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Theorising Habits of Mind as a Framework for Learning

Abstract

In recent years, *learning* and the *attributes of successful learners* have re-emerged as key issues in educational research. Although a capacity to learn has been identified as an individual's key to future success, 21st century learners represent particular challenges to teachers and schools who strive to remain relevant to new kinds of learners in a constantly changing world. In this context, Habits of Mind has emerged as a framework of attributes that, proponents (Marzano, 1992; Costa & Kallick, 2000) claim, comprise the myriad of intelligent thinking behaviours characteristic of peak performers, and are the indicators for academic, vocational and relational success. The issue for this paper is that, despite its importance for understanding how successful learners *learn*, HOM are presented as an a-theoretical body of knowledge, underpinned by little more than 'intuitive common-sense' and experts' testimonials. In this paper, the theoretical underpinnings for HOM are explored and linked with existing learning theories.

Background

As a result of global trends and the apparent emergence of a global knowledge economy, learning and the attributes of successful learners have re-emerged as key issues in educational research in recent years (Levine, 2002; Taylor, 1999; Meier, 2003). Within this context, Habits of Mind (HoM) are claimed to be intelligent thinking behaviours used by peak performers to solve problems and organise learning within vocational, relational or academic settings (Costa & Kallick, 2000). A number of writers (Costa & Kallick, 2000; Marzano, 1992; Anderson, 2004) claim HoM can assist learners to self-regulate their learning and to find solutions in relationships and in the workplace.

Self-regulated learning, and finding solutions in the workplace are possibly two of the most desired qualities that employers might seek from their employees in a perceived knowledge economy. If knowledge is deemed to be the key resource (Houghton & Sheehan, 2000), supplanting land, labour and capital as the major corporate asset (Havens & Knapp, 1999), then it may be claimed that it is the valuing, managing and developing of knowledge, essentially through new learning and finding solutions to problems, that adds value to an organisation (Stewart, 1997).

If we argue the existence of a global knowledge economy, then such a premise requires schools to attend to new priorities (Coppen, 2002; Hargreaves, 2003; Sizer & Meier, 2004). In addition to book learning and problemsolving (analytical skills), there are calls for creative, communicative (media), teamwork and enterprise skills (Coppen, 2002; Hargreaves, 2003).

Combined with a call for the teaching of such entrepreneurial skills, some question the relevance of current educational practice.[1] As an alternative to current practice, writers offer arguments for real world problem-solving and the utilisation of skills in context rather than isolation (Eurydice, 2000; Houghton & Sheehan, 2000; Coppen, 2002; Hargreaves, 2003). In the classroom, this might require a renewed examination of learning theory and possibly significant changes to pedagogical practice. Passive learning would need to make way for meaningful learning that requires the learner to have emotional involvement (Coppen, 2002) and there would be the requirement for the teacher to create authentic, empowering learning environments (Kellner, 2000).
In the following quote, Hargreaves (2003) summarises the teacher strategies that might best serve a knowledge economy.

> *Teaching for the knowledge society, I argue, involves cultivating these capacities in young people – developing deep cognitive learning, creativity and ingenuity among pupils; drawing on research, working in networks and teams, and pursuing continuous professional learning as teachers; and promoting problem-solving, risk-taking, trust in the collaborative process, ability to cope with change and commitment to continuous improvement as organizations*.
>
> (Hargreaves, 2003, p. xviii)

In this context, HoM have emerged as a relatively new innovation in learning and teaching, gaining currency in particular learning organisations at this time. The appeal of HoM is based on their application to life-long learning, creativity, teamwork and skill formation. As such they have the potential to build students' capacity to learn, which is essential if learners are to stay abreast of the rapidly changing aspects of work, technology and society. Examples of these lifelong learning strategies begin to explicitly emerge in HoM such as Thinking Interdependently, Striving for Accuracy, Being Open to Continuous Learning, Communicating with Clarity and Precision, and Taking Responsible Risks.

Habits of Mind

The HoM framework has mainly been developed through the work of Arthur Costa and Bena Kallick, and subsequently through the work of Robert Marzano (1992) with his creation of the *Dimensions of Learning*. Costa and Kallick's (2000) ideas began with professional discussions in 1982, before developing into classroom experiments that have shaped the current HoM concepts.
Initially, Art Costa (1985) created a *hierarchy of thinking* in his article, *The Behaviours of Intelligence.* Costa's hierarchy of thinking included the concepts of discrete thinking skills (comparing, classifying, hypothesising); thinking strategies (eg. problem-solving, decision-making); creative thinking (model making, metaphorical thinking); and the cognitive spirit (open-mindedness, searching for alternatives, withholding judgment).

