

Chapter 8

Learning Social Cognition

Beyond the School

Chapter Introduction

Metacognition needs to be a constant process that each of us carries out on a daily basis. We should always be looking for better ways to think and arrive at solutions more efficiently.

The reason, I believe, that most people pay little head to this vital process is due to a general belief that the efficiency of one's thinking is fixed.

Research indicates, in the case of Chelsea and the Romanian orphans, that what we experience from the outside world affects the development of the mind and has significant influence on the way we perform. It should not be deemed that cognitive development is for the young alone. It is a process of a life time.

Beyond School Adults Have a Task of Fine Tuning Cognition

After leaving school, the young adult who has encountered an idealistic approach to cognitive function will then have the opportunity of fine tuning his/her own thinking style so that it then may relate more appropriately to particular social applications. Being made aware of idealistic thinking models, while not completely compatible with everyday use, provides training in metacognitive practices which will later make the individual conscious of other people's thinking models therefore being able to lift from those models the most beneficial features which they can apply to their own model of thinking. This will produce generations of people who consciously set out to recognise the most efficient ways of processing information through thinking.

Metacognition leads to self evaluation and self improvement

At present, we judge results purely by outcome and pay little heed to the efficiencies or inefficiencies of the way the individual arrived at the result. In this way professional people, while reaching desired results, may in fact be very costly in the way they reached it compared to another who has concentrated on efficiently reaching the same goal.

Method is at least as important as the result

Most Adults Do Nothing About Cognition As They Think It is Fixed Genetically

At present, we view the process of thinking and cognition as some sort of mystery that occurs in the cranial region without much rhyme or reason. Things are only mysteries if we fail to apply ourselves to understanding them. In the case of thinking, we have been led to believe that it is a process that is either possessed or not possessed genetically. However, there is significant evidence from a number of educationalists and researchers that thinking can be explored and taught. (de Bono, Halpern)

Most people regard thinking as a mystery

If we choose to disregard any philosophical base other than that which embodies our present theories, we will always remain ignorant of any other more beneficial viewpoints. I believe that this has happened in education as very few educationalists are prepared to accept any other basis of educational theory other than the evolutionary based model from which educationalists derive the concept of innate cognition. If we hang on to our old views for the sake of tradition, we may very well by-pass efficiencies that may otherwise be enjoyed by our society.

If we dismiss new theories we are likely to miss vital new knowledge

Genes that contribute to most of their behaviour have been found for organisms other than human beings, such as for flies. Ralph Greenspan, Professor of Neural Science, N. Y. University, claims that scientists, even with careful research techniques, have failed to link specific human behaviours to either solitary genes or to small sets of genes. (Scientific American, April, 1995, p74)

No genetic link yet found for human cognition

This points toward a greater chance that cognition is learned from the social environment. Richardson (1991, p125) states

Richardson says intelligence develops in response to the particular environment now being experienced

“The intelligence of the organism cannot be risked by translating genes directly into characters that fitted yesterday’s environment but not today’s. Instead, it is invested in an “epigenetic”³¹ function which allows the development of the specific character to be

³¹ *Epigenesis*: The theory that an organism develops through differentiation of its initially structureless entity, opposed to *preformation*. New Webster’s Dictionary, 1971

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responsive to the particular environment now being experienced.”

Richardson, on the same page, indicates that if intelligence was genetically linked without environmental influence that it would render a living organism incapable of responding to fast changes within the environment. Thus today’s organism will be out of step with the present environment while the next generation would continue to be out of step with the then current environment. It is upon this notion that Richardson indicates a strong environmental link to the development of intelligence. In my opinion cognitive development is the process of producing that environmental intelligence.

Richardson argues that if intelligence was genetically transmitted without environmental influence, then each generation would be poorly fitted to meet the current environment

Adults Need to Understand The Power of Interaction in Cognitive Development

Chelsea is a recent research subject who provides strong evidence that cognition is substantially developed through the five senses. A doctor claimed that Chelsea was genetically retarded. Thus she was excused from school and denied many of the learning opportunities that normal children enjoy. Later in life it was discovered by another doctor, Dr Gluzgrugh, that Chelsea was not genetically retarded at all, but was profoundly deaf. With new technology they were able to construct her hearing so that for the first time she was able to interact with the auditory world. She then began to learn and develop. While Chelsea is now able to speak, she does not have full control of the motor functions of speaking. Neither has she developed many of the cognitive skills which would provide her with logic, sequence and understanding of social behavioural patterns. Her case confirms other research that indicates that unless an individual can hear from the first few weeks of life many of the dendritic connections required for motor integrated control do not occur later in life. See the attached video tape of Dr Gluzgrugh’s presentation on Channel Nine Network, Sydney, Sunday 28 May 1995)

Chelsea provides evidence that cognition is developed through the five senses

The Romanian orphans provide a large sample of children who were taken away from their parents by the county’s dictator and placed in orphanages. These children had

Romanian orphans gave us an experiment no ethics committee would approve

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minimal adult human contact from the time they were small babies. It is reported that the only contact they had was that they were fed and changed.

