How do teachers develop their technological pedagogical content knowledge in the context of system-wide pedagogical and curriculum reform?

Abstract

Teachers are under pressure to change their practices so that schooling is more relevant to the children of the 21st century where our society has moved from an agrarian to industrial to informational society. “[T]eachers today are having to learn to teach in ways in which they have not been taught themselves” (Hargreaves et al., 2001, p. 197).

Victorian schools are currently implementing changes to curriculum and teachers are being challenged to strengthen their teaching capacity in response to Government policy and initiatives. This study investigates the development of teacher professional knowledge and practice in the context of these changes. Specifically, the study explores how selected teachers conceptualise, articulate and develop a body of knowledge to teach and implement the Information and Communications Technology (ICT) domain of the Victorian Essential Learning Standards (Victorian Curriculum and Assessment Authority, 2005) curriculum framework. The study captures teachers’ conceptualisations and elaborations of their practice as they enact changes to their curriculum and pedagogy.

Defining pedagogy and effective pedagogy

Throughout the last few centuries, educational systems have been entrusted with preparing students for the changing demands of the labour market. While the foci and purposes of education have shifted to accommodate social, political, cultural and economic expectations, consistently the education literature demonstrates that the outcomes have been to enhance student learning through improved teaching practices. Educational theorists of the 20th and 21st centuries have espoused a plethora of definitions and models of pedagogy, pedagogical approaches and implications for teachers’ classroom practices. Current definitions used range from those adopted by cognitive psychology (Eggen & Kauchak, 2001), to sociology (Bernstein, 1996), feminist (Luke & Gore 1992; McWilliam, 1999) and workplace learning (Fuller & Unwin, 2002). Informing these theories are philosophies, values and assumptions about how we learn and the subsequent approaches that enable learning. Finding consensus on a definition of pedagogy within the literature is difficult, however there is agreement that central to the profession of teaching is pedagogy (Gore, 2003; Darling-Hammond, 1998). Britzman (2003) notes that
‘pedagogy points to the agency that joins teaching and learning’ (p. 54). Loughran et al. (2006) call for an understanding of the relationship between teaching and learning at its core, fearing that the meaning of the word pedagogy has been weakened through its use as a synonym for teaching.

Pedagogy is viewed ‘effective’ depending on the level of student acquisition of knowledge, skills, attitudes and dispositions within a particular social and material context (Vaughn et al., 2006). It is more than having a toolkit of activities and a repertoire of routines (Hoban, 2002; Berry & Milroy, 2002). No matter what pedagogical model or strategies teachers choose, the literature suggests that teacher quality is the key determinant of student learning. According to Hattie (2003), teacher quality is the single greatest in-school influence on student engagement and outcomes. His analysis of over half a million academic studies on the effects of different educational interventions on student learning found that teaching has a measurable impact on students’ cognitive, affective and behavioural outcomes, ranging from 30 to 59 percent. This makes the impact of the teacher more important than other factors such as resources, curriculum guidelines and school organisation. Systems and schools implement programs to develop teachers’ pedagogy based on the notion that it is the quality of pedagogy that most directly and most powerfully affects the quality of learning outcomes that students demonstrate’ (Gore et al., 2004).

The notions of ‘authentic pedagogy’ (Newmann et al., 1996), ‘critical pedagogy’ (Giroux, 2000; Lankshear et al., 1996; Lather, 1995) and ‘productive pedagogies’ (Education Queensland, 1999) have all arisen over the last decade out of the need to identify that essential blend of knowledge and skills required for effective teaching.

Teacher knowledge

A persistent theme in the education literature is the view that a growing knowledge base is needed to improve teacher quality. Research has indicated that “…lifelong learning is necessary for sustaining teacher morale, for career advancement and promotion, for a vibrant workforce, for managing change, for improving skills, content knowledge or pedagogy” (Kington et al., 2003, pp. 43-4).