[1] For instance, the prevalent approach of 'just in case' teaching (i.e. repackaging old information just in case learners might need it later – examples might include the teaching of ancient history to all Year Four children or the learning of a foreign language for no authentic purpose) (Coppen, 2002).

Costa's original thinking behaviours were further refined in his 1991 edition of *Developing Minds: A resource book for teaching thinking.* Subsequent to this work by Costa, a number of writers (Marzano, 1992; Meier, 2003; Sizer & Meier, 2004) have developed similar, yet slightly different lists surrounding the HoM concept.
Since 2003 the Australian National Schools Network has adopted Costa & Kallick's (2000) HoM as an explicit tool for improving learning environments in schools across the country. As this particular list represents the most widely used HoM across Australia, I have chosen to focus on Costa & Kallick's (2000) HoM.
Costa and Kallick (2000) have presented sixteen Habits of Mind, claimed by these authors to be characteristic of peak performers. A brief description for each of these Habits of Mind follows in Table 1.

Table 1 : Description of the Habits of Mind

Habit of Mind	Description
Persisting	Persevering in a task through to completion. Not giving up.
Managing impulsivity	Taking the time to deliberate before acting.
Listening with understanding and empathy	Making the effort to perceive another person's perspective.
Thinking flexibly	Considering options and changing perspectives.
Metacognition	Thinking about your thinking. Being aware of your thoughts, feelings and actions and their effect on others.
Striving for accuracy	Setting high standards and finding ways to improve.
Questioning and problem posing	Finding problems to solve. Seeking data and answers.
Applying past knowledge to new situations	Accessing prior knowledge and transferring this knowledge to new contexts.
Thinking and communicating with clarity and precision	Striving for accurate oral and written communication.
Gathering data through all senses	Paying attention to the world through taste, touch, smell, hearing and sight.
Creating, imagining and innovating	Generating new and novel ideas.
Responding with wonderment and awe	Being intrigued by the mystery in the world.
Taking responsible risks	Living on the edge of one's competence.
Finding humour	Enjoying the incongruous and unexpected. Laughing at oneself.
Thinking interdependently	Being able to work and learn with others in teams.
Remaining open to continuous learning	Resisting complacency in learning and admitting when one does not know.

Habits of Mind and the current learning context

By its very nature the HoM framework focuses attention on the processes and strategies that students' minds need to engage with for effective learning to occur. This focus on the processes of the mind is not a new phenomenon. Rather, the nature of the human mind has engaged thinkers through the centuries with early contributions by ancient philosophers including Socrates, Plato and Aristotle (Bransford, Brown & Cocking, 2004). These philosophers' theories of wisdom, education, knowledge, intelligence and learning have set the context for modern explorations into the emerging science of learning. In more recent decades, researchers have developed a core body of knowledge surrounding how learning occurs, how learning should be taught, and how learning should be assessed (Bransford, Brown & Cocking, 2004).
The issue for this paper is that, despite its importance for understanding how successful learners *learn*, HoM are presented as an a-theoretical body of knowledge, underpinned by little more than 'intuitive common-sense' and experts' testimonials. In this paper, the theoretical underpinnings for HoM are explored and linked with existing learning theories.

Towards a theoretical framework for HoM

In this section I will examine the theoretical influences upon HoM, and attempt to develop a theoretical context for the use of HoM as a learning framework. Specifically, I will relate HoM to theories on the nature of intelligence, cognitive learning theories, social learning theories and brain research.

Theories on the Nature of Intelligence and Habits of Mind

During the past century, theorists have argued the connections between the notion of intelligence and specific thinking attributes (Spearman, 1904, 1927; Thurstone, 1938; Guilford, 1967; Biesheuvel, 1969). Amongst others, Costa and Kallick (2000) present the theoretical work of Dewey (1933); Whimbey (1975); Ennis (1986,1987); Baron (1985); Glatthorn & Baron (1985); Sternberg (1985); Langer (1989); Perkins (1995); and Beyer (1998) as support for the concept of HoM. These theorists contribute significant insights into the relationship between the notion of intelligence and designated thinking behaviours as represented by the HoM. This section of the paper identifies the links between these theories and Costa & Kallick's concept of HoM.