When released from the orphanages all but the very youngest showed signs of severe retardation. If the innate cognitive development model were correct it would be statistically unsustainable to contend that all these children happened to be retarded by mere chance. Instead the experience with these children supports research that finds that cognitive development occurs as a result of human interaction at an early age.

It is statistically unsustainable to support theory of innate cognitive ability and claim that these children were all retarded by mere chance

As a result, these children, while saved from the situation, maintain signs of permanent retardation. This further validates Dr Gluzgrugh's view that early interaction with adult carers is essential for cognitive development.

Validates view that early interaction with adult carers is essential for cognitive development

Thus, those who believe in the innate cognitive model, do so in the face of evidence that appears to lead away from that belief. Indeed many who hold that view exclusively are demonstrating that their theory loading is major influence in their thinking. It is my belief that it is the right of any individual to maintain a personal belief but I also believe that those holding to any belief should not inhibit the presentation of alternate views and findings on any particular research topic. On the other hand it is the responsibility of those with any view to validate that view. It is in this spirit of validation that I present the views of other researchers who view the role of cognition as a social dynamic to be learned for improving learning.

The rights and duties of holding any theory loading

As society at large has paid little attention to the importance of consciously understanding cognitive development, social changes have occurred inhibiting the attainment of many important cognitive skills required for learning. Most teachers and parents assume that cognition demonstrates itself almost instantaneously in children at particular ages regardless of social circumstances. Children who fail to demonstrate these skills at approximately the ages expected from the observation of many children, are classified as retarded. This view is influenced by Piaget. However, it has been since found that while Piaget's views are observable in many children it is not necessarily true that the cognitive skills develop merely because of maturation. (Gredler, 1992, pp 250, 251) Other evidence shows that social interaction with the environment is necessary and that deprivation of certain specific social experiences precludes further

Not necessarily true that cognitive skills develop merely because of maturation

development of specific key cognitive skills. (Dr Gluzgrugh, Channel Nine Network, Sydney, 28 May, 1995)

Assumptions of Innate Cognition Blinded Society to Effects of Technological Change

The assumption by many that cognitive development occurs naturally and without assistance has led people to be ignorant about how the changing face of society, through social change caused by technological development, has altered the opportunity for children to develop many of the essential cognitive skills that at one time were achieved through play. As a result educational institutions have been ignorant of the changes in cognitive developmental opportunities and therefore have not been prepared for providing the development of cognitive skills that were previously developed by social interaction.

It must be made clear, however, that if the cognitive skill deficits are identified and attended to, that the technologies causing the difficulties in basic cognitive development, wisely used, can enhance educational development well beyond previous educational expectations.

The assumption that cognitive skills are developed without assistance has led society to ignore the changes that have occurred in cognitive development in modern society

Technologies that have helped cause cognitive deficits can, if wisely used, enhance cognitive development

Chapter Conclusion

If adults and parents modelled metacognitive practices, such activity would, in my view, be passed on to younger children. Metacognitive practices carried out by parents would also spill over into parents being conscious of developing adequate cognitive skills within their own children.

Adults must also realise that the development of cognitive efficiency is occurring all the time. If unaware of metacognitive processes, the development will be slower. If metacognitive activity is practised the development will be faster and more focussed.

As adults, we so frequently allow ourselves to be philosophically driven by the masses. If the masses believe that cognition cannot be improved, we tend to fall into line with that philosophy. Thus many adults become fixed in their ability range, when advancement is within the reach of most.

Section 3

Validation

Chapter 9

COGNITIVE DEVELOPMENT

EMPHASIS SUPPORTED BY

OTHER RESEARCHERS

Chapter Introduction

The notion of cognitive development is not new. It has been the centre of research by a reasonable number of researchers including Piaget, Vygotsky, Cunningham, Halpern and Brunner together with Australian researchers such as Helga Rowe, Biggs and Telfer and others. However, the researchers viewed the concept of cognitive development in a variety of ways.

It is the purpose of this part of the thesis to understand the varying notions of cognitive development and to demonstrate how each of the views relates to my views and at the same time indicating which of these views cannot be accepted by me in the light of my present proposals.

Helga Rowe

Helga Rowe believes that the concept of cognitive development is an important consideration as a prerequisite for learning. She believes, that in the past, testing students' abilities has centred around the concept of intelligence. Since intelligence is considered to be the measure of efficiency in learning, she believes that there is little future in assessing to find a label to describe the individual but it is more profitable to provide an inventory of all those cognitive skills that produce the factor of efficiency. In holding this view, Rowe demonstrates her belief that these cognitive domains can be taught and remediated as she says "This enterprise (Nonverbal Ability Test, NAT) may be of crucial importance to many children and especially for students with learning disabilities ..." (Rowe, 1986, p198)

Helga Rowe says there is little future in assessing ability to find a level, better to provide an inventory of cognitive skills

"One of the main strengths of the NAT is that it provides an individual profile which can be used to develop an appropriate intervention program." (Rowe, 1986, p198) Clearly this indicates that Helga Rowe supports the idea that it is possible that cognitive skills are not necessarily developed purely by maturation. Her research obviously indicates to her that there is need for intervention programs in specific cognitive domains where those skills have been poorly developed. It is even further elaborated in her statement that "Such intervention programs must be truly individualised in that children with similar profiles may need quite different programs." (Rowe, 1986, p198) This indicates that she considers cognitive development to be variable from one child to the other and that cognitive development is not merely a matter of maturation but is subject to the variable