**Shulman’s classification of teacher knowledge**

Lee Shulman (1987) identified that teacher knowledge is at the heart of teacher quality and developed a seven-part classification of teacher knowledge. He described teachers’ practice as drawing upon a professional knowledge base built up from seven elements:

- knowledge of subject matter
- pedagogical content knowledge
- knowledge of curriculum
- general pedagogical knowledge
- knowledge of learners and their characteristics
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- knowledge of educational contexts
- knowledge of educational aims, purposes and values.

Shulman’s work (1986a, 1986b, 1987) continues to guide the research, policies, programs, and practices of local, national and international work on pedagogy.

**Pedagogical content knowledge**

Perhaps the most original and significant aspect of Shulman's classification is the category of pedagogical content knowledge (PCK). In developing this construct, he generated interest in the importance of ‘deep’ knowledge of the subject itself, and knowledge of the pedagogy needed to successfully teach it. Shulman offers a way of distinguishing the distinctive form of teachers’ professional knowledge, by describing the relationship between the traditionally mutually exclusive knowledge bases of content and pedagogy. This form of knowledge builds upon, but is different from, teachers’ content knowledge or knowledge of general principles of pedagogy. In his view it is “the special amalgam of content and pedagogy that is uniquely the providence of teachers, their own special form of professional understanding” (1987, p. 8). It entails knowledge of how to structure and represent content to students; knowledge of the common conceptions, misconceptions, and difficulties that students encounter when learning particular content. He argues that it is the capacity "to transform the content knowledge he or she possesses into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by the students" (1987, p. 15).

**Technological pedagogical content knowledge**

Building on Shulman's idea of pedagogical content knowledge, Mishra and Koehler (2006), have added technology to the equation and designed a model that they call ‘technological pedagogical content knowledge’ (TPCK) to refer to the interrelationship of the three key components of learning: content, pedagogy, and technology. It emphasises that the knowledge and skills of the 21st century teacher intersect these three fundamental areas. (Mishra & Koehler, 2006). Developed to assist with the integration of technology across the curriculum, the implication is that properly prepared teachers can take advantage of the unique features of technology to teach content in ways they otherwise could not (Garofalo et al., 2000).
Mishra and Koehler urge that rather than looking at each of these components in isolation, we also need to look at them in pairs: pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and all three taken together as technological pedagogical content knowledge (TPCK).

The policy and curriculum context for this study

With policy directions designed to equip students with skills for living and working in the 21st century, there is a need for teachers to build the body of knowledge, skills and behaviours to teach the interdisciplinary ICT (Victorian Curriculum and Assessment Authority, 2005) domain. Pedagogical and curriculum reform in Victoria supports the view that growth in teachers’ pedagogical content knowledge is necessary to build teacher capacity. This is demonstrated in the publication of professional learning and curriculum resources by the Victorian Department of Education and Early Childhood Development including the English, Maths and Science Developmental Continua P-10 (Department of Education and Training, 20061).

System-wide endorsement for interdisciplinary curricula is evidenced in the Victorian Essential Learning Standards (Victorian Curriculum and Assessment Authority, 2006).

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1 The English Developmental Continuum P-10 was first published online in 2006, followed by the Maths and then the Science Developmental Continua P-10 in the years 2006-7. During this time, the Department of Education and Early Childhood Development (DEECD) was known by its former name, the Department of Education and Training (DE&T). These resources continue to be added to and regularly updated.
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2005) where schools are expected to organise their whole school curriculum to include the Physical Personal and Social Learning; Discipline-based Learning and Interdisciplinary Learning. This places pressure on Victorian teachers to adopt interdisciplinary pedagogical approaches that cross discipline boundaries and connect students with ‘authentic’ learning experiences. The Principles of Learning and Teaching P-12 (Department of Education and Training, 2004) has been designed to develop teachers’ pedagogy to better deliver the curriculum reform agenda. Tension exists as teachers are presented with “opportunities for creativity and innovative possibilities for making connections” (Strathern, 2006) while they are concurrently challenged to create learning experiences with intellectual rigour and sophisticated conceptual understandings that cross curriculum boundaries within a connected and cohesive curriculum (Shulman & Sherrin, 2004). Through these initiatives there is a movement to place the teacher at the centre of change with the teacher as researcher and problem solver gathering information to arrive at solutions that address often challenging circumstances.

