

## **Three key elements in ICT Professional Development**

Dr Sarah Prestridge  
Griffith University  
Australia

### **Abstract**

This paper describes a research project that investigates elements of ICT professional development that contribute to enabling teachers to change their ICT beliefs and practices. Three key elements of professional development were found to form a core reflective process that can be applied to different professional development programs to support teachers' in their abilities to redefine their technological pedagogical content knowledge. These three elements will be discussed.

### **Purpose and Objectives**

The research project described here aimed to investigate the processes required in professional development for teachers to change the way they use technologies in the classroom. The context of the research explored the possibility and effectiveness of 'virtual' professional development, whereby teachers could engage in professional development regardless of geographical isolation or other limitations of time and place. Such an approach seeks to enable teachers in any given school-based location across Australia, to better understand digital pedagogy and how this differs from more traditional, non-technologised practice. Drawing on frameworks and insights developed the project aimed to:

1. Explore the implementation and maintenance of high levels of interaction in teachers' classroom based investigation, constructive discussion, and reflective practice as virtual ICT professional development,
2. Identify the points at which teachers begin to adopt, adapt and appropriate with ICT in their classroom practice and when their personal ICT confidence/ competence can direct their engagement in ICT professional development and help reform their pedagogical practices;
3. Exemplify what constitutes 'best practice' for digital pedagogies, across a range of subject areas, learner orientations and classroom contexts.

In this paper the first project aim will be discussed with reference to the other two aims when relevant.

### **Significance of research**

The demand for teachers to utilise pedagogy that embraces digital contexts has precipitated a worldwide concern for teacher professional development in ICT. Australia's determination to 'have technology enriched learning environments that enable students to achieve high quality learning outcomes and productively contribute to our society and economy' (DEEWR 2008 p 4) is consistent with international programs and priorities. Measures to address problems with infrastructure and access to ICT, labeled as 'first-order' barriers (Ertmer 2005) have made considerable progress and these barriers are now being overcome. The National Education Technology Plan in America (U.S. Department of Education 2010) and the *Every Child Matters* program of change in the United Kingdom (Department of Children Schools and Families DCSF 2009) for example,

mean that in those countries, technological infrastructure such as broadband internet, as well as new ICT equipment, online curriculum resources and ICT training for teachers is being delivered.

Worldwide, teachers are gaining access to ICT, online tutorials are available, and digital curriculum resources are accessible and are continually being developed - the digital classroom is a reality. However, teachers' ability to use these digital tools in their classrooms, that is, practising the digital pedagogies required for the effective implementation of ICT, is not yet in evidence amongst the majority. (Ertmer & Ottenbreit-Leftwich 2010, Al-Zaidiyeen Mei & Fook 2010). In addition, success with regard to technology integration has been based on how extensive or prominent the use of it has been in schools rather than on whether the teacher has been able to utilize it for 'new', 'better' or more 'relevant' learning outcomes (Moyle, 2010). Similarly, as evident in Prestridge's (2007) examination of curriculum reform in Australian primary schools, the majority of teachers were expected to reach targets aimed at augmenting the existing curriculum, that is, by adding-on ICT or assimilating ICT as traditional teaching that has been technolog-'ised'. The *Digital Education Revolution* in Australia is a response to the disturbing finding that even though most teachers and students benefit from access to computers and online resources 'only a minority are reaping the benefits of the information technology revolution' (DEEWR 2008 p 3) through the use of digital pedagogies.

ICT professional development is perceived as an avenue for pedagogical change based on the notion that the implementation of ICT will signify subtle shifts in expectations of schooling in the 21<sup>st</sup> Century and that alternate modes of using ICT in classrooms can be modeled in deliberate approaches within professional development programs. However, professional development needs to focus on issues of pedagogy rather than on the technology itself and building teachers' confidence in change rather than evidence of competence (Loveless 2008) has greater potential for transforming outcomes. Fisher, Higgins and Loveless (2006) call for a 'renaissance', a cultural change in the teaching profession. Such a redefinition of teacher practice requires a mind-shift in teachers to work in new ways, collaborate beyond the school boundaries, focus student learning on high task complexity and continuous learning (Loveless 2008; Prestridge 2007). It is no longer appropriate to believe that ICT competency training for teachers in computer applications so that they in turn, can up-skill their students, is an effective educational or professional development model especially as we already have "multi-media expertise" in our classrooms.