Firstly, Costa and Kallick's (2000) Habits of Mind challenges the notion of intelligence as a single, pervasive, general mental ability (Spearman, 1904,1927). According to Costa & Kallick, intelligence is not simply linked to test scores and academic ability, but recognition is given to the role of non-academic, social-emotional factors in explaining intelligence. As a framework of thinking attributes, Habits of Mind also moves beyond the view of intelligence as an "ability on demand" as conceptualised in a number of models of human intelligence (Guilford, 1967; Thurstone, 1938; Sternberg, 1985). In the Habits of Mind framework, intelligence is about applying your abilities when you become aware of what you are supposed to be doing, but it also includes the concepts of sensitivity and inclination. According to Costa & Kallick (2000), being aware of the appropriate moments to employ Habits of Mind, and motivating oneself to invest time

and energy to their use, is just as important as the possession of the actual mental abilities themselves. Costa and Kallick (2000) argue that Habits of Mind serve academic purposes, but also represent a toolkit for solving life dilemmas and responding to daily demands.

Dewey (1933) could be argued as the founding father for Habits of Mind because he promotes reflective thinking as a universal educational aim. Dewey theorises that reflective thinking makes possible action with a conscious aim and that it also makes possible systematic preparations and inventions. He argues that reflective thinking enriches objects and events with meanings. Further to his argument on reflective thinking, Dewey acknowledges the vital importance of attitudes such as open-mindedness, wholeheartedness and responsibility. He claims that the aim of education is to weave into unity our personal attitudes and our knowledge of the principles of logical reasoning, along with the skills to manipulate these logical thinking processes. Dewey's work flows seamlessly into Habits of Mind such as *Metacognition, Striving for Accuracy, Thinking Flexibly* and *Creating, Imagining and Innovating.*

Logical reasoning skills as a subset of reflective thinking are also supported by the work of Whimbey (1975). One of the strongest proponents of conceptualising 'intelligence' as a complex mental skill rather than a unitary phenomenon, Whimbey (1975) defines 'intelligence' as an "attentional/processing skill used in analysing and mentally reconstructing relations" (Whimbey, 1975, p. 120). He breaks down intelligence into skill components including the searching and apprehension of all relational details; the use of prior knowledge; the creation of accurate comparisons; and step-by-step analysis and construction. Again strong connections can be made here with the Habits of Mind such as *Applying past Knowledge to New Situations, Striving for Accuracy, Gathering Data through all Senses* and *Metacognition*.

These same Habits of Mind are also supported by Sternberg's (1985) triarchic theory of intelligence. Sternberg compartmentalises 'intelligence' as *contextual* (based on an individual's response to their environment); *experiential* (based on past and current experiences); and *componential* (consisting of (a) meta-components such as planning, monitoring and evaluating; (b) performance components such as task processes; and (c) knowledge-acquisition components such as learning processes).

Metacognition and *Thinking Flexibly* find support in the work of Langer (1989). Langer introduces the concept of 'mindfulness', whereby our minds continually create new categories and labels as we adapt to our environment. Langer argues that 'mindfulness' is achieved through the welcoming of new information; being open to more than one viewpoint; controlling the context of a situation; and focussing on the process rather than the outcome.

Explicit instruction in thinking as a means of enhancing intelligence is supported by writers such as Baron (1985), Glatthorn and Baron (1985), Ennis (1987), Perkins (1995) and Beyer (1998). The work of these theorists connects directly with the Habits of Mind of *Questioning and Posing Problems, Striving for Accuracy, Thinking Interdependently,*

Thinking Flexibly, Creating, Imagining and Innovating, Metacognition and *Thinking and Communicating with Clarity and Precision.*

Baron (1985), Glatthorn and Baron (1985), and Ennis (1987) have promoted the teaching of critical thinking *dispositions* (eg. clarity, basis, inference, interaction) as well as the teaching of critical thinking *skills* that include abilities such as being able to seek out problematic situations; seeking evidence from multiple sources; creating and revising goals based on evidence; and weighing up the costs of the searching process.

Strong links with *Questioning and Posing Problems, Striving for Accuracy, Managing Impulsivity* and *Metacognition* are evident in Perkin's (1995) work. Perkins (1995) theorises that intelligence comprises three dimensions – neural, experiential and reflective. He suggests that whilst neural intelligence is genetically determined, experiential intelligence can be expanded through extensive experience, and that reflective intelligence can be expanded through instruction in metacognition and thinking skills. According to Perkins (1995) the major aspects of intelligence requiring attention include (a) avoiding hasty judgment; (b) open-mindedness; (c) generating multiple perspectives; (d) maintaining mindfulness; (e) caution about the idea that seeing is believing; and (f) caution about projecting interpretations not supported by the evidence.

Beyer's (1998) work informs Habits of Mind such as *Metacognition*, and *Questioning and Posing Problems*. Beyer moves into the specifics of thinking instruction, suggesting that teachers engage students in thinking through the use of thoughtful questions and metacognitive strategies. He also emphasises the importance of teachers employing scaffolding techniques (eg. graphic organisers, procedural checklists), as well as the integration of thinking skills with explicit content instruction.