While the jury is still out on the impact of ICT on learning outcomes there is a policy and program push through the Victorian Department of Education and Early Childhood Development to adopt and integrate ICT into all aspects of the teaching and learning program. This push is not grounded solely in quantifiable student learning outcomes, it derives also from a desire to prepare students for life and work in a technology rich society. Like Kamler and Comber (2004), I am interested in what this means for redesigning pedagogies for these times and the impact on changing professional identities.

Working with the teachers

Establishing a close working relationship with teachers as they embark on new challenges with ICT, provides insights into how ICT is being used in learning environments, how teachers are adapting and changing their pedagogical repertoire to accommodate changes and challenges, and the activities they undertake to develop their technological pedagogical practice. Six female primary teachers have been recruited from schools facing challenges of disadvantage caused by low socio-economic status and cultural and linguistic diversity. The teachers selected for this study have demonstrated interest in ICT through their involvement in the ICT network in their Local Government Area (LGA) and have experimented with the use of ICT to broaden their pedagogical repertoire, trialling new ideas to improve their practice and the learning outcomes of their students.

The study takes place in three primary schools all within a three kilometre radius of a LGA network based on geographic proximity, in a growth residential area approximately 25kms from the central business district of Melbourne, Victoria. Demographic data shows that this is a rapidly growing area of low to middle income earners, with a high proportion of families in the process of buying their own homes. The schools serve a diverse and multicultural community. There are more than 30 different languages represented in each of the schools. According to the Australian Bureau of Statistics 2006 census data, there are growing numbers of residents from
a wide range of ethnic groups with languages other than English and Indigenous Australians in the neighbourhood. A large proportion of students in each of these schools are recipients of the Education Maintenance Allowance (EMA). These are schools where innovation is needed to address challenges that arise from the social and economic fabric of their locality and they provide opportunities to explore and understand how teachers develop their capacity to teach an interdisciplinary domain under complex conditions.

The schools participating in the study have identified strengthening their pedagogical practices to teach the ICT (Victorian Curriculum and Assessment Authority, 2005) domain as an area of focus to address their particular challenges. They have made a commitment to improving teaching and learning outcomes through professional learning that enhances the integration of ICT into their programs. These are schools that are implementing the *Victorian Essential Learning Standards* (Victorian Curriculum and Assessment Authority, 2005) and *The Principles of Learning and Teaching P-12* (Department of Education and Training, 2004) and are involved in an ICT network to build teacher capacity in the ICT domain (Victorian Curriculum and Assessment Authority, 2005). There is a high expectation in each of the schools that teachers will integrate ICT into their classroom programs. In addition, new teaching appointments are assessed on the willingness to deliver quality programs using ICT.

In order to study how teachers develop their technological pedagogical content knowledge, the teachers undertake a learning inquiry (or self study) of their choice aimed at improving their teaching practices with ICT. The inquiry is designed as a catalyst to heighten the teachers’ sensitivities to how they learn. Ongoing dialogue takes place as they develop and evaluate a focussed activity requiring deep thinking and reflection about their practices and their own learning.

With each teacher, professional practice and development is discussed at the beginning, at the end of their inquiry, and then a few months after the completion of the inquiry. Teachers discuss the interrelationships between content, pedagogy and technology for effective teaching. They also reflect on what works in terms of their own professional learning and what they observe of the learning of other teachers. The digitally recorded discussions help gain an understanding of their practice with ICT and what they do to develop their practice. They also contribute key documents produced by the school, including the School Strategic and Implementation Plans, and their own work plans, unit plans, and other curriculum and planning documents.

As suggested by Merriam, all interviews are transcribed. ‘Verbatim transcriptions of recorded interviews provided the best database for analysis’ (1998, p. 18). These transcriptions enable the verification for accuracy by the teachers. Verification is not a technique available through field notes alone. In addition, according to Partlett and Hamilton (1976) information may only acquire meaning or relevance as the research evolves, therefore all information imparted by participants needs to be recorded. In line with their advice, the transcriptions are used for progressive focussing as new themes and ideas emerged.
Generating theory

A theory is being generated as these six primary teachers trial and reflect on action oriented, problem solving classroom research to improve their teaching. The teachers are involved in the theory generation as data is collected, coded and synthesised and then fed back to them in the form of diagrams for comment. Constructivist Grounded Theory, as a research methodology, shapes both data collection and analysis of this study and the way the results are reported, through the development of a theory.