### **Theoretical framework**

The project sought to define what, from a theoretical perspective, are considered effective digital pedagogies. Such a benchmarked understanding will enable all teachers to have a clearer idea of what is required in the reformation of their practice. Teachers are presently unsure about what is expected to be accomplished through the national deployment of personal computers and a 1:1 classroom. In Australia, current definitions of Digital Pedagogies are derived from education policy documentation such as that provided by the Department of Education in Queensland (DETA) through *The Smart Classroom Professional*

*Development Framework* (2009-2011) which proposes specific indicators for teachers to demonstrate ways of working effectively to promote learning in a digital world. The *Smart Classroom Professional Development Framework* (2011a, p.1) promotes pedagogical development through “effective pedagogies” that “transform” teaching and learning. However, current pedagogical practices demonstrate that teachers are only adding on ICT to existing practices rather than reforming practice and engaging authentically with digital pedagogies (Ertmer & Ottenbreit-Leftwich, 2010; Prestridge, 2010). Not much has changed since Bigum (2002, p.133) described early approaches to the integration of ICT as “domesticating” the computer, where ICT are made to conform to requirements of the existing classroom rather than transform teachers’ practice. A framework that articulates the changes to pedagogy required of teachers to integrate technology effectively is provided by Koehler and Mishra (2006; 2009). They identify the need to develop teacher Technological Pedagogical Content Knowledge (TPACK), emphasizing the integral dynamic interrelationship of these three domains for quality teaching, as well as the shaping or reconceptualisation of content and pedagogy by technology. ICT professional development can only become transformative if teachers are enabled to move from an adaptation stage of integrating ICT to one where they are able to appropriate and transform their practices. The project sought to identify significant phases of teacher change so that an informed and a transformed approach to designing professional development can be implemented throughout all education systems in Australia.

### **Research methods**

The project used a multimode or mixed method approach (Creswell 2008) to investigate virtual ICT professional development for those transformative qualities that enable teachers to engage effectively with digital pedagogies. The project maps teachers’ development of pedagogy, curriculum and assessment practices in which ICT is embedded as an educational tool. Seven Catholic primary and secondary schools were involved in the project. The schools are geographically removed from one another throughout the state of Queensland. There is 654km between Dioceses. This represents a broad spread of Catholic Christian Schools. Each school within the relevant Dioceses has no formal online environment for cross-communication and, as such, can be considered as independent or stand-alone. Each school nominated four teachers to participate in each year of the professional development activity, totalling 48 teachers involved in ICT professional development over two years. The significant approaches to data collection and analysis in this project are outlined below.

Phase 1: Phase one involved mapping teachers’ current pedagogical beliefs and practices across Catholic primary and secondary schools: Pre-post data collection and analysis on the teachers’ personal use of ICT, professional ICT beliefs and current ICT pedagogical practices in their classrooms and Professional Development experiences and approaches. All teachers in the seven schools participated in phase 1 of the project. A mixed methods approach was adopted for phase 1 of the project so that the quantitative data directed the qualitative data collection. This funneling down to more fine grained data enabled questions to be asked of the data, comparisons to be made for

similarities and differences amongst data, and identification of properties and dimension of concepts to improve reliability and validity of the findings. The following provides an overview of the funneling approach:

(Instrument 1) *Online survey*: The questions contained in the online survey asked participants for background and demographic information, teachers' personal experiences, confidence and competencies with ICT; understandings of ICT in learning- items evidencing Technological pedagogical content knowledge (TPACK); and ICT professional development experiences and approaches. Participants respond using a 7 point Likert scale. The data was analysed using a 'double clustering' process. First, a factor analysis was used to identify dimensions underlying the set of questions (i.e., the factor analysis will identify groups of items that 'go together' in a correlational sense). Second, a cluster analysis identify groups of participants that have similar profiles across the dimensions. The cluster analysis can be used to guide the selection of demonstrably salient participants for the later qualitative data collection- individuals who are typical of cluster formations (i.e., centroids who are close to the cluster centres) were approached. In addition, the qualitative data collection take as one of its foci of interest the reasons why individuals belong to particular cluster formations. Thus, the quantitative data collection inform some aspects of the qualitative data collection. Individuals will be identified from a coding system that matches survey to cover sheets. For ethical reasons, the survey and cover sheet were stored separately.

(Instrument 2) *Semi-structured interviews*: Participants were chosen from the resultant clusters of survey data, defined as those 'typical' or close to the centre of the cluster. Interview schedules were constructed to explore survey results and facilitate triangulation of the relevant concepts found.