Learning Theory informing Habits of Mind

Consideration of current learning theories indicates a number of links with the notion of Habits of Mind. In this section I will outline the possible theoretical links to Habits of Mind provided by Information Processing Models of Learning; Metacognitive Models; Cognitive Styles; Constructivism; Social Learning Theory; as well as some specific contributions from proponents of Emotional Intelligence.

Information Processing Models of Learning

Habits of Mind such as *Applying Past Knowledge to New Situations*, *Gathering Data through all Senses and Thinking* and *Communicating with Clarity and Precision* implicitly include the concept of sensory perception and memory. According to Schneider & Bjorklund (1998) the sensory register is the originating storage compartment of the brain. This compartment receives information through the five senses and stores this information for less than a second. If we attend to the information, it moves to subsequent storage compartments in the brain. Baddeley (1986) has coined the term 'working memory' or more commonly termed 'short-term memory', a temporary storage

place having the limited capacity of approximately seven items (Miller, 1956). Short-term memory serves learning purposes such as the recall of phone numbers or the remembering of street addresses when navigating through an unfamiliar city.
A third storage compartment is long-term memory. Tulving (1985) suggests the existence of three types of long-term memory – episodic memory (personal events); semantic memory (language and environments); and procedural memory (steps in performing a skill).
Connectionist models (Ellis & Humphreys, 1999; McLelland & Rumelhart, 1986) of memory and cognitive processing suggest multiple storage locations throughout the brain. In these models, the brain is comprised of a complex network of interconnected information units. Memories and information do not exist in isolated compartments but are connected by increasingly complex networks.
Information Processing Models inform Habits of Mind in terms of information storage and recall. Information storage begins at the point of *Gathering Data Through all our Senses*, when we receive stimuli from the environment through our natural pathways, before our brain processes the stimuli and stores the information in a meaningful way. When we use the Habit of Mind, *Applying Past Knowledge to New Situations*, we need to be able to retrieve information from our brain's memory compartments to use this information in a different context (eg. recalling our multiplication tables when planning the dimensions of a house extension). In this way information is recalled and processed into meaningful knowledge. In turn, then, this meaningful knowledge can assist learners to *Think and Communicate with Clarity and Precision*.
Information Processing Models are useful here in terms of a learner's ability to retrieve information, process information and use knowledge meaningfully. However these same models ignore contextual and personal factors such as the role of emotions in learning and the attitudinal influence of the learning environment.

Metacognitive Models

One of Costa and Kallick's (2000) Habits of Mind is *Metacognition*. This habit is defined as 'thinking about thinking' or 'knowledge about knowledge' (Weinert, 1987), and it refers to the thinking processes involved in self-monitoring and self-regulation. Self-monitoring is the broad process of keeping track of our remembering and understanding. Self-regulation includes the central processes of planning, directing and evaluating cognitive behaviour (Nelson & Narens, 1994; Schneider & Bjorklund, 1998).

Costa & Kallick (2004) claim that a primary goal of teaching Habits of Mind is the creation of self-directed learners. Self-directed learners regulate their beliefs, cognitions, actions and motivations by selecting their own approach to learning and processing information (Shin, 1998). This process of self-regulation includes specific metacognitive strategies which can generally be categorised as either planning, monitoring or evaluating strategies (Pintrich & DeGroot, 1990; Pintrich & Schunk, 1996). Examples of planning questions might be – "What are my task goals?" or "Which resources can I access?" Monitoring questions might be – "How am I going with this task? or " Do I need to alter my approach?" Examples of evaluating questions might be – "What have I accomplished?" or "What should I do differently next time?"

Metacognitive experiences also include the notion of feelings as related to particular cognitive experiences (Flavell, 1987; Flavell, Miller, & Miller, 1993). For example, if we do not understand a concept being explained in a lecture, we may feel anxious due to our lack of understanding and ability to process the given information. In this case we have metacognitively reflected on our processing shortcomings and felt concern at our lack of comprehension. *Metacognition* includes the concept of being aware of our feelings and how these feelings influence our attitudes and behaviours.

There is a significant wealth of research to suggest that learners benefit from the use and development of metacognitive strategies. A number of studies (Lucangeli, Coi & Bosco, 1997; Cardelle-Elawar, 1995; Spence, Yore & Williams, 1999) suggest a positive relationship between metacognitive awareness and performance on academic tasks. In one Australian study, Bruce & Robinson (1991) found that direct instruction in metacognitive word-identification strategies and metacognitive awareness-raising contributed to improved reading comprehension and word identification in poor readers. Studies such as those mentioned here suggest that the explicit instruction in *Metacognition* positively benefits learners in academic settings.