I am interested in Grounded Theory because not only is it a means of generating theory, it is a method grounded in data. However at first, Glaser and Strauss’s original work on Grounded Theory in 1967 did not resonate as an appropriate method for my research because of its notions of objectivity and its positivist origins. I wanted to engage teachers to construct knowledge, to construct theory through a collaborative process where biases and influences are considered and articulated. I wanted to explore how teachers develop their pedagogical content knowledge, and I did not think this was possible as an objective observer; I needed a collective approach to constructing theory. Actively constructing theory with teachers would help with validity and reliability. They were to be not only informers but co-constructionists and the sounding board for legitimisation and confirmation. In addition to theory validation against the literature, I wanted to ensure the theory resounded for those from whom the data had derived and to whom it applied. It was not until I read the work of Kathy Charmaz (2000) that Grounded Theory gained appeal and traction for my research in education. Charmaz, a student of Glaser and Strauss, observes that Grounded Theory has moved to also encompass the constructivist inquiry paradigm. Charmaz, in her contribution to the Handbook of Qualitative Research (2000), proposes a distinction between objectivist and constructivist Grounded Theory. Constructivist Grounded Theory “emphasises how data, analysis, and methodological strategies become constructed, and takes into account the research contexts and researchers’ positions, perspectives, priorities, and interactions” (Bryant & Charmaz, 2007a, p. 10). Charmaz, since 1990, has maintained that researchers from a range of theoretical perspectives can use Grounded Theory to effect. She explores the opportunities it provides the social researcher with a constructivist world-view when developing theory from qualitative data.

From an analysis of Strauss and Corbin’s texts and tools, Mills et al (2006) detect that there is constructivist intent in their approach to inquiry. They argue that all variations of Grounded Theory exist on a methodological spiral connected to epistemological underpinnings and that Constructivist Grounded Theory is positioned at the latter end of this methodological spiral.

Grounded Theory now appeals to researchers from a range of disciplines because of its power to generate theory that illuminates and explains surfacing themes. Grounded Theory researchers collect and analyse data simultaneously from the initial stages of data collection. The researcher returns to participants to gather more focussed data to address conceptual gaps and refine emerging themes. The
researcher shapes the interview to arrive at a theory, tightly weaving data and analysis to refine rising analytical concepts and themes. For Charmaz (2006), in-depth interview data is well positioned to enable a Grounded Theory analysis and she espouses ways of shaping conceptual understandings from interview data that captures the realities of lived experiences and rich insights into people’s situations.

As both a method of inquiry and a method of analysis, it resonates with the principles of social constructivist epistemology that underpin my approach to the iterative interplay between data collection and inductive data analysis, and constructing theory with participating teachers.

**The role of literature**

Urquhart and Fernandez (2006) are of the mind that while a preliminary literature review will orient the study, the generated theory will determine the relevance of the literature. While an extensive literature review guides this study, emerging themes from the data demand greater insight and background; this involves an ongoing dialogue with new literature.

**The role of diagramming**

For Lempert, “Diagrams are central in Grounded Theory work. They create a visual display of what researchers do and do not know. As such they bring order to the data and further the total analysis”. (Lempert, 2007, p. 258)

From the beginning, I have used the diagram to represent, in skeletal form, what is emerging from the data. Used as a tool to return an evolving theory to the teachers, the diagram helps gain further insights and often confirm that I am capturing the emerging themes and concepts. The diagram is also used to stimulate thoughts on the interrelationships between the key themes and discuss complexities. It provides the possibility of elevating the discussion to a more conceptual level while at the same time drawing out the details, nuances and dimensions. The diagram becomes an instrument to aid further interrogation of concepts and ideas, and helps achieve a breadth and depth of perspective with every return. Throughout the course of the interviews the higher order key elements of the diagram have not changed, however complexity has emerged in the details and dimensions and how they are characterised.