Supports belief that cognitive skills are not developed merely by maturation

Cognitive Developmental Emphasis Supported by Other Researchers

influence of the child's social context. "The results of a number of studies suggest that the major differences between people in life achievement, income, prestige, social standing and even education, are due more to circumstances and luck than to differences in personal characteristics and attributes, including the attributes of intellectual ability." (Rowe, 1986, p8) Rowe quotes 17 well known cognitive scientists who support this last quoted statement. It is against the force of luck that the intervention programs for the development of deficient cognitive domains help to minimise the inefficiencies caused by such wide social variations in development.

The variations in a practitioner's ability to remediate cognitive skill deficits hinge upon factors such as the type of social interaction that was available to the child at a very young age, thus enabling the initial dendritic growth that occurs with appropriate verbal and tactile intervention very early in the child's development. This early dendritic cognitive networking sets the scene for cognitive efficiencies later on in life. (Dr Gluzgrugh, Channel Nine Network, 28 May 1995). Upon this physiological dendritic cognitive development builds other social cognitive skills based on language. It is these other skills that are being addressed in Helga Rowe's Language Free Evaluation of Cognitive Development.

I agree with Helga Rowe that the role of cognitive development remediation is not to produce exceptional individuals but is purely for the purpose of providing efficiencies to even out the cognitive disparity between one individual and another. (Rowe, 1986, p198)

Traditionally education has concentrated on testing for the purposes of grouping individuals with like abilities and then providing courses with varying goal expectations according to ability.

Intelligence, in a more traditional model, investigates the components of an individual's cognitive function but averages the results to present a measure of intelligence. Helga Rowe believes that this approach is quite inappropriate in that low scores in some of the domains are a direct result of prerequisite skills in other cognitive domains. Thus, the individual's potential of intellectual activity may be significantly high if that prerequisite skill was attended to by suitable remediation. Thus, the potential of an individual can be masked by deficits thus causing

The importance of dendritic growth in very young babies

Role of cognitive development is not to produce exceptional people, rather it is to remove disparities between people

Education has provided different goals for people with different (IQ type) labels

Rowe says no single measure of ability is adequate to summarise any person

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young people with a great deal of potential into underachieving. To avoid this masking effect Helga Rowe in her tests have set out to provide an inventory of cognitive skills to be viewed and remediated independently of one another. Thus, in Helga Rowe's perspective, a teacher needs to be attending to the skills that enable learning as diligently as one attends to disseminating the information to the children. (Rowe, 1986, p201,202)

It is for the above reason that Helga Rowe believes that the traditional IQ approach is less desirable than a diagnostic approach in which testing would be used to identify the cognitive skill deficits that impede learning for each individual. She then advocates that these deficits be addressed so that, when a topic is taught, all students would work at a level of complexity higher than they otherwise could.

It is her suggestion that educators need to be attending to the process of matching needs and programs by having available to the educators a relatively broad picture of the student's strengths and weaknesses in essential cognitive functions. However, a teacher involved in the primary task of the current information-crowded curriculum, with the associated current complex reporting system experienced in NSW, would find it almost impossible to focus on the individual's cognitive skill deficits along with the usual curriculum demands. This inability for most educators provides me with a mandate, at present, to assist both student and teacher in the task of providing cognitive development so that each student is able to cope with the required information management for the curriculum. However, Helga Rowe's view appears to support my view that the curriculum needs to have a cognitive emphasis rather than an information management one. (Rowe, 1986, p44 through to 48)

Rowe advocates diagnostic approach to teaching

The traditional and continuing emphasis on information leaves teachers little time to deal with cognitive deficits

Biggs and Telfer

Many educators pay credence to the concept of cognitive development but rather than seeing it as an active process that can be encouraged or discouraged by environmental circumstances, it is seen as a description of achievement levels that an individual possesses due to maturation. Piaget viewed this kind of development in quite fixed chronological stages however Biggs and Telfer believe that the evidence is

Biggs and Telfer challenge Piaget's theory that understanding develops at particular ages because of maturation

