognitive approach lay with the **skills and understandings of those facilitating the process**. Some CMs seemed to embrace, understand and embody the metacognitive process expertly and (generally) it was in these schools where greatest success was recorded.

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**KEY FINDING**

For reflection to be most effective it has to be valued and prioritised by executive and teachers alike, with someone taking responsibility for leading discussion. The process needs regular time set aside at staff or stage meetings, using a variety of formats so that it doesn’t become repetitive. The value of combining individual reflection with whole staff or stage discussion lies in showcasing and celebrating each other’s success, providing the opportunity to debrief from problems and ensuring support for risk taking and trying new things. The process for facilitating reflection needs to be culturally appropriate.
It is essential that at least one member of school executive be willing and able to lead the process, including:

- promoting a shared vision of the project and what it means for the school;
- developing a sound plan for implementation;
- introducing and promoting the approach in an enthusiastic, non-threatening and culturally appropriate way;
- clearly stating everyone’s responsibilities;
- actively modelling learning and risk-taking;
- valuing the discussion and reflection process and affording it a high priority at meetings; and
- allocating resources (where available).

The most positive outcomes were achieved when executive viewed Technology Together as part of a broader professional learning and revitalisation agenda within the school.

**KEY FINDING**

It is critical that teachers perceive school executive to be strongly supporting and endorsing the metacognitive approach and that this support be not only through resourcing the project and allocating time at staff meetings, but also through modelling their own learning and involvement. Including ICT as a key focus in the school plan is essential.
A series of resources were produced to support schools in implementing *Technology Together*. The format of the booklets used in 2006 included the:

- Yellow Project Information booklet which contained information specific to the research;
- Red Introductory Guide which provided an overview of the *Technology Together* approach;
- Blue Metacognitive Framework booklet which provided a background to the learning approach;
- Green Getting Started booklet which guided the analysis of the school’s context and culture in relation to ICT;
- Orange Initiatives booklet which supported teachers in setting their own challenging but achievable goals;
- Purple Strategies booklet which engaged teachers in learning strategies that promote ICT capability;
- The Journals (A, B and C) for teachers to record their goals, reflections and achievements.

**POSITIVE ASPECTS**

...of the resources included their layout, ‘callouts’ and colour; bite-size ideas and stories; succinct point form; and their accessible writing style. The Orange Initiatives booklet was seen as particularly useful.

**ISSUES**

...included that there were too many booklets and these needed to be simplified; the need for clearer guidance about how to engage in the metacognitive process and that the content be ‘chunked’ so that it could be processed in a meeting and/or across a term.

**SUGGESTED MODIFICATIONS**

...included producing one booklet that was relevant to the ongoing needs of all teachers and another for mentors/ facilitators; more emphasis on journaling and reflection processes; and turning some of the content into PowerPoint presentations that could be readily used at staff meetings (M=4.25).
This research would suggest that the metacognitive approach can be successfully implemented within a whole-school environment and that it can have a positive impact on the culture of the school and ICT use by teachers. The following claims can be made, based on the data presented by participating schools.

**Overall findings**

*Technology Together* can:
- change teachers’ understandings of ICT integration;
- promote a positive attitude to ICT;
- motivate teachers to experiment and try new things;
- increase teachers’ confidence to learn;
- create a ‘can do’ attitude;
- change teachers’ attitude to professional learning;
- enhance school leaders’ relationships with teachers;
- lead to positive outcomes for students
- build a learning community;
- change teachers’ relationships with their students;
- lead to culture change.

That said, the research has also highlighted the complex range of factors that influence teachers’ ICT learning. No two individuals are the same, and nor are any two schools. In fact, it is this very complexity that led to the development of the metacognitive approach. While the metacognitive approach can provide schools with a framework, ideas, tips, resources and suggestions, together with stories and ‘real life’ examples of teachers’ experiences, it cannot guarantee outcomes in all schools. Much relies on school leadership, the school culture and the personal capabilities of those in the schools implementing the process.

Ultimately, teachers need to have ownership over the process and be motivated and engaged, and while *Technology Together* suggests ways of building this commitment, as the research has shown, there will always be some staff who remain resistant to ICT integration, or to ongoing professional learning and change more broadly. *Technology Together* can provide guidance in these circumstances and tips on how to gradually and subtly engage all teachers, but teachers (just like students) can’t be made to learn. By working at the level of changing school culture, it is believed that even the most reticent teachers can be, at least in some way, influenced by the process and carried along with the current of culture change.
Technology Together has generally been an amazingly successful initiative…. It was embraced with open arms by most teachers and most of those who weren’t initially thrilled by the concept are now so caught up in their successes and new ICT projects that they are definitely on board…(School N).
main recommendations

1 Technology Together should continue to be perceived and promoted as a process rather than a short-term project.

2 The action learning principles of plan, act, observe and reflect should continue as a part of the Technology Together process.

3 The initial school analysis is important to retain, including the pre- and post-survey of teachers. All staff could be involved in analysing and discussing this data.

4 Resources should be further refined to help schools introduce the concept of metacognition to staff.

5 The role of values, attitudes and beliefs in ICT learning, and the limitations of a skills-only focus in effecting long-term change should be explicitly discussed with all teachers, and continue to be reinforced throughout implementation.

6 A cyclical process of focusing on personal development and pedagogy should be emphasised.

7 CMs need to be sensitive to the levels of anxiety felt by teachers and the diversity of their ICT backgrounds. The continued inclusion of the teacher survey is recommended, but with results being returned to schools in a streamlined manner.

8 ‘Risk taking’ should be added as an element in the metacognitive model and specific resources should be produced to support schools to discuss and facilitate this.

9 Technical support staff employed by schools should, wherever possible, encourage both help-seeking and problem solving and be made aware of the foundations of Technology Together.

10 Participation in Technology Together needs to be prioritised as part of a school’s annual plan and broader vision.

11 Ideally, a period of 18 months is needed for implementation of Technology Together, from initial discussions and planning to whole-school implementation over 3-4 learning cycles (terms). Where possible, schools should avoid coinciding involvement with other major commitments.

12 An external facilitator is required to add a level of accountability and provide fresh ideas and guidance, with a suggested visit to participating school once a term.

13 An introductory workshop for mentors is valuable and it is essential that executive staff attend. Support is also strong for whole-school workshops and, depending on the broader context, it may be feasible to engage mentors in a briefer introductory process supplemented by a whole-school workshop.

14 Whole school goal-setting can beneficially supplement individual goal setting, particularly when it is creative and fun and encourages co-learning. Whole school goals can, however, be detrimental if pursued at the expense of a focus on individual learning.

15 While the metacognitive approach promotes ‘making the most with what we have!’ the provision of at least some release time and equipment (if required) demonstrates to teachers that the process is valued and supported. Careful management of how release time is presented and promoted to staff is critical.


…Change is a process, not an event. The change process has started at (our school). We have felt uncomfortable, frustrated, intimidated and overwhelmed. We have experienced failure. However, now we know that we are not alone. We know that there are others who can help us and there is more than one way to solve a problem. We have also felt success, we have been innovative, and we are excited by the progress we have made this year.

(School E)
If you would like further information about *Technology Together*, or this research, please contact:

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