Cognitive Styles

It can be argued that each of the sixteen Habits of Mind is informed by Cognitive Style theory, but *Managing Impulsivity, Striving for Accuracy, Metacognition, Responding with Wonderment and Awe, Questioning and Posing Problems, Applying Past Knowledge to New Situations,* and *Thinking Interdependently* are more explicitly informed by work in this area.
Cognitive style refers to a learner's characteristic preferences for thinking, perceiving, processing and remembering information (Sternberg, 2001; Ferrari & Sternberg, 1998). Each learner possesses learning style tendencies (eg. visual attention as compared to auditory attention) and makes cognitive choices in relation to how they perceive and perform learning tasks.

Considerable research (Kagan, 1958, 1966; Entwistle, 1991) has surrounded the relative speed of learner's responses to set learning tasks, with some students reacting quickly (impulsively) and other students responding more slowly (reflectively). Reflective students generally take longer to complete tasks but are mostly more accurate than their impulsive peers (Entwistle, 1991). Clear connections can be made here to *Managing Impulsivity, Metacognition* and *Striving for Accuracy*. *Managing Impulsivity* involves thoughtful and deliberate planning before deciding upon our actions, and *Striving for Accuracy* includes the concepts of checking our work and setting high standards for its completion. Reflective thinking is generally regarded as being synonymous with metacognitive strategies.

Other studies have focussed on the concepts of 'deep' and 'surface' approaches to learning (Zimmerman, 1998). Some students have been perceived as intrinsically motivated, possessing a curiosity for the learning tasks and using 'deep' approaches such as questioning, planning and evaluating. These students also try to relate past knowledge

to new situations (Biggs & Moore, 1993). In contrast, students with a 'surface' approach have extrinsic motives for studying (eg. not wanting to fail) and they use mostly memorisation strategies to cover the material (Biggs & Moore, 1993). The Habits of Mind, *Responding with Wonderment and Awe, Questioning and Posing Problems* and *Applying Past Knowledge to New Situations* have clear connections with these studies into 'deep' and 'surface' learning. When a learner delves deeply into a topic they generally do so out of intrigue and a desire to answer their own questions about the concept. They also try to make connections with their prior learning so that the new knowledge is personally useful and meaningful.

Cognitive styles are also influenced by social structures and processes (Herbert, 2000; Meadows, 1998). This means that a learner's preferred ways of thinking, processing and remembering are impacted by their socio-cultural history and environment. A learner does not think or process information in isolation, but she is influenced by her teachers, peers, media and family members. In this sense, every learner has skills in Thinking Interdependently, having some measure of socially-constructed cognitive style.

Constructivism

Habits of Mind meld comfortably with the contemporary notion of constructivist learning. Constructivism is based on the principles of active participation in learning (Howe & Berve, 2000); self-regulated learning; social interaction for effective learning; and personal meaning-making (Bruner, 1990). Constructivist learning environments tend to be collaborative, learner-centred and inquiry-focused.
The principles of constructivism parallel Habits of Mind such as *Metacognition, Thinking Interdependently, Questioning and Posing Problems, Managing Impulsivity* and *Gathering Data through all Senses.* Firstly, as learners construct their own meanings of their world, they employ metacognitive strategies such as reflection, planning and evaluation, as well as data-gathering processes through their five senses. Secondly, social interaction provides opportunities for learners to clarify their thought processes and learn from others in reciprocal situations. Finally, a questioning attitude serves the learner in terms of meaning-making and solving problems.

Social Learning Theory

Some of the sixteen Habits of Mind are informed by the work of Bandura (1977). Bandura's Social Learning Theory suggests that a learner's behaviour is influenced by the interactive processes between cognitive and personal influences, external influences and influences of the behaviour itself. Bandura (1977) identifies three key aspects of this interactive process, namely observation, language and self-talk. According to Social Learning Theory, learners use observation, language and self-talk to make sense of the world and assist in their choice of behaviours.
Managing Impulsivity and *Metacognition* include the concepts of self-talk and self-regulation of behaviours, while *Gathering Data through all Senses* comprises observational skills and learning from others. *Thinking and Communicating with Clarity*

and Precision incorporates language as the key communicative tool and the means of clarifying the learner's ideas and thoughts.

Emotional Intelligence and Habits of Mind

The Habits of Mind, *Persisting, Managing Impulsivity, Listening with Understanding and Empathy, Finding Humour* and *Responding with Wonderment and Awe*, incorporate recognition of the significance of emotions within the learning process. For example, it makes intuitive sense that empathy for another person requires some skills in reading emotional cues, and that laughing at oneself and the world is closely related to one's emotions. Additionally, it also makes intuitive sense that persisting and managing impulsivity presupposes an ability to manage one's emotional responses.