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that cognitive development is not bound to those chronological periods although many children may attain certain levels of cognition at those ages purely by chance. (Biggs and Telfer, 1987, p216–217) Even though an individual may attain a particular cognitive level in one task or subject area in the school it does not mean the same level of cognitive development is necessarily seen in the same cognitive skill in all subject areas. Biggs and Telfer believe it is the role of the school to generalise these skills for each subject to which they are applicable. They believe it needs to be carried out by modelling, feedback and motivation. While it is believed by these researchers that this is the role of the school, it appears that those within the schools do not clearly understand that this is their role. In the first place, information appears to be the major concern of each teacher. If the students do not conform to the set standards for attaining proficiency within the topic areas there is a tendency not to look into the processes of modelling to elevate the individual's cognitive ability to cope, but purely to dilute the experiences and challenges that Biggs and Telfer claim to be the essence of motivation. The difficulty in visualising cognitive development purely in developmental modal stages is that little attention is paid to the individual cognitive skills that combine to produce a particular modal approach. For example, if a baby displays adequate command of a sensory motor skill in one activity it does not necessarily mean that the same baby will succeed in a different task requiring a different aspect of the sensory motor mode. If the baby has not attained a well developed concept of shape, but has developed a very strong concept of direction, all activities requiring the directional skills related to sensory motor activities display a high level of proficiency. However, if the same child had to carry out tasks requiring placing shapes within spaces supplied, the child may not show the same enthusiasm to participate. The observer may then wonder, if the unitary skills are not known, how on the one hand can the child perform the task and not in the other circumstance. While maturation might have something to do with an age level at which children can develop certain types of cognition, it does not guarantee that all the individuals unitary skills within a mode or cognitive domain will be completely developed at that time. While Biggs and Telfer do not express the concept in exactly this way they do say, "while physiology makes a change into a higher mode possible, it does not guarantee it." (Biggs and Telfer, 1987, p 217) The child may never develop some of the unitary skills within the domain if intervention does not occur. This

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phenomenon is what appears to give an uneven application of the cognitive mode or domain. Especially in high school, the uneven application of modal approaches is not monitored in a cohesive manner. One teacher notices aptitude in one subject but a teacher of another may not even know that the student was able to carry that modal activity in the other subject.

While modal descriptions of cognitive development are useful to describe the attainment of particular cognitive potentials, this model of cognition is limited if a teacher or practitioner wishes to understand the unitary components of a particular mode that may be inhibiting the efficient functioning of that individual within that mode. I believe it is just not sufficient to attribute the unitary development of that mode to environmental experience. This scenario leaves the important task of cognitive development so much to chance.

This generality pervades our educational system. Ever since IQs have been used in schools they have been in the form of a single number, meant to represent the full capabilities of the student. Any teacher or counsellor wishing to intervene to help a student could get no more information about that child's cognitive skills. Indeed the single number hid from the staff the elements of cognition that made up the mysterious IQ score. To help the student, staff were forced to rely on intuition, experience or guess work to identify the key elements in which the child needed help. Thus, a large number of children have benefited from the work of many dedicated teachers but, sad to say, I believe that many children could have been better and more efficiently helped had teachers had better tools with which to work.

Teachers with many years of experience have told me that, although IQs have been faithfully recorded for many years, these measures of intelligence have virtually never been used in practice. I believe that the general uselessness of testing cognition through IQs has led teachers to believe that little can be done in cognitively developing their students. I believe that much of the conflict that occurs in the classroom has been caused by the fact that teachers are required to teach concepts for which the students lack the necessary cognitive skills. Neither teachers nor students can identify the real impediment to learning as experienced by the students but the students react in socially unacceptable ways when required to try to do things they have inadequate skills to do.

To remediate or e needs to know the present development of even small subskills

The IQ, a single score to encapsulate a multitude of skills, has hindered remediation

In NSW schools IQs have long been recorded but very seldom used

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The description of cognition in cognitive modes or domains does little to improve upon the dependence on a single figure for IQ. Certainly it breaks the measure into several parts, each related to a group of cognitive skills, but it still fails to be sufficiently precise to allow teachers or other practitioners to successfully intervene to help the cognitive development of children or adults. Description of abilities in modes has provided teachers with glib jargon but still with little understanding of the underlying skill deficiencies that are the components of each domain.

Description of present development of cognitive domains not adequate for remediation

Above, I have listed some of the reasons that many practising teachers regard educational psychology and related cognition as of little value. Biggs and Telfer say, in the preface of their book (p ix), *The Process of Learning*, "As a foundation discipline of education educational psychology is an essential part of teacher education. However, the link between educational psychology and what happens in classrooms is not always clear to teacher-education students. Because psychology does not prescribe what classroom teachers do, many students and teachers believe it to be irrelevant and so dismiss it."

Educational psychology is essential to teacher training yet frequently dismissed by teachers

Through the study of Biggs and Telfer the true significance of educational psychology for teachers can be found in the concepts of metacognition, metalearning and metateaching.

Metaprocesses are the truly significant aspects of educational psychology

Metacognition is the awareness of one's own cognitive processes rather than of the content with which those processes are associated. It is the awareness both of the student and of the teacher of being able to control and improve the basic cognitive skills associated with thinking, reading, comprehension and writing. (Biggs and Telfer, 1987, p 546) Flavell 1996, in Biggs and Telfer p143, describes metacognition "as the knowledge of one's cognitive processes and products". Flavell believes that we should be actively monitoring and regulating those processes.