Diagramming works on a number of levels, not only does it help validate the work undertaken to date, it provides a stimulus for further elaboration and clarification. It is a tool for ‘saturation’ as it helps focus discussion on the core concept, helping to build the framework and its interrelationships and dependencies. Diagramming helps build the relationship with participants in the research and elevates and clarifies their role as both informants and co-constructors of the theoretical framework. The diagram helps close the loop on the work as the participating teachers journey through the various phases of the research, from participating in early discussions to contributing to and validating the theoretical framework that emerges from their data. What has amazed me in the process is how
emphatically and easily the teachers have confirmed and validated this work, and have been able to see their stories and those of their peers in the conceptual framework.

Through the diagram, the teachers participate in co-construction. Through Constructivist Grounded Theory as a research methodology, I enact my epistemological stance, and arrive at a socially constructed theory.

The diagram: Teacher learning – internal and external factors

The following diagram has been developed in collaboration with the teachers to describe how they develop their technological pedagogical content knowledge.

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Figure 2: Teacher learning: internal and external factors
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The following table describes the details and dimensions emerging from the selective coding process.

<table>
<thead>
<tr>
<th>External Environmental</th>
<th>This includes</th>
<th>Growth is optimised by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td></td>
<td>Providing opportunities for interaction with external knowledge bases</td>
</tr>
<tr>
<td></td>
<td> System and school policies, curriculum programs and guidelines eg. authoritative pedagogy and standards documents</td>
<td>• Theories, constructs, paradigms for deeper understanding, to challenge ideas and structure thinking</td>
</tr>
<tr>
<td></td>
<td> School and system data</td>
<td>• Interrogation of local and system data to make adjustments to curriculum and pedagogy</td>
</tr>
<tr>
<td></td>
<td> National and international research and literature</td>
<td>• Just in time learning with experts based on needs and interest</td>
</tr>
<tr>
<td></td>
<td> Evaluation of programs and policies</td>
<td>• Interaction with and feedback from colleagues and students</td>
</tr>
<tr>
<td></td>
<td> Personal and professional knowledge of colleagues, experts, coaches</td>
<td>• Assessment and audit of knowledge gaps</td>
</tr>
<tr>
<td></td>
<td> Students’ personal knowledge</td>
<td></td>
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<tr>
<td></td>
<td> Parents’ personal knowledge</td>
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</tr>
<tr>
<td>Values and beliefs</td>
<td> Attitudes</td>
<td>• Strategies to align personal values and beliefs with school and system values and beliefs</td>
</tr>
<tr>
<td></td>
<td> Disposition</td>
<td>• Leadership support and commitment to integrating ICT into all aspects of the teaching and learning program</td>
</tr>
<tr>
<td></td>
<td> World view</td>
<td>• Disposition to change and trialling new things</td>
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<tr>
<td></td>
<td> Assumptions reflected in Government and school priorities, culture and behaviours</td>
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</tr>
<tr>
<td>External Environmental</td>
<td>This includes</td>
<td>Growth is optimised by:</td>
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<td>-------------------------</td>
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<td>------------------------</td>
</tr>
<tr>
<td>Vision</td>
<td>Vision</td>
<td>Clearly conceived, articulated and communicated vision, mission, goals and strategic plan:</td>
</tr>
<tr>
<td></td>
<td>Mission</td>
<td>• Vision for a technology rich learning environment</td>
</tr>
<tr>
<td></td>
<td>Goals</td>
<td>• Ability to envision and transfer vision – collective vision</td>
</tr>
<tr>
<td></td>
<td>Strategy</td>
<td>• Leadership enacts and models the vision</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Leadership empowers others to enact the vision and starts with the most willing</td>
</tr>
<tr>
<td>Practice</td>
<td>Current practices in education:</td>
<td>Developing a culture of continuous improvement:</td>
</tr>
<tr>
<td></td>
<td>School and system pedagogical and assessment practices</td>
<td>• Raising expectations of teachers</td>
</tr>
<tr>
<td></td>
<td>School and system professional learning arrangements and offerings</td>
<td>• Providing access to new and emerging practices</td>
</tr>
<tr>
<td></td>
<td>Implementation of school strategic plan</td>
<td>• Valuing risk-taking and experimentation</td>
</tr>
<tr>
<td></td>
<td>Behaviours and culture in operation at the system and school level</td>
<td>• Providing opportunities for in-situ learning ie. professional learning teams, coaching, mentoring, team teaching, inquiry, observation, dialogue and reflection</td>
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<tr>
<td></td>
<td>School curriculum priorities, programs and work plans</td>
<td>• Providing opportunities and establishing processes to use newly acquired skills</td>
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<tr>
<td></td>
<td></td>
<td>• Enabling distributed leadership and autonomy</td>
</tr>
<tr>
<td>Internal Personal</td>
<td>This includes</td>
<td>Growth is optimised by:</td>
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<td>------------------</td>
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</tr>
<tr>
<td>Knowledge</td>
<td>✗ Personal knowledge ✗ Professional knowledge</td>
<td>• Assessing knowledge gaps • Activities and support of colleagues to raise content, skill and confidence level • Engaging with new ideas through, for example: journal articles, conferences, research papers, evaluation reports, school visits, collegial dialogue, internet searching</td>
</tr>
<tr>
<td>Values and beliefs</td>
<td>✗ Attitudes ✗ Disposition ✗ World view ✗ Assumptions</td>
<td>• Curiosity and enthusiasm for learning • A disposition to learning and trialling new practices • A belief that students have valuable skills and knowledge to bring to the learning experience • Adaptability to environment of constant change • Alignment between ‘external’ and ‘internal’ values and beliefs</td>
</tr>
</tbody>
</table>