(Instrument 3) *Document analysis*: Interview participants were asked to provide curriculum documentation that illustrates their use of ICT in learning. This was analysed against ICT pedagogical frameworks (Starkey, 2010; DET, 2011) to exemplify teachers' current pedagogical approaches used for embedding ICT in learning sequences.

Phase 2: Action research data collection and analysis: The second phase required teachers to undertake individual Action Research projects. Action research has been chosen as the most appropriate methodology because (i) its emphasises social practice as a focus for research, (ii) the importance of participants being agential in the research, (iii) the action research plan-act-observe-reflect cycle and (iv) the emphasis on transformation (Altrichter Kemmis McTaggart & Zuber-Skerritt 2002; McTaggart 1997). The teacher's role as researcher, together with the role of transforming beliefs and practices, are fundamental to the proposed project.

In the implemented virtual program of ICT professional development, using an action research approach, each of the 48 teachers developed an ICT Action Learning Project based on their classroom ICT needs and professional interests. They contributed to an 2D educational NING through self-generating forum contributions, participate in regular meetings in the 3D virtual space through Second Life with global networking opportunities, developed and regularly posted to their professional blogs and made comments across blogs. Teachers

also shared what they learnt at their school staff meetings, district meetings and international conferences. In the pilot project, teachers were visited by a Professional Development officer who collaborated on ICT Action Plans and at times, organized meeting for groups of teachers involved in the project to share what they were doing with other teachers face to face. However, as the project advanced all face to face opportunities were removed as new teachers became involved and geographical distances increased all professional development activities were conducted online.

## Results

### Conceptualising ICT professional development

This research is concerned with identifying principles underlying ICT professional development that enable teachers to change their pedagogical beliefs and practices. Current forms of ICT professional development were described as “fragmented and fleeting” (OECD, 1998, p. 15) and as not tackling pedagogical issues adequately (OFSTED, 2002). What was and is still needed is a model of ICT professional development that enables the transforming possibilities of ICT to become part of every teachers’ practice. Drawing on action research as a method and guiding ethos, this study deconstructed and reconstructed critical professional learning activities that are considered essential for teachers to engage in to enable them to change their existing pedagogical beliefs and practices. The model (see Figure 1) that has evolved from the study presents a justifiable response that can be applied to the virtual context and not limited by geographical isolation or other limitations of time and place.

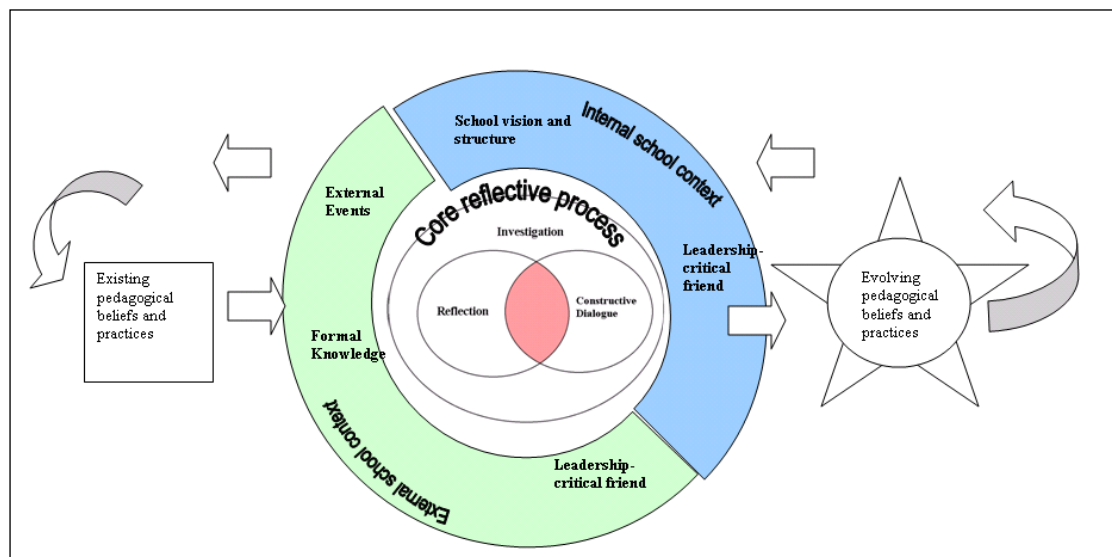


Figure 1 Transformative ICT professional development model

Figuratively in Figure 1, teachers enter this model from the left hand side and move as the arrows indicate, from left to right, in a circular motion. They enter with existing pedagogical beliefs and practices. These existing pedagogical beliefs and practices are shaped through engagement within the core reflective process to produce a state where their beliefs and practices are continually

evolving. An evolving state implies meaning associated with teachers' understanding of professional development. Firstly, it implies that a teacher considers professional development as continual and an intrinsic part of their professionalism. Secondly, it implies that different pathways are required within professional development.