Metacognition defined

Metalearning is metacognition applied to students' learning approaches. It is the ability of students to combine and efficiently sequence cognitive skills in order to obtain an efficient optimum result. (Biggs and Telfer, 1987, p 546)

Metalearning defined

Metateaching is the use of metacognition in formulating the idea of how to functionally carry out teaching efficiently and at the same time considering the impact that it will have on the student. Biggs and Telfer emphasise that as they are arguing that students need to become much more

Teachers must adopt metateaching too

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metacognitive about their learning that teachers must become as equally metacognitive about their teaching. They claim that many of the poor practices that students develop arise from either the poor modelling or the unreasonable pressures that teachers place on students. (Biggs and Telfer, 1987, p 164)

Biggs and Telfer strongly emphasise throughout their book that as teachers through the processes of metacognition, metalearning and metateaching cognition is at the very heart of making teaching work. It is, in my view, that many students have been discouraged from further studies and learning because teachers, in the past, have neglected to guide their students into efficient cognitive practices. The bulk of students attending my centre are those who have little to no idea of cognitive skills and strategies. Many believe that thinking is some abstract, ethereal fantasy that lurks in the corner of some privileged people's minds. For learning to become efficient at the school and educational practitioner level, we must avoid demonstrating what we know about the students by using glib sweeping terms to describe educational deficit conditions but need to demonstrate how learning works and how the deficit conditions can either be avoided or minimised. Therefore, in our advisory capacity we need to be *metaconsulting* so that we ensure that we are meeting the functional needs of those who listen to our advice.

In investigating Biggs and Telfer's concept of metacognition, it is clearly demonstrated that metacognition is the development of Heuristic models or pathways of thinking. When a person has well defined thinking pathways it provides an opportunity for the thinker, when particular thinking processes fail or succeed, an opportunity to revisit the process and modify it, or in the case of success to repeat it and learn it. (Biggs and Telfer, 1987, p 144–145)

As cultural changes occur, so do the ways we think about things need to change. For someone who is metacognitive such changes are merely an act of that person's thinking. Thus, change for such people is gradual and continuous. In this way, our thinking is relevant to the current circumstances in which we are surrounded by ever quickening change.

Teachers must become able to explain how learning occurs and be able to diagnose deficits in cognitive processes

Metacognition includes rethinking processes, repeating those that succeeded, modifying those that failed.

Change is normal for people who are metacognitive

Diane F. Halpern

The need for an understanding of cognition and its role in educational teaching is emphasised by Diane Halpern in (Halpern, 1989, per book "Thought and Knowledge" where she says in the preface "Traditionally instruction in how to think has been a neglected component in American education. Students were more often taught what to think than how to think. Education has primarily been concerned with presenting students with "facts" on a wide variety of topics – the "knowing that" – while offering little on how to utilise this information or how to discover facts on their own.— the "knowing how" (Halpern, 1989, p xi). Diane Halpern also recites instances where law students can repeat the laws perfectly but cannot interpret them. Another instance is where medical students are neither prepared by school or university to think. Thus, when they graduate they are not prepared as "qualitative thinkers nor clinical problem solvers. As a result, America is considered to be "a nation at risk" as students are not being taught to think. Thinking today is more needed by the general populace as each person has to make more decisions that influence the well being of many more people around us than our forefathers had to. Diane Halpern cites important decisions such as: the development of nuclear weapons, the economy, AIDS testing and privacy, conservation of natural resources world wide and we need to decide each day if the chemicals put in our food are carcinogens or not (Halpern, 1989, p 2,3)

Halpern says education in USA teaches facts but neglects thinking

Another problem Halpern addresses regarding the modern individual is how to process the deluge of information coming the average persons way. The information needs to be interpreted, digested, learned, and applied but despite this obvious need educators have not understood their role in the process. Most think that these skills occur naturally and others, I believe, do not think about the issue at all. As a result of educationalists ignorance of the need to teach thinking, Halpern points out, "Traditionally, our schools have required students to learn, remember, make decisions, analyse arguments and solve problems without ever teaching them how ." Such students are those who lose motivation and become frustrated with the system. They rebel against homework and about participating in lessons at school. Even worse Halpern reveals that 25% of college students do not know how to think. Thus, there is a good possibility that the teachers who are frustrating the students do not know how to think or direct student thinking either (Halpern,

We have been deluged with new information yet we have not been taught how to digest it

1989, p 4).

When speaking to teachers about cognitive development, many are convinced that thinking cannot be taught. Even Halpern believes that thinking occurs naturally (Halpern, 1989, p 6). She believes that thinking is as natural as breathing. However, on this point, I believe that she has made some general assumptions ignoring the differentiation between thinking and response. Response is the reaction that one has to a stimulus. When a baby feels hungry it responds by crying. At this point, the mother or father satisfies it's need. Then only as the child learns language it is then provided with the structure to further learn pathways of cognitive processing. Without the parent to teach the skills, the child will not be able to learn. Therefore, the basis for non structured thinking is taught and the better the teaching at a young age the more proficient the eventual older child will be at thinking. Halpern claims that only critical thinking can be improved. Critical thinking, I believe, is where the one teaching the thinking makes the learner aware of the thinking process.

