PEDAGOGICAL CONTENT KNOWLEDGE AND THE THINKING DOMAIN

Literature Review

In examining the educational literature appearing in the past two decades, it is evident that there is an intensity of interest in the field of teaching thinking. The flood of publications is in the following areas of research; creating a culture and environment for good thinking (Cam, 2005), teaching thinking skills and tools (DeBono, 1976), cultivating thinking dispositions and behaviour (Ritchhart, 2001, 2002), developing cognition (Sutherland, 1992; Nickerson et al., 1985; Adey & Shayer, 2002), thinking strategies (Perkins 1995; Cam, 2005), critical thinking (Richard, 1995), questioning for thinking (Harpaz & Lefstein, 2000), developing a thinking curriculum (VCAA, 2005; PoLT, 2005) and designing thinking classrooms and thinking schools (Golding, 2005).

Developing 'thinking' is one of three domains situated in the interdisciplinary learning strands of the Victorian Essential Learning Standards (VELS). It is further broken into three dimensions: reasoning, processing and inquiry; creativity and reflection; evaluation and metacognition. Victorian schools and classrooms are encouraged to create a climate that 'values and promotes thinking'. Students must be given 'sufficient time to think'. In teaching thinking, Victorian teachers are encouraged to 'model skilful and effective thinking and make their own thinking explicit as part of their everyday practice' (adapted from VELS).

There is a plethora of different approaches to teaching thinking in the classroom. These approaches all define 'good thinking' in different ways and are based on different theoretical approaches (see Table 1, page 64). The literature on the teaching of thinking, still remains focused on three main areas; imparting thinking *skills*, cultivating thinking *dispositions* and constructing *understanding* in thinking. Yoram Harpaz (2003) has developed a "formula for teaching thinking" which comprises these three elements. Good thinking for Harpaz (2003) is the product derived from adding *thinking skills* **+** *thinking dispositions* **+** *understanding of knowledge***.** This formula for teaching thinking presents answers to this crucial question in the field: *What is good thinking?* and *How is it developed?* These three approaches to teaching thinking also compete with each other for control of the field (Harpaz, 2003, p.1).

The *skills* approach to teaching thinking is still widely regarded as constituting the foundational element to good thinking.

The <u>Skills</u> Approach or Teaching <u>of</u> Thinking

Historically, the skills approach has been the most common approach to teaching thinking. Developed by means of the pattern of impartation, this approach challenges traditional education, which focuses on the transmission of knowledge (Harpaz, 2003, p. 6). As Harpaz further explains:

> These claims - teach thinking, not knowledge; good thinking is skills - swept educational discourse; and the 'educational market' (first and foremost the American market) was filled with thinking skills of various qualities e.g. skills of critical thinking, of creative thinking or of effective thinking (p.6).

The teaching of 'thinking skills' is the most common approach to teaching thinking; the plethora of teacher resource and activity books support this (Bowkett, 2006; Eberle, 2004;

Fulton, 2001). Sometimes referred to in the literature as the 'direct approach' to thinking or the teaching OF thinking, the term 'thinking skills' is the *good use* of thinking and embodies the various *thinking means* (strategies, heuristics, algorithms and the like) that render thinking processes more effective (Harpaz, 2003, p.6). DeBono's Cognitive Research Trust (CoRT), Direct Attention Thinking Tasks (DATT), Plus, Minus, Interesting (PMI), or CAF (Consider All Factors) are examples of this approach. Graphic organizers, venn diagrams, concept maps and mind maps are also examples of the skills approach to teaching thinking. The contribution to teaching thinking by Project Zero refers to this teaching approach as 'thinking routines'. This is discussed later in this literature review.