Growth optimised by the following views of ICT: • A view that ICT has a multiplicity of applications and enhances and diversifies learning experiences • A view that dynamic, visual media motivates and engages students • A view that ICT should be integrated across all learning areas
- A view that ICT underpins students' lives and is integrated into all aspects of life, school and work
- A view that ICT provides a dynamic range of ways for students to present their learning
- A view that students are digital natives

<table>
<thead>
<tr>
<th>Investment</th>
<th>Vision</th>
<th>Clearly conceived, articulated and communicated vision and goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- An envisioned pathway and plan for arriving at the vision</td>
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<td></td>
<td></td>
<td>- Modelling, sharing and enacting the vision</td>
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<tr>
<td></td>
<td></td>
<td>- High expectations of self and others</td>
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<tr>
<td></td>
<td></td>
<td>- Vision for a technology rich learning environment</td>
</tr>
</tbody>
</table>

- Personal investment and commitment to learning
- Personal investment priorities
- Investment of time and energy to engage with learning

- Vision
- Mission
- Goals
- Strategy
This includes Growth is optimised by:

<table>
<thead>
<tr>
<th>Practice</th>
<th>Current education practices</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• Networking, sharing practices through dialogue, modelling and demonstration within and across schools</td>
</tr>
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<td></td>
<td>• Sharing practices through mentoring, coaching, team teaching and shadowing</td>
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<tr>
<td></td>
<td>• Mentoring, coaching, team teaching and shadowing</td>
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<td></td>
<td>• Structured reflection</td>
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<td></td>
<td>• Trial and feedback cycle</td>
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<td></td>
<td>• Inquiring into own practice (self-study)</td>
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<td></td>
<td>• ‘Playing’ with technology and troubleshooting</td>
</tr>
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<td></td>
<td>• Interrogation of local and system data to make adjustments to curriculum and pedagogy</td>
</tr>
<tr>
<td></td>
<td>• Just in time learning with experts based on needs and interest</td>
</tr>
<tr>
<td></td>
<td>• Interaction with and feedback from colleagues, parents and students</td>
</tr>
<tr>
<td></td>
<td>• Assessment and audit of gaps in professional practice</td>
</tr>
</tbody>
</table>

Table 1: Towards an understanding of how teachers develop technological pedagogical content knowledge

Emerging results

The teachers reflected on and discussed Shulman’s diagrams and descriptions of PCK and Mishra and Koehler’s diagrams and descriptions of TPCK. When asked how they developed their technological pedagogical content knowledge, they spoke in general about how they developed the professional knowledge and practice to teach with ICT. They describe how they develop their pedagogical content knowledge in terms of all seven of Shulman’s elements of teacher knowledge and use terms like professional practice and teacher knowledge synonymously and interchangeably with PCK. They do not naturally make the distinction between PCK
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and other elements of Shulman’s teacher knowledge and in fact see PCK as encompassing all of those elements.