Halpern believes thinking develops naturally but she has failed to distinguish between response to a stimulus and cognitive thinking

The parent teaching the child language provides the initial patterns of thinking. In the first instance, the child is taught about *things*. The very first thing we do before we can start thinking is to have a label to attach to the *things* about which we think. Once having mastered the labelling process, the child is then taught about action in relation to things and, so therefore, the child learns to think about things in an active environment. For example, "I want a drink of water" or "I want an ice cream" the child has then been able to think about what they want and what happens within their environment. As the child becomes more proficient with this concept of thinking in terms of *things* and *events*, the child is then taught about *circumstances* or relationships. This causes the child to begin connecting things and happenings in particular sequences. These sequences then create a particular pattern of thought. Thus, from birth the child has been taught to think through language. An evidence of this is found in the story of Helen Keller who describes a non-linguaged interaction with her environment. She claimed that it was like being at sea in a ship in a fog experiencing a chaotic set of stimuli and the only pattern in her life was the overall concept of light and dark, hot and cold and the understanding of hunger and anger within herself. It was not until a language was developed for her that she was able to think rather than just

Children in our culture learn to language and think in the same order: *thing, event and circumstance*

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react to stimuli.

Halpern states that she finds it difficult to define thinking but finds it reasonably easy to define critical thinking. (Halpern, 1989, p 6) However, in the light of the preceding discussion, I believe the concept of thinking is not as intangible as one might first think. Language embodies the very basic essence of thinking, *thing, event and circumstance*. On this basis, a vast number of relationships can be made among these meaning models to produce a concept which is thinking. This process does not necessarily follow a well defined anticipated pathway. Laterality is the term that is given to these seemingly unconnected relational meandering of the mind within the framework of language. This has been described by Cunningham as semiosis. Semiosis is the collection of interpretants unique to each individual which, in essence, create unique relationships described through language. When these interpretants become internalised and become networked, sign networks are the result. The development of sign networks, which are models of thinking created by that persons experience, provide particular approaches to each individuals thinking. While the process of developing models of thinking through semiosis can seem rather mysterious and random, the eventual sign network models do have structure. It must be noted that this structure however is also dynamic as new interpretants can be added to it as time moves on.

Halpern defines critical thinking but not non critical thinking

Critical thinking is where society agrees that particular thinking processes should follow a particular pathway. In analysis, for example, the approximate pattern is to take an issue, look at the background and the context of it, then dissect the issue into its individual ideas, look at the pros and cons of each idea, then accept or reject the ideas according to the weight of evidence for that idea then relate back to the issue with the findings to decide the veracity of the original issue. Thinking that follows pathways such as this is critical thinking. Thinking that uses a leap of intuition from issue to solution is not critical thinking.

Critical thinking occurs when particular words, such as "analyse", trigger particular pathways of thinking

Since both thinking and critical thinking are able to be taught through language, the importance of methodically teaching language to children from birth is a matter that requires serious attention and further research. Therefore, the teaching of cognition, in my view, should not only be at a formal level of education but needs to be taught to parents so that their children are able to begin setting a firm

Parents need to be aware of the need to teach language and thinking from an ear y age

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foundation for thinking from an early age.

The dynamic nature of non-critical thinking is the spontaneity of unexpected, and often immediately insupportable, conclusions reached through the connection of unusual relationships. This action of the mind will often accept a piece of information and connect it with seemingly unrelated data in memory. In this type of thinking, we usually have little recollection of the actual pathways that have led to the conclusions. This is why most people feel that all thinking is a mystery, when they are not aware that formal critical pathways exists where one can be aware of the actual process that has lead to the conclusion. As far as informal semiotic thinking is concerned, the only mystery about it is not the basis of the thought process *thing, event* and *circumstance*, but the juxtapositional process of interpretants within a persons mind. It is through this unstructured thinking that we say when a person has a great idea seemingly from nowhere, that this person has had a brain wave. What has happened is that there has been some random juxtaposition of interpretants that produce sympathetic patterns of thought relating to solutions to a conceived or unconsciously perceived social problem. Even though the juxtaposition process cannot be anticipated, what can be improved even in unstructured thinking is the basis of that thinking which is language. The more sophisticated a persons language becomes the more likely that the person will be exposed to a greater number of possible interpretants. In addition, the more sophisticated is a persons language, the more complex can be the networked models that result from unstructured thought.

Non-critical thinking results from the juxtaposition of unexpected combinations of interpretants and reaches conclusions via pathways that are seldom remembered

While Diane Halpern supports the concept that thinking or cognition can be taught, I believe that she has an unclear model of what the basics of thinking are. However, despite her difficulty of defining thinking, she maintains that this should not stand in the way of human beings experimenting and trying to improve it (Halpern, 1989, p 6)

Halpern believes that thinking/cognition can be taught

Evidence That Thinking Can Be Improved

Herrnstien, Nickerson, de Sanchez and Swets 1986; Walsh 1981 and Schoenfeld, 1987 were all involved in extensively testing "Thinking Programs" in Venezuela. It was found that students who were exposed to thinking improvement were superior in performance in standardised thinking skills tests to control groups who had not been exposed to the program

"Thinking programs" in Venezuela

(Halpern, 1989, p 9)

Chance (1986) conducted a review of a number of "Thinking Skills", programs. He concluded that thinking is a skill that can be taught but it is best taught by direct instruction rather than teaching thinking by inference arising from doing tasks or exercises (in Halpern, 1989, p 9)

Chance says thinking is best taught direct y

Fox, Marsh and Crandall (1983) have also validated the effectiveness of teaching thinking skills to college students. It was found that students exposed to the instruction compared to the control group made significant gains in cognition generally (Halpern, 1989, p 10).