Within the discourse on skills in teaching thinking, a fundamental differentiation divides between simple or basic skills and higher order and critical thinking skills. The literature provides a wide range of definitions for the term 'critical thinking'. Also referred to as 'deep' thinking (White, White, & O'Brien, 2006) thinking by 'probing' (Fascoe, 2003), 'epistemic and ethical thinking' (Norris, 2003), critical thinking as 'attitude plus knowledge of facts plus some thinking skills' (Russell, 1960, p.651). Critical thinking skills have been linked to developing better citizenship, cultivating independent and responsible thinkers, developing thinking skills and habits to make a positive difference in learning and living (Golding, 2004, p.30-36). Critical thinking emphasises a heightened awareness of multiple points of view and context, as well as an evaluation of one's own thought processes before reaching a conclusion. Thus, the teaching of critical thinking requires teachers to engage students, to 'assess and scrutinize 'knowledge' prior to its consumption' (Tsui, 2003, p.328).

Teachers of critical thinking have been described as 'thinking coaches' (Golding, 2004) and in this role, teachers are facilitators of students' thinking helping them to develop thinking skills and behaviours. Their role of 'coach' also involves:

- Helping students learn to inquire and evaluate for themselves.
- Making the development of thinking an explicit aim of a classroom (using 'thinking language' such as 'think', 'know', 'guess' and 'remember').
- Modeling and personally promoting the development of thinking.
- Having the environment of the classroom promote the development of thinking.
- Having class time set aside for the development of thinking.

Although the skills approach to teaching thinking is still widely used by teachers, the main criticisms of this approach are that it treats thinking as an add-on to the learning taking place, and as such the transfer of these skills to new contexts is by no means guaranteed (Eggen & Kauchak 2006).

The Dispositions Approach or Teaching for Thinking

The dispositions approach to teaching thinking also challenges the traditional view of teaching as 'imparting bodies of knowledge' and the view that 'thinking' can't be reduced to a discrete set of skills. Central to the dispositions approach is the notion that the foundational element of good thinking is thinking dispositions and not thinking skills. Conceived as 'energy suppliers' (Harpaz, 2003, p.9), thinking dispositions connect thinking skills and action.

Dispositions are teachable by means of patterns of cultivation intended to foster thinking dispositions or intellectual character. Thinking dispositions are exhibited over time across diverse thinking situations. Therefore, to cultivate in students their thinking dispositions, teachers need to engage students in productive thinking and promote thinking on an ongoing nature rather than in discrete teaching moments. A 'thinking disposition' is a

reasoned motivation for a certain thinking pattern, a thinking quality (open-mindedness, depth, systematic thinking, etc.) imbued with motivation. Therefore, people may possess thinking skills but no motivation or disposition to implement them (Harpaz, 2003).

Founders of the field of teaching thinking use various concepts to describe the dispositional dimension of thinking (see Table 1 below). Although all these concepts overlap to a certain extent and are used indiscriminately by the writers, there seem to be marked differences as well. Each concept illuminates a certain aspect of the dispositional dimension of thinking.

Founders in the field of teaching thinking	Dispositional dimension of thinking
Dewey (1933/1998, pp. 29-33).	*attitudes*: open-mindedness, whole-heartedness and responsibility
Costa and Kallick (2000)	sixteen *habits of mind*: persisting; thinking and communicating with clarity and precision; managing impulsivity; gathering data through all senses; listening with understanding and empathy; creating, imagining, innovating; thinking flexibly; responding with wonderment and awe; thinking about thinking (metacognition); taking responsible risks; striving for accuracy; finding humour; questioning and posing problems; thinking interdependently; applying past knowledge to new situations; and remaining open to continuous learning.
Sternberg, (1996, pp. 251-259)	twenty *personal qualities* that denote 'successful intelligence' (self-motivation, control of impulses, knowing when to persevere, translating thought into action, etc
Richard Paul, (1992, pp. 151-156)	nine *traits of mind* or *rational passions* of the critical thinker (independence of mind, intellectual curiosity, courage, humility, empathy, integrity, perseverance, faith in reason and fair-mindedness
Siegel (1988, pp. 39-42)	*critical attitude* or *critical spirit* of the critical thinker
Perkins (1995, pp. 284-285)	seven *dispositions* (to be clear, broad, deep, sound, curious, strategic and aware)
Jonathan Baron (1985)	wrote of *a disposition* - he regarded good thinking, rational thinking, as founded on one basic disposition, "active open-mindedness"

Table 1: Dispositional dimension of thinking as described in the literature.