While the teachers agree that their work is at the intersection of content, pedagogy and technology, the representation of mutually exclusive areas intersecting does not accurately depict their views on how they see the interplay between these once traditionally separate knowledge bases and how the different parts are weighted. The 21st century teacher, working in a context that defines and advocates the interdisciplinary nature of ICT, naturally blurs and obfuscates these lines.

Marguerite: “It’s interesting because I never would have thought that content and pedagogy should be separate anyway. Surely if you’re thinking about the way you’re teaching and why you’re teaching, your content’s not…shouldn’t be separate, if you’re looking at what you’re teaching and why you’re teaching and how you’re teaching it…it should all be interlinked.”

These lines are blurring in the curriculum policy documents. Content and syllabus has been replaced with statements describing the intersection of pedagogy, content and technology. As the Victorian Essential Learning Standards (VELS) defines and promotes the contemporary view of ICT as an interdisciplinary domain, teachers think more broadly and deeply about the interconnections and interdependencies across what were once more traditional boundaries.

Marguerite: “…if you look at the Standards, the content’s not so clear, I think. The Standards to me are more in how the children are going to use it [ICT]…more a pedagogical statement than a skills statement. It’s still got the skills there, but it’s more why they’re going to use it. That’s the way I read it anyway.”

The teachers believe their growth is dependent on more than developing content knowledge, pedagogical repertoire and skills in the use of ICT. What is emerging is that ‘internal’ (individual) and ‘external’ (school and system) factors and conditions impact on the professional growth of teachers. The system, the school and the individual have to invest time and resources and develop the values and beliefs, vision and practice to optimise collective and individual teacher learning. It is not only important that teachers have a disposition to learning for growth to occur, but the leadership team in a school need to be disposed to enacting strategies that enable and encourage growth. It’s not enough that the teacher has a vision for effective integration of ICT across the curriculum, if her school blocks or does not share this vision, this will inhibit her growth. The ‘external’ environment has to explicitly articulate and action policies and practices to enable the development of technological pedagogical content knowledge.

Lorraine: “Well, the fact that there’s this balance between them. You can have all these external environmental things happen, the school believes this or has this understanding, has this vision, but unless it’s also balanced on the other end with the internal and personal, having the skills or the vision or the values, then you could end up with a ‘floppy flower’. And I think it’s important to have that balance, the internal is happening at the same time as the external.”

Synergy between the ‘internal’ and ‘external’ enables greater professional growth. All of the teachers believed greater professional growth occurred where there was external alignment to personal values and beliefs.
Sandy: “We’ve got our own vision here at school but your vision still has to match the school’s vision, and with values and beliefs, you still have to match the values and beliefs of our… the school”

Rowena: “Especially an area like ICT, if your values and beliefs aren’t linked to the values and beliefs of the environment, then you’ve got a real problem. The fact that my values and beliefs mirror those of the environment has meant that the technology is available, PD is available, they’ve got structures set up where Marguerite’s showing us what to do every second week. Those structures facilitate me to bring my values and beliefs to life…I’ve done things in my classroom in the last two years that if I was in some schools, they’d be going, ‘What is she on?’ [both laugh] Because the external values and beliefs mirror mine, I feel that I can take these risks, have a go.”

In fact teachers seek employment in schools whose values and beliefs align to their personal values and beliefs, recognising that they need this for their professional growth:

Rowena: “When I chose this school, I specifically selected this school because I knew the values and beliefs were like mine. The last school, the values and beliefs fit with mine on a number of levels but then they started to stifle me a little bit and I felt I needed to be somewhere where it was more aligned. I specifically chose here. I don’t know what you do if you’re not in that situation.”