The capacity for professional development is indicated in the formation of and relationship between the central three sections. The central section is named the core reflective process and is made up of three elements of- investigation, reflection and constructive dialogue. As the teacher moves from left to right, he or she engages simultaneously with the three professional learning elements. These three elements must be viewed as dynamically interdependent. Each is required in ICT professional development to initiate teacher engagement that pre-empts reflection to enable further informed strategic action. The innermost shaded intersection of these three activities is considered the space where teachers are able to transform their beliefs and practices. Each of these processes will be described in detail now.

Teachers' transformation occurs within ICT professional development when teachers' verbal reflection, supported by written reflection is actioned with critical discourse that is based in collegial formations. Teacher action is best embedded within an investigative context such as a classroom based inquiry. Teachers engaged in this dynamic interplay of the three professional learning activities make links with elements in the internal and external school contexts when they are required, such that internal and external leaders are drawn on to direct or challenge teachers' pedagogical beliefs; formal knowledge and external events are used to inform teachers' pedagogical practices; and school vision and structures provide opportunities to collaborate with other teachers within and across schools. The core reflective processes of investigation, reflection and constructive dialogue represent the three elements that are critical in professional development. Each of these processes will be described in detail now.

### **Construction of investigation**

Investigation as both the corpus and guiding principle for professional development is promoted within the literature on teacher-as-researcher based within action research (Carr & Kemmis, 1986; Kemmis & McTaggart, 1988; McTaggart, 1997) where teachers adopt the activist role as part of their professional practice. There were three themes that emerged from the analysis that supported and directed this claim.

The first theme that emerged in investigation indicated that ICT professional development had greater transformative potential if it enabled teachers to use the process of investigation to focus on examining their pedagogical beliefs and practices rather than as a re-tooling agency (re-tooling refers to developing ICT skills). This condition was evident in the literature with researchers such as O'Rourke (2001) and Green & Bigum (1992) promoting ICT professional development based within pedagogical examination however the shape and

actualities of ICT professional development had yet been defined by them. This research proposes that in regard to investigation greater transformative capacity is enabled when investigation provides a space for self-realisation. Establishing a pedagogical focus for ICT professional development where competency training is considered as a secondary condition directed by and restricted to the chosen classroom investigation was found to cater for both ICT competent and less competent teachers as well as move teachers' thinking towards teaching and learning outcomes. An important factor in enabling teachers in self-realisation is the examination of new teaching approaches rather than a reconstitution of established practices using a different technological application. Self-realisation is supported by this approach to investigation but can only be achieved in combination with processes of reflection and constructive dialogue.

Strengthening this modelling of investigation is the analogy of investigation as a platform from which external professional activities can be viewed by teachers. As expressed in the literature, ICT professional development has conventionally been considered as workshops or isolated events outside of the school (Ingvarson & MacKenzie, 1988; Lankshear & Bigum, 1998). A model of investigation locates ICT professional development in the classroom where teachers relate knowledge presented externally back to what is happening locally. This changes the way external activities are perceived and utilised by teachers. The findings of this research suggest that once a classroom becomes the centre for investigation by teachers in ICT professional development there is a change from teachers consuming knowledge provided externally to reflecting upon and transforming one's own beliefs and actions. Professional development becomes related to the classroom rather than to external professional activities.

The final theme to emerge from data under investigation provided practicalities for establishing classroom based investigations. These practicalities align closely with the previous two themes discussed. For teachers to be motivated and to sustain involvement investigation must be considered as part of what teachers do in classrooms daily rather than as an extra or additional exercise. It must also be designed to cater for specific professional needs and be linked to student learning outcomes.

### **Construction of reflection**

In regard to constructive dialogue, reflection as a professional learning activity was found to connect directly in the verbal form with written reflection providing a supportive role for teacher. Teacher's written and verbal reflections were both found to have capacity to support teacher change when teachers engage with these forms. Written reflection used independently by teachers and verbal reflection engaged in collaboratively by teachers, play a substantial role in enabling teachers to transform their pedagogical beliefs and practices. To illustrate this, the oval shape of the process of reflection within the transformative model (Figure 1) indicates the distinction between written (unshaded section) and verbal reflection (shaded section) where verbal reflection, constructive dialogue and investigation are combined as an integral capacity for enabling teachers to transform their beliefs and practices. Both the value and role of reflection were examined to establish this re-constitution.