Although thinking dispositions do not appear in great numbers as do thinking skills, they are a key to understanding and engaging in teaching for thinking. Six thinking dispositions are described by Richard Ritchhart (2001, 2002) as the theory of intellectual character: 'the overarching conglomeration of habits of mind patterns of thought and general dispositions towards thinking that not only direct but also motivate one's thinking pursuits' (2002, p.

xxii). The Ritchhart Framework for thinking (2001, 2002) is a move from reflective thinking approach to a more critical thinking approach and includes:

- Creative thinking – thinking that is 'looking out', looking up' and 'looking about' and contains the dispositions to be open-minded, and curious.
- Reflective thinking – thinking that is 'looking within' and contains the disposition to be metacognitive.
- Critical thinking – thinking that is 'looking at', 'looking between' and contains the dispositions to be seeking the truth and being skeptical.

There are a number of current research projects aimed at understanding and enhancing thinking and learning. The following three 'thinking projects' by Project Zero[1] (Thinking Routines, Cultures of Thinking and Artful Thinking) use the idea of 'Visible Thinking' as an overarching construct in their work. 'Visible Thinking' is an approach to thinking which involves students in:

- articulating and explaining the thoughts behind a particular conclusion.
- 'seeing' one's cognitive abilities.
- making their thinking explicit and a natural part of the classroom conversation and life.
- setting the stage for internalizing powerful practices of thinking and learning.
- deepening subject-matter learning.

Perkins (2004) adds that visible thinking requires teachers to use the language of thinking in their teaching. This can be achieved when teachers model thinking in their teaching practices, ask their students key questions such as 'What is going on?' and 'How do we know?' and create opportunities for students to engage in Thinking Routines e.g. KWL (What do you KNOW?, What do you WANT to know?, What do you want to LEARN?)

Project Zero has recently completed the Patterns of Thinking Project, an investigation into the nature of critical and creative thinking. The focus of this project was on understanding, teaching and assessing thinking dispositions. Research revealed that while many people have thinking abilities, they might not be disposed to using them. The project identified three logically distinct components that are necessary for dispositional behaviour: ability, inclination and sensitivity. The research revealed that inclination and sensitivity make unique contributions to 'intellectual behaviour' and that sensitivity, in particular, is a key factor in effective learning. Derived from the Patterns of Thinking Project, are three 'thinking projects' by 'Project Zero': Thinking Routines, Cultures of Thinking and Artful Thinking. The implications for pedagogy in these projects follow.

Thinking Routines

Over the past five years, the Visible Thinking Team at Project Zero at the Harvard Graduate School of Education has been developing, refining, and implementing 'Thinking Routines'. Based on the premise that effective teaching demands that teachers establish routines to guide the basic physical and social interactions of the classroom, thinking routines need to be established to help guide students' learning and intellectual interactions. Thinking Routines are based on an enculturative model of dispositional development which views thinking, and more specifically, the disposition toward thinking, as something that must be nurtured in students over time (Tishman, Perkins, & Jay, 1993). Teachers are encouraged to use simple patterns or structures such as, Think-Pair-Share (TPS) (Lyman, 1981), brainstorming, PMI (Plus, Minus, Interesting), Concept Mapping,

[1] Accessed from the following website http://pzweb.harvard.edu/index.htm.

over and over again to support and scaffold specific thinking moves or actions, and to encourage students to initiate, explore, discuss, document, and manage their thinking in classrooms (Ritchhart et al., 2006). These thinking routines are aimed to help students develop thinking dispositions by making thinking a more visible and apparent aspect of classroom life (Perkins, 2003; Tishman & Palmer, 2005).