Some writers (Goleman, 1995; Mayer, Caruso & Salovey, 1999) have argued for the categorisation of 'emotional intelligence' as a form of intelligence. Emotional intelligence has been defined as the ability to recognise the meanings of emotions and solve problems using this emotional knowledge (Mayer, et al, 1999). Goleman's (1995) conceptions of emotional intelligence include the skills of empathy, impulse control, persistence and delayed gratification. Some studies have found positive correlation between emotional intelligence and self-esteem, sociability and life-satisfaction (Mayer, Salovey & Caruso, 2000). It could be argued that employment of the aforementioned HoM might indicate a certain level of emotional intelligence and potentially lead to improvements in self-esteem, sociability and life satisfaction.

Closely related to emotional intelligence is the concept of 'resilience'. Resilience describes one's ability to succeed despite adverse circumstances. Suggested resilience-building strategies include HoM related skills such as persisting, working in teams, self-understanding and reframing viewpoints (Miller, 1996).

Brain Research and Habits of Mind

Contemporary developments in brain research may also assist our understandings of Habits of Mind as a framework for learning. This section reviews the key findings from neuroscience as they relate to learning and Habits of Mind.

Five key premises can be made in relation to brain development and its relationship to learning. The first major premise of brain research is that learning produces a physical change in the brain – that is our "plastic" brains can recreate their own wiring according to the stimuli and environment. This rewiring can occur before birth and throughout life (Zull, 2004). The learning implication here is that intelligence is not fixed at birth, but rather that the learning of new concepts, knowledge and skills can occur throughout the lifespan. This premise coincides neatly with the Habits of Mind, *Remaining Open to Continuous Learning* and *Taking Responsible Risks*, whereby learners try new and different challenges in efforts to gain increased knowledge, skills and wisdom. Some pertinent examples might be a retiree who learns the skills of surfing, or a mother who returns to complete her tertiary education.

A second major premise here is that learning organises the brain (Bransford, Brown & Cocking, 2004). Growing brains can customise themselves to their environment through structural organisation and reorganisation. Brain research by Sylwester (1997) suggests

that exposure to a wide variety of impulses (immersion) causes cells of brain dendrites to branch out and connect with other dendrites, and repeated exposure to the learning task thickens the myelin sheath that surrounds the axon portion of the dendrites. The belief is that the thicker the myelin sheath, the more encapsulated is the learning and recall of information is faster (Rushton, Eitelgeorge & Zickafoose, 2003). Therefore an enriched learning environment increases brain cell weight, branching of dendrites and synaptic responses (Diamond & Hopson, 1998). In other words, brain cell communication is all about making new and stronger connections (Jensen, 2005) and learning is the key driver of this connection process. The implication of this second premise is that learning environments should be rich in sensory experiences. This implication coincides with the Habit of Mind, *Gathering Data through All Senses*. Many early education centres strongly advocate this premise through the provision of highly sensory environments that allow children to touch, smell, see, taste and hear a multitude of stimuli.

A third major premise from brain research builds upon the notion of stronger brain connections. The third premise is that learning occurs best when our brain makes connections with previous knowledge and experience (Hardiman, 2001). Our brain builds better memory and deeper understandings when new stimuli is linked to existing stores of knowledge. This premise corresponds directly with *Applying Past Knowledge to New Situations*, a Habit of Mind that incorporates the concept of knowledge transfer to different contexts. When students use personal mathematical knowledge to assist their technology designs, or when adults correct their budgeting mistakes from the past, transfer of exiting knowledge is occurring.

A fourth major premise of brain research is that the brain prefers multi-processing of a number of inputs rather than a slow linear pace of learning (Caine & Caine, 1997). Learning is often rich and unconscious – that is our brains process both parts and wholes at the same time and our brains are affected by peripheral influences (Lackney, 2002). This simultaneous multi-processing function of the brain infers that learning environments should appeal to various senses and that information can be delivered in multiple, simultaneous modes. Again *Gathering Data through All Senses* is highlighted through this premise, an example being a student who can listen to a lecture, process visual input given by the tutor, and create notes on the lecture topic simultaneously.