Through an analysis of the perceived value of reflective blogs, the distinction between written and verbal reflection became apparent. Teachers' blogs were found to be recordkeeping devices with no analytical quality indicating a lack of understanding of how to reflect. Teachers in this study also required a significant amount of support in devising action plans. These findings indicate that for written reflection through blogging to be perceived by teachers as valuable, the capacity for instruction is required to move the rhetoric of action research and reflective writing into the practical realm. In this research teacher's written blogs was found to play a supporting role to teacher's engagement in verbal reflection.

Conversely, verbal reflection was perceived by teachers as a valuable form of reflective activity. Through professional opportunities online and virtually that provided collegial contexts, teachers were found to be more constructive in their reflections. Teacher's verbal reflection was affected by two circumstances. Firstly, in instances where teachers were asked probing questions by others verbal reflection was found to be deeper and had the capacity for development. Whereas, in instances where the teacher had to verbally reflect in real time chats, reflections were limited to a clarification of their ideas. Both of these circumstances had a positive affect on the depth of verbal reflection with greater development and capacity for verbal reflection occurring when a connection existed with the constructive dialogue process in the form of a critical friend. Finally, reflecting verbally face to face was perceived by teachers as more relevant to a teacher's professional practice and in general teachers' preferred verbalising their thoughts compared to blogging.

As a result of these findings from an examination of the perceived value of both written and verbal reflection and the role of written reflection in the context of teacher ICT professional development, verbal reflection assumes greater capacity for enabling teacher's transformation of their pedagogical beliefs and practices if it is perceived as interdependent with the process of constructive dialogue. When teachers engage in constructive dialogue it provides capacity for and development of verbal reflection. Written reflection provides a supportive independent function. Teacher's reflective practice, within the ICT professional development model, draws support from the internal context in the form of leadership from a critical friend, and school structures that provide opportunity for collegial/reflective meetings in small and large forums. To the external context, teachers' reflective practice requires external leadership again in the form of critical friend for a broader endorsed perspective; and to wider external events that provide opportunities for collegial/reflective discourse. Teachers' verbal reflection when supported by their written reflection enables them to transform their practice when they are able to engage in conjunction with constructive dialogue that is embedded in the process of investigation. This combination suggests a dynamic interplay of the three professional learning activities. The final professional learning activity, constructive dialogue will further advance this dynamic interplay within the core reflective process.

### **Construction of constructive dialogue**



Like reflection, constructive dialogue is a process that teachers engage collaboratively to stimulate new ideas. It sits within the context of investigation as an action where teachers' critically discuss what is happening inside and outside of their classroom.

As established in reflection, there were beneficial connections between reflection and collegial dialogue that was represented by a unified shaded section in Figure 1. Teachers' engaging in verbal reflection within collegial contexts linked to internal and external critical friend dyads, was found to benefit the depth and development of a teacher's reflection. Building on from this, teachers' constructive dialogue implied the need for teachers' to engage in critical discourse and the underlying supportive role of collegiality within community and connection to internal and external leadership for greater capacity in enabling teachers' to transform their practice. Constructive dialogue in the transformative ICT professional development model (Figure 1) represents a layer of collegiality (unshaded section) and a critical capacity (shaded section) within community of learners. An analysis of three themes within collegial dialogue appropriated this fine-tuning.

The first theme explored the transformative potential of learning communities in face to face and virtual environments. The findings suggest that even though face to face environments were perceived by teachers as a preferred mode for developing community this was based on the assumption of community being a place to share and collaborate. In comparison, critique was evidenced within and a requirement of teachers' participation in a virtual community. Critique symbolised the transformative potential, the notion of 'learning' in an online community and also contributed to sustainability. However notions of mindset, reciprocity and lack of perceived knowledge limited this potential in the virtual forum. A concomitant relationship emerged that evidenced negotiating and sharing in face to face environments supporting critical discourse in virtual environments. This finding indicates the layering of collegiality and critique within the process of constructive dialogue.