Cultures of Thinking

The 'Cultures of Thinking' project at Bialik College, a Prep to Year 12 College in Melbourne, extends the long line of research in the area of thinking dispositions conducted at Project Zero. This project began in 2005 and is using the Visible Thinking approach to explore how a whole school can develop a culture of thinking that nurtures students' and teachers' disposition toward thinking. In the 'Cultures of Thinking' project, teachers adopt a whole school approach to seek ways to discover and document students' thinking. To develop in students the language and habit of thinking, teachers make the classroom environment rich with documents of thinking and for thinking. Teachers use 'thinking routines' to support and nurture students' thinking and in their teaching send clear expectations about the importance and role of thinking in learning.

Artful Thinking

'Artful Thinking' is a program currently in development by Harvard Project Zero in collaboration with the Traverse City, Michigan Area Public Schools (TCAPS). The program is one component of a larger TCAPS grant from the US Department of Education to develop a model approach for integrating art into regular classroom instruction. The purpose of the Artful Thinking Program is to help teachers regularly use works of visual art and music in their curriculum in ways that strengthen students' thinking and learning. Currently targeting grades K-6, the program will eventually be used in all grades. There are two broad goals of the program: (1) To help teachers create rich connections between works of art and curricular topics; and (2) to help teachers use art as a force for developing students' thinking dispositions. The program takes the image of an artist's palette as its central metaphor. The artful thinking palette is comprised of thinking dispositions which emphasize intellectual behaviours such as asking provocative questions, making careful observations, exploring multiple viewpoints, and reasoning with evidence. These six dispositions are developed through the use of 'thinking routines'.

On a smaller scale, a number of primary and secondary schools in Israel have begun to establish a model of schooling called Intel-lect School where classrooms are set up as a 'community of thinking' (Harpaz, 2000, p.12). It is Harpaz's passionate belief that 'to learn is to be involved'. The community of thinking schools in Israel use a pedagogy that relies on 'fertile questions'. Teams of students, guided by 'teacher coaches', undertake research around these rich, open questions and present their findings in a 'concluding performance' that can take many forms depending on the learning style and inclination of the students. This pedagogical style aims to produce effective thinkers and learners (Harpaz, 2000, p.12).

Closer to home, the Ithaka Project, based on Ron Ritchhart's theory of Intellectual Character is focused on developing understandings of intellectual character and thinking dispositions. One of the key findings to merge from Colleen Abbott's (2005) recent research is that the 'development of dispositional thinking is supported by classroom cultures which involve the consistent use of salient models of good thinking, engagement in rich subject matter and the shared experience of the language of thinking' (p.136). The implication is that schools need to become 'more explicit in building good thinking as something which underpins learning' (Abbott, 2005, p.136).

There are several common elements in these 'thinking projects'. Evident is that the teaching of thinking is viewed as a conscious choice, a reasoned attitude and motivation and not a function of 'personality' or 'character' but of 'thinking quality'. These thinking dispositions strongly emphasize that a person must have not only the required thinking skills and operational capacities, but also the inclination to employ them when an appropriate situation arises, and a capacity to sustain their actions over time and reflect on and evaluate their effectiveness. Producing quality thinking is also sensitive to awareness and motivation and is context-dependent.

There are many claims in the literature on the teaching of thinking that advocate a 'classroom climate' of thinking (Barell, 1991; Costa, 1991; Perkins et al., 1993b; Ritchhart & Perkins, 2000; Tishman, Perkins, & Jay, 1995). Positive classroom climates characterized by high expectations, teacher encouragement, pleasant physical surroundings, enhance all kinds of learning including thinking (Lofland, 2006). Costa (2003) suggests that of prime importance in the teaching of thinking is developing a classroom culture that supports and nurtures thinking. Sue Wilks (2004) proposes that in creating a 'thinking environment' in the classroom, teachers are putting an emphasis on problem posing, reasoning, self-correction and a willingness to admit errors and seek explanations.