Lastly, a fifth major premise is that emotion and thought are physically intertwined (eg. emotion chemicals such as adrenalin, dopamine and serotinin), and our bodies become part of this network because we feel emotions in our body, which in turn influences our brain (Zull, 2004). This means that emotions are not confined to the thoughts in our head, but that emotions manifest themselves through physical changes in our body (eg. blushing, sweating, tension), sending further emotional messages back to our brain. Therefore learning needs to feel good and be intrinsically motivating (Zull, 2004). Positive emotions drive attention, which in turn drives memory and learning (Wolfe & Brandt, 1998; Sylwester, 1995). Therefore learners need to attend to lifeskills, be exposed to meaningful content and work within a supportive physical and emotional environment (Kovalik & Olsen, 1998). This final premise relates directly to *Metacognition* and *Listening with Understanding and Empathy*, whereby learners seek increased awareness of the meaning of their own emotions and make efforts to understand the emotions of others. This greater understanding of emotional meaning may be enhanced through metacognitive strategies such as the monitoring of emotional cues, and reflective

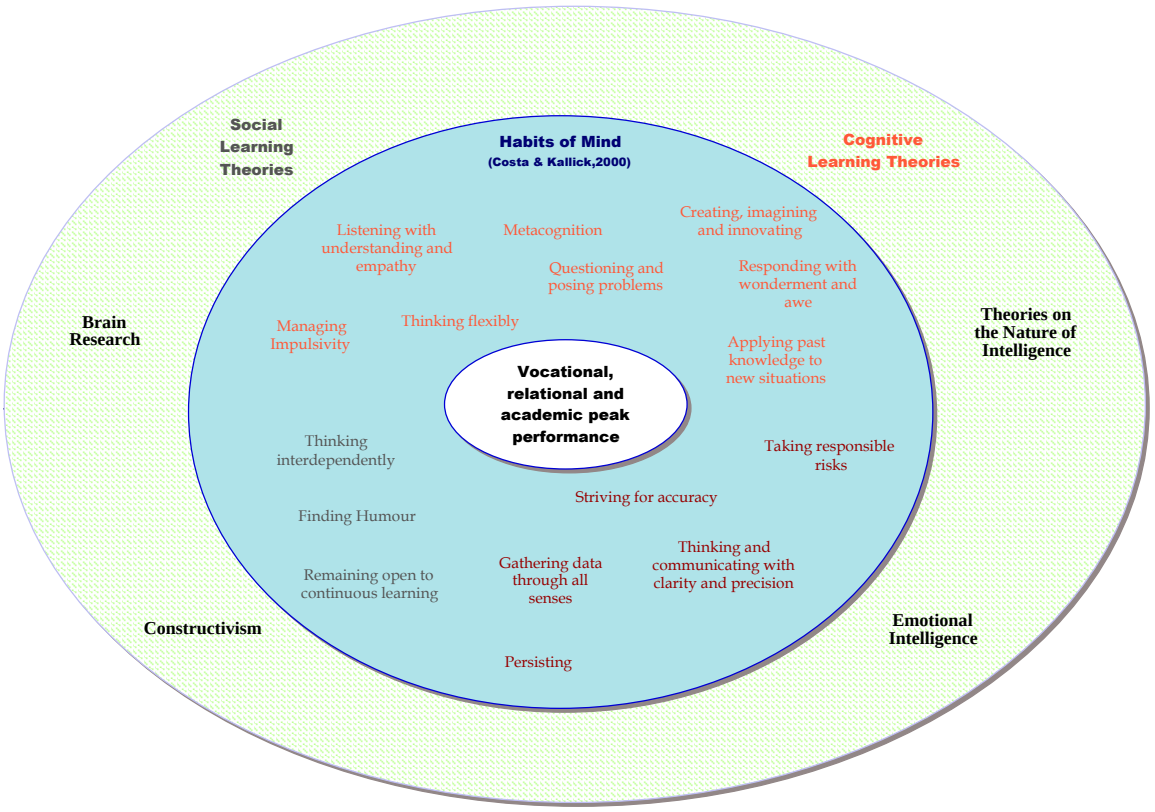
thinking based on appropriate questions, as well as the reading of verbal and non-verbal cues of others.

Theorising Habits of Mind as a framework for learning

I have presented here how theories on the nature of intelligence; learning theories; emotional intelligence; and brain research may inform Habits of Mind. In this final section, I will attempt to synthesise this information into a possible theoretical framework.

Costa and Kallick's (2000) Habits of Mind are presented as the thinking attributes of peak performers in any number of life contexts. Whether it is within relationships, academic activities or occupations, Habits of Mind are viewed as potentially effective tools for solving problems and ensuring peak performance. Habits of Mind can be seen to be informed by cognitive and social learning theories, as well as theories on the nature of intelligence and contemporary research into brain development. A summary of these general influences on Habits of Mind are graphically represented in Figure 1 following.