College students improved their cognition

Schoenfeld and Herman experimented with college freshmen and sophomores by teaching them general strategies for problem solving. It must be noted that these strategies were not related directly to mathematics. However, having been taught these cognitive strategies, it was found that these students faced mathematical problems very similar in manner to mathematics professors. This indicates that it is possible to generalise cognitive strategies to many different applications. There was a control group associated with the experiment that demonstrated no significant change when exposed to the mathematical problem solving. (Halpern, 1989, p10)

Indications that cognitive strategies can be generalised

Halpern reveals the fact that there are not only the preceding examples that can be cited but there are numerous examples that can be examined where better thinking has arisen from appropriate cognitive instruction. However, she does sound a warning about unrealistic and exaggerated claims that have been made regarding cognitive enhancement. Examples of such claims include subliminal learning, neurolinguistic programming or chemical superlearning techniques where it is claimed that superhuman states of mind can be reached through non scientific and mysterious techniques. In my view the concept of teaching cognitive development is not a process of developing superhuman individuals but is concerned with making sure that the normal cognitive skills that are reasonably accessible to all through normal modelling to young children is being supplied to each person. Individuals, I believe, can miss out on developing certain cognitive skills through some quirk of social fate. It is my contention that the social changes that have occurred over the last 50 years have been so immense that a majority of individuals are suffering from developmental deficiencies brought about unknowingly

Numerous other examples of thinking being improved but not aiming to produce superhumans

unconsciously by a new and ever changing social order.

Is Intelligence Related to Thinking Skills?

The question of what constitutes intelligence is a debate that has occupied the minds of psychologists for generations. While the concept of intelligence is important for psychologists so that they may have a measure in order to categorise individuals into needs groups as was the case for the French Government in Binet's day, a clear definition has not been derived and to this very day intelligence is still a contentious issue. The problem of describing intelligence in the past has been in not understanding the base elements of intelligence. A variety of professionals, who have observed many subjects in such varying number of social circumstances all believing those circumstances to be acts of intelligence and observing quite different outcomes that to them became the essence of intelligence. Since those studying intelligence were academics, they believed the most intelligent thing in society is what they do. Thus, immediately both ego and social bias became an unconscious factor in their judgement. As a result of this approach, tests in the past, have been devised that test for outcomes rather than for the base elements of intelligence. This situation occurred because Since the basic elements of intelligence have not been clearly understood. In a particular society it may be considered intelligent to know that the value of gold is more than the value of copper and therefore, in an intelligence test, such a question is devised to test the individuals intellectual perception. However, for societies who do not have the possibility of obtaining gold but actually possess copper, they may view copper as having more worth to them. This is the danger of attributing intelligence to circumstantial knowledge. Sternberg, 1981, derived a definition of intelligence. He believes that an intelligent person is one who is able to cope with non-entrenched tasks. In other words how the individual copes with the unfamiliar. (Halpern, 1989, p23)

Basic elements of intelligence are in dispute

Whatever is a suitable measure of intelligence, in my view, is not well understood by any researcher. Therefore, the question of whether cognitive instruction improves an individuals intellectual ability or not is rather circumstantial. However, the view that I have maintained in judging whether teaching cognition is beneficial, is to judge whether changes in coping with one's social environment have been made in the lives of people who have received the instruction

Whether improving cognition improves intelligence is an irrelevant question

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Whether or not others consider this person to be more intelligent in traditional terms, it is of little significance compared to the new motivations that have caused this individual to gain enthusiasm in learning and a greater ability to cope with their environment.

Whether an individual is able to successfully cope with non-entrenched activities within an artificial time frame or whether the individual is able to answer questions that are deemed to be the knowledge belonging to the intelligent, in my view, is rather academic. I believe the real essence of judging whether cognitive instruction is successful is the change that is brought about in the total lifestyle of that individual. Therefore, judgement of cognitive improvement must be carried out on an individual basis related to that person's lifestyle. This is the basis upon which this thesis bases the success, or lack of success, of cognitive training. Further on in this work case studies are supplied to verify outcomes.

I judge the success of cognitive development by the change it induces in total lifestyle

Despite my personal view, it is deemed by Halpern that learning to become a critical thinker will make one more intelligent. (Halpern, 1989, p27) She claims that this is supported by Sternberg in his triarchic theory of intelligence. Sternberg views intelligence as being composed of meta components, knowledge acquisition and performance components. Meta components are those cognitive skills we consciously use to help us plan, develop and monitor our thinking. Knowledge acquisition refers to information management and memory techniques. Performance components, Sternberg believes, are thinking skills. All these can be learned, developed and improved, according to Sternberg, 1985.

Halpern deems that improving critical thinking improves intelligence

Gregory, 1981, points out the paradoxical nature of the intelligence debate by posing the following problem:

Gregory's intelligence-education paradox

1. "Intelligence is supposed not to be increased by education.
2. Abilities are supposed to be increased by education.
3. Intelligence is measured by abilities."

The paradox he is posing, in simpler language, "How can anyone claim that intelligence is not affected by education and then measure intelligence by asking someone about things that are typically learned in school? If we think of intelligence as the knowledge that you have stored

Uncertainty about what intelligence measures

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somewhere in your head, then surely some experiences will allow you to acquire more knowledge than others. If we think of intelligence as the ability to solve novel problems, then experience and instruction in solving many types of problems should improve your efficiency in novel problem solving tasks.”