The Understanding Approach or Teaching with Thinking

Harpaz (2003) asserts that good thinking in an educational context is about students developing deep understanding. Thinking fundamentally has content -it is about something. Understanding is the ability to think and act flexibly with what one knows.

Sometimes referred to in the literature as the 'infusion approach' to thinking, teaching *with* thinking entails 'infusing' thinking skills in specific subjects across the curriculum. The infusion approach supports the notion that the quality of our thinking depends on our knowing the thought-about topic, or more precisely our understanding of it. An individual understands a concept, skill, theory, or domain of knowledge to the extent that he or she can apply it appropriately in a new situation. Those who favour infusion argue that thinking cannot and should not be separated from its context, that this approach is more readily incorporated into current practice, and that transfer is more likely if thinking is embedded in all teaching and learning in a 'thinking curriculum'. Used in the teaching of thinking, it allows for a differentiated curriculum within the classroom and thereby provides authentic enrichment and extension tasks for the more capable students and relevant, achievable tasks for all (Meath, 2004).

Good thinking of any sort - critical, creative or effective - is 'parasitic upon the *knowledge* component' (McPeck, 1994, p.111). McPeck, repeatedly states in his books and articles the following points about the role of understanding in thinking: (1) there is no generalized thinking, only thinking about something; (2) a good thinker on one matter is not necessarily a good thinker on another matter; (3) the quality of thinking depends on knowledge of the thought-about topic and on the discipline to which it belongs; (4) teaching thinking must focus on teaching for understanding of the theoretical disciplines.

Further examinations of teaching thinking in the literature, the role of understanding is specific to 'location, as application, or as performance'. According to the first conception, location, 'to grasp [to understand] the meaning of a thing, an event, or a situation is to see it in its *relation* to other things: to note how it appears or functions, what consequences follow from it, what causes it, what uses it can be put to' (Dewey, 1933/1998, p.137). The

second conception, application, occurs when 'an individual understands a concept, skill, theory, or domain of knowledge to the extent that he or she can apply it appropriately in a new situation' (Gardner, 1999, p.119). The third conception, performance, 'is the ability to think and act flexibly with what one knows' (Perkins, 1998, p.40). Further examples of 'understanding performances' are explanation, exemplification, justification (Perkins, 1992, p.77). It is appropriate to consider the second conception of understanding as part of the third. In such a case application is 'the ultimate' or 'the privileged' understanding of performance. These three conceptions of understanding may have a common basis: the assumption that understanding depends on the presence of appropriate representations in the mind. When a concept/representation is well connected to other concepts/representations (understanding as location), it is better understood. The better a concept is located in a system of other concepts, the better its application (understanding as application) (Harpaz, 2003, p.14-15).

Understanding can be 'constructed' through the 'Philosophy for Children' program and through reflective thinking or Metacognition'. How the teaching of thinking is accorded in both follows.

Metacognition or Teaching <u>About</u> Thinking

Metacognition is thinking about thinking and learning. Metacognition does not only construct the field of teaching, but is also considered by the approaches to teaching thinking as a most critical skill/disposition/understanding for good thinking, and teachable and learnable through impartation, cultivation, or construction. As Harpaz (2003, p.18) further explains:

> The *skills* approach bases metacognition upon a series of skills. Mastering these skills ensures an efficient implementation of thinking about thinking in order to manage it.
>
> The *dispositions* approach includes metacognition in its list of dispositions. A disposition toward metacognition is a central element in the intellectual character of a good thinker. According to this approach, people need a special disposition in order to think about their thinking and manage it. Everyone possesses ability for metacognition, but not everyone has the disposition to implement it.
>
> The *understanding* approach reasons that metacognition is possible, or at least generative, when it is equipped with a new understanding through which former understandings are seen, corrected and improved. Metacognition, like cognition, cannot be an empty activity; it is always and necessarily bound with certain content, and is valuable only when this content is understood.