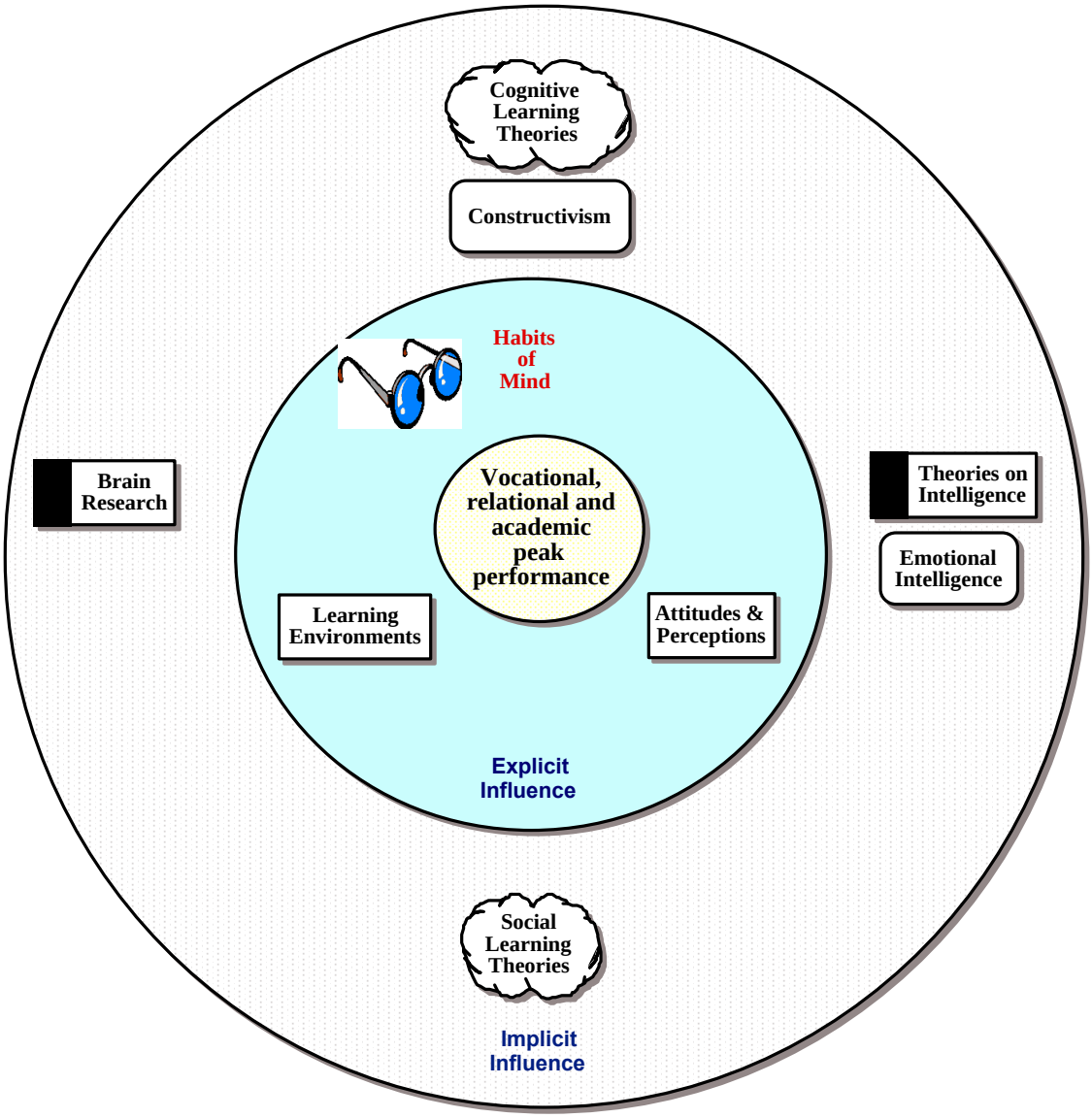
Figure 1: General Influences on Habits of Mind



These general influences upon HoM, in turn, may be seen to have implicit or less direct impact upon vocational, relational and academic performance. Cognitive learning theory

(including constructivism), social learning theory, brain research and theories on the nature of intelligence (including emotional intelligence) may, however, directly influence the HoM displayed in the classroom, as well as the learners' attitudes and perceptions and the learning environment itself. I propose that it is these three latter dimensions within the schooling context that have the most explicit influence upon vocational, relational and academic performance. A summary of these scales of influence appears in Figure 2 below.

Figure 2: Scales of Influence upon Peak Performance



In Summary

Although HoM is generally presented without a solid theoretical basis, consideration of learning theories, theories on the nature of intelligence, and brain research, indicates that there are potentially strong connections to research-based findings on learning. By attempting to make these theoretical underpinnings more explicit, I have sought to present HoM as a potentially useful learning framework relevant to contemporary understandings of teaching and learning. Further research into HoM in contemporary classrooms needs to be undertaken to strengthen the theoretical basis for HoM as a credible learning framework.

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