Gregory proposed one way of solving this intelligence debate and that is to alter the first assumption that intelligence cannot be increased by education. He asks the question “Isn’t this the way young children increase their intellectual capacity?” It is by learning that young children expand their cognitive processes and again we can make reference to cases such as Chelsea and the Romanian orphans.

While intelligence is not well understood, it appears that there is some reason to believe, what ever the term intelligence means, that cognitive training does increase intelligence. However, our measure of cognitive training successes should not be in terms of intelligence until we understand what it is that we are measuring.

Gregory suggested the way out of the paraddx was to reject the assumption that intelligence cannot be increased by education

Whatever intelligence is, it seems cognitive development improves it

A Framework For Thinking

The principles upon which cognitive training is carried out in my Centre is based upon attitude, procedure and knowledge. Attitude is “the stuff of life” which I see as controlling the biological functions of the body. Procedures are precise pathways along which either thinking or action can take place in an orderly manner. The order produced by procedure allows improvement to be made. In terms of thinking procedure it allows for metacognition. Knowledge is the fuel for ongoing thinking. It is knowledge that provides the excitement of exploring new concepts. The procedure of thinking allows us to effectively handle the unknown and the unexpected. The very thinking style may very well help one to focus on a varying range of interpretants that would not otherwise be considered unless the thinker had a number of thinking tools to view the new concepts from many perspectives. Attitudes also require frameworks. For example the framework of perseverance. Preparedness is another example of an attitudinal framework. These all need to have a procedural process. For example a person may develop a process of preparedness by going through a visualisation ritual that prepares the biological factors of a person’s thinking for action. On the contrary, those who do not develop procedures of preparedness develop the attitude of instinctive avoidance. Such people visualise their

The importance of attitude, procedure and knowledge in cognitive development

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avoidance procedures when faced with particular situations.

Halpern thoroughly supports this framework of cognition that has been the backbone of my cognitive approach to teaching. “An essential component of critical thinking is developing the attitude of a critical thinker. Good thinkers are motivated and willing to exert the conscious effort needed to work in a playful manner to check for accuracy, to gather information and to persist when the solution is not obvious and requires several steps.” This, according to Halpern, makes the difference between those who may pay lip service to concepts and those who actually carry them out. Those who are unable to develop good attitudinal procedures are those who find it difficult to put into action critical thinking styles as they believe the entire process is too difficult. (Halpern, 1989, p29) (Mind Power, Kehoe, 1990, p17, 18)

Halpern supports this framework of cognition

Belief in how one thinks is an attitude that is required before a person can be a successful thinker. If we do not believe that we can order our thinking processes as in understanding the concepts of metacognition, the individual is little likely to view the process as being useful. Few people become aware of things such as impulsivity and rigidity that impair their ability to think flexibly. Others are quite prepared to allow gaps to exist in their knowledge and logic base thus inevitably causing ill conceived conclusions. The attitude of “near enough is good enough” impairs an individual’s accuracy in thinking. A good thinker needs to be willing to be corrected. The correction experience stands as a learning tool for future thinking experiences. This provides an opportunity for the thinker to be aware of ineffective strategies in thinking. (Halpern, 1989, p29, 30)

Some qualities of good thinking

Halpern appears to view attitude as being separate from a framework of thinking, however I see attitude as being an integral part of this framework as it involves preparing the biological function of thinking. Without the motivation and the belief that one must have in self-actualisation no efficient thinking will occur. The thinking framework outlined by Halpern appears to encompass both the procedural and information frameworks as I have previously outlined in my model. Establishing goals and choosing thinking skills to reach those goals are some of the components I would utilise in the procedural aspect of thinking. Halpern’s second feature of her framework is what is known. This correlates with the information aspect of my previous stated model. Halpern believes that this is the

Halpern views attitude as separate from the framework of thinking

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starting point for directed thinking and she alludes to the existence of new information that the individual works with through the thinking process. Another task of the information-knowledge feature of thinking is to monitor logic, gaps in information and the concordance of new and old information. (Halpern, 1989, p35, 36)

While I believe Halpern views attitude as being a very important aspect of the thinking process she does not include it as part of the framework of thinking itself. However, I view attitude as an intrinsic part of the thinking framework as the frameworks of attitude must be exercised simultaneously with both procedure and information-knowledge features of thinking.

Contrary to Halpern's view I see attitude as an intrinsic part of the thinking framework

Metamemory

As computers require well planned access pathways for efficient retrieval of information so does the human brain. Learners so often haphazardly expose themselves to the concepts they need to learn and wonder why they find difficulty in utilising the information. The model of memory that I have developed over some years of experimentation for myself includes the following components:

To remember one needs a well planned pathway for efficient retrieval

- Emotion
- Procedural programming
- Application

Emotion is the point where the analogy with the computer ends as there is nothing that can simulate the effects of emotion on a computer as it effects the human brain. Halpern agrees that emotion is an integral part of the human process of memory. (Halpern, 1989, p63) She gives the example of President