And schools seek teachers of like values and beliefs, and exclude others:

Sandy: “Our school has its values and we should all be working towards the same common goal. And while we might be totally opposed in what we believe in, we still have that common goal within the school, we’ve got our mission. If you’re not going to be working towards the mission of the school then you shouldn’t really be here. I see it coming together.”

Lorraine: “At the moment I’m looking at applications for graduates. When you look at what they believe, you think, ‘Does this fit in with our culture? Is this what we believe? If it’s not then this person really doesn’t belong here with us. One of the things that’s important to us is that people have common values and beliefs when they’re part of our community.”

But what happens if there is no synergy? What strategies then? Table 2 outlines a number of ways that growth can be optimised. For example, you create a vision of what’s possible by modelling and starting with the most willing.

Marguerite: “It’s patience, it’s coaching, it’s mentoring, it’s all those things, just being there, being supportive, not accepting that there’s blockers there and doing the best you can, but having said that but also, it’s not worth fighting a battle that you’re not going to win. So if there’s someone that’s such a total absolute blocker, I’m not going to bash my head against a brick wall, I will work somewhere else and show that person that this is what’s possible let’s have a go.”

There is also the view that the stopping of old practices can be mandated through operational changes. In this instance, practices change after introducing a directive and process that requires a technological action or response. The following example shows how changes to the way information is accessed and changes in expectations can lead to changes in practice.

Marguerite: “I can give you some examples here of teachers who wouldn’t touch a computer and then we went to all email for our communication and they had to start using it and now they’re using the computers in their rooms, they’re able to send attachments with their emails. I mean I was constantly over there…I can’t get this done…It’s patience, it’s coaching, it’s mentoring.”
Denise: “...years ago we would have had this: ‘Email, I’m not going to do email.’ ‘Well, sorry, you’re not going to get all the information because everything’s now on email.”

What teachers are grappling with

Teachers are grappling with new professional identities:

- lifelong learner, commitment to continuous improvement
- identity of 21st century teacher inextricably linked to technology
- changing collegial relationships, individual vs. team based approach, colleague as model, mentor and coach
- changing student-teacher relationships, positioning of teachers as facilitators of learning, transfer of agency to students, shift in locus of control, building independence and autonomy
- positioning of teachers as leaders - distributed leadership and shared responsibility
- positioning of teachers as change agents – influencing and empowering others
- positioning of teachers as reflective practitioners,
- positioning of teachers as interventionist,
- positioning of teachers as innovators, ‘falling forward’
- positioning of teachers as researchers and data analysts
- positioning of teachers as flexible, adaptable in an ever-changing environment.

Teachers are grappling with new views and expanding notions of ICT for learning:

- moving from foe to friend
- moving from a tool view to embedded, tacit and intrinsic
- moving from skill development tasks to authentic tasks
- moving from ‘bolted on’ to integrated into all aspects of learning
- moving from enhancing learning to transforming learning
- moving from skill and task oriented to complex problem solving, finding solutions
- moving from classroom centred to ubiquitous - anytime, anywhere
- technology as equity, agency
- technology as opportunity
- new and emerging technologies inextricably linked with innovation, changing practices.

Teachers are grappling with new interpretations of pedagogy:

- describing effective pedagogy as interwoven with technology; as the interrelationship between technology, pedagogy and content,
- acknowledging that pedagogy is transformed by technology.

Teachers are grappling with new interpretations of content:

- moving from ‘the facts’ to ‘big picture, big concepts’.
Conclusion

In this study, a body of evidence affirms factors that optimise teacher learning. Teachers, schools, and policy makers can consider and invest in key actions, not only to improve learning and teaching of the interdisciplinary ICT (Victorian Curriculum and Assessment Authority, 2005) domain, but moreover to consider how these enablers may be applicable to teacher learning more generally. What is also coming to the fore is that new professional identities are shaping what and how teachers learn.

References


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2 Interim data and analysis from the Longitudinal Study have been available since 1999.
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