Encouraged as part of a thinking curriculum or the thinking classroom, metacognition is developing in students an understanding about different perspectives and about ethical reasoning (Chambers et al., 2002). Martinez (2006) proposes that teachers should model metacognition in their work in the classroom. When a teacher 'thinks aloud' particularly during problem solving, his or her verbalizations can be a powerful source of cognitive processing that can be internalized by students. This 'cognitive modelling' is a source of powerful learning for students. Social interaction among students should be used to cultivate their metacognitive capacity (Martinez, 2006).

Philosophy for Children

'Philosophy for Children' is designed to develop thinking and reasoning skills through classroom discussion and philosophical topics. Posing problems, gathering information, thinking about possibilities, making decisions and justifying conclusions are central to the

philosophy for children approach to developing thinking. This approach to thinking is organized around novels in which children apply philosophical thinking to their daily lives (Fisher, 2003, 2006; Golding, 2006). First introduced by Lipman's Philosophy for Children Model (Lipman, Shar and Oscanyan, 1980, cited in Wilks, 2004) the community of inquiry involves establishing a classroom climate conducive to critical reflection. There is also a worldwide 'philosophy for children' movement, which aims to translate the procedures and concepts of logic and ethics into practical issues which can be worked through in discussion with children (Fisher, 2003).

The teacher's role in a Community of Inquiry (Santi, 1993:21 cited in Wilks, 2004) includes:

> Facilitator: Helps the circulation and comprehension of ideas and helps students see themselves as problem seekers and problem solvers.
>
> Provoker: Stimulate participants to explore and deepened their own positions through opposition to given statements and by offering new cues for discussion.
>
> Modulator: Foster the cohesion of the discourse, leading the reasoning process towards the most productive directions.
>
> Monitor: Control the correctness of reasoning and underlined possible flaws in argument. Encourage listening to others.
>
> Supporter: Support and encourage the cognitive operations involved in the thinking process i.e. Provide 'scaffolding' for intellectual development. (Wilks, 2004. p17)

Conclusion

The different approaches to teaching thinking ultimately illustrate a move away from a traditional teacher-centred model of teaching to a more student-centred approach, often described as an 'enculturation' model. The main division in the field is between those who aim to teach thinking skills through specially designed programs and those who favour the infusion of thinking throughout the established curriculum. Questions relevant to the teaching of thinking still subject to further investigation and research include:

- Is it better to teach these skills directly or to create situations whereby students learn them inferentially through being placed in circumstances which call for them to apply these skills?
- How much classroom time is required in order for thinking skills instruction to be effective?
- Are thinking skills explicitly teachable?
- Is the teaching of thinking independent of the subject matter that makes up the rest of the school curriculum?

Recommendations

As this is a new and emerging field the particular articulations within various schools and programs have been described as ways of developing teacher learning in the area. This review has paid attention to the following areas of a 'thinking' domain which need to be considered when developing initiatives in teacher learning:

- Creating a culture and environment for good thinking (Cam, 2005).
- Teaching thinking skills and tools (DeBono, 1976).
- Cultivating thinking dispositions and behaviour (Ritchhart, 2001, 2002).
- Developing cognition (Sutherland, 1992; Nickerson et al., 1985; Adey & Shayer, 2002).
- Thinking strategies (Perkins 1995, Cam, 2005).
- Critical thinking (Richard, 1995).
- Questioning for thinking (Harpaz & Lefstein, 2000).
- Developing a thinking curriculum (VCAA, 2005, PoLT, 2005) and
- Designing thinking classrooms and a thinking schools (Golding, 2005).

The dilemma in this area is the emphasis given to each area. The following questions may be useful for professionals in determining that emphasis:

- Is it better to teach thinking skills to students via infusion programs or separate curricula?
- Is it better to teach these skills directly or to create situations whereby students earn them inferentially through being placed in circumstances which call for them to apply these skills?
- How much classroom time is required in order for thinking skills instruction to be effective?
- Is it better to impart good thinking abilities rather than bodies of knowledge?
- Are thinking skills explicitly teachable?
- Is the teaching of thinking independent of the subject matter that makes up the rest of the school curriculum?

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