The connection between collegial dialogue and leadership was examined through an analysis of the different roles of leadership found within this research context. This analysis further explored the relationship between critique and collegiality to inform the reconstruction of collegial dialogue into constructive dialogue. Three different roles for leaders were identified that had different implications for transformative outcomes. Firstly leadership as trainer indicated a collegial relationship to develop ICT competencies which was considered by some teachers as a very important part of ICT professional development. Little transformative potential was enabled from this form of leadership, however the gaining of competence and confidence as a precursor to the appropriation of ICT (Dwyer, Ringstaff, & Sandholtz, 1991) establishes the importance of such a role. The findings here suggest that the leadership as training established collegiality in investigative contexts.

Secondly leadership as critical friend indicated a strong focus on a critical lens for professional development. Critique was found to be fundamental in enabling

teachers to examine current beliefs and practices, support deeper reflection and inform strategic action. Critique embodied the move from collegial to constructive dialogue. It epitomised the need for teachers to challenge their beliefs and validated the notion of an educational community which valued both friendship (community) and learning (educational). The connection between constructive dialogue, verbal reflection and external leadership was further supportive of the inclusion of the element of leadership-critical friend in the external context. The need for an outsider's broad and informed perspective was found to be crucial in supporting teachers to transform their mindsets and pedagogical practices.

Thirdly leadership as connector emphasised collegiality again that connected constructive dialogue with the internal context of school vision and structures. Collegiality in this form represented a sharing of professional culture being nurtured within and across schools. The link between school culture and professional development is evident through this form of leadership with particular visionary activities and school structures beneficial to enabling teachers to transform their practice. Evidence of in-school and across-school connections benefited collegiality amongst participating teachers.

These three roles of trainer, critical friend and connector indicate the need for both critique and collegiality to fulfil different needs within community that could be considered educational. The notion of learning as part of professional development was explored further to indicate that balance needed between collegiality and critique. The term constructive dialogue was created to represent this balance. Learning was found to be representational when teachers engaged in collegial dialogue whereas learning was found to be transformative when teachers engaged in critique. For ICT professional development both forms of learning are required.

The third theme to be examined under collegial dialogue was community within an online forum. The findings suggest that a learning community was created in an online environment as both collegiality and critique were enabled. Symptomatic features of the online environment were found to limit teacher's constructive dialogue and evidence of social activity was found to benefit collegiality. Teachers required both collegiality and critique for participation. These findings further support the importance and construction of the term constructive dialogue in the model (Figure 1) and suggest the potential for this form of communication and community building within ICT professional development.

Constructive dialogue has emerged with greater transformative capacity than collegial dialogue within ICT professional development as it identifies the need for teachers to engage in critical discourse that challenges and shapes their pedagogical beliefs and practices; it acknowledges the importance of teacher's discussion taking place within a supportive, nurturing environment; it symbolises the learning emphasis of professional development; and in this instance it has enabled teachers to engage with key issues associated with a transformed pedagogy namely mindsets and the infusion of ICT in learning. As a

professional learning activity within the core reflective process, it represents a layer of collegiality supporting critical discourse, hence the shaded section embedded within the unshaded circle boundary of constructive dialogue (see Figure 1). As a teacher engaging in constructive dialogue, they look towards the internal context for leadership that performs three roles of trainer, critical friend and connector and provides school vision and structures that enable discussion within and across schools. To the external context teachers engaging in constructive dialogue, like reflection require broader leadership through a critical friend and further opportunities for group discourse. Teacher's constructive dialogue is actioned while reflecting within the context of investigation. The dynamic interplay of the three professional learning activities within the core reflective process can now be described as a transformative approach.

### **A transformative approach**

The construction of investigation, reflection and constructive dialogue with internal and external contextual connections underlined by a collaborative design process provides teachers with the ability to move from their existing pedagogical beliefs and practices to a state where these beliefs and practices are evolving. Teacher's transformation occurs within ICT professional development when teacher's verbal reflection supported by written reflection is actioned with critical discourse that is based in collegial formations. Teacher action is best embedded within an investigative context such as a classroom-based inquiry. Teachers engaged in this dynamic interplay of the three professional learning activities makes links with elements in the internal and external context when they are required, such that internal and external leadership are drawn on to direct or challenge a teacher's pedagogical beliefs; formal knowledge and external events can inform teacher's pedagogical practices; and school vision and structures provide opportunities to collaborate with other teachers within and across schools. ICT professional development is about enabling teachers to use ICT seamlessly in the teaching and student learning process. It is about developing teachers who are critical of themselves to acknowledge and utilise the differences they have with learners; developing the capacity for continual renewal and being responsive to the changes brought by new technologies; and lastly, it is about teacher's seeking the new and transforming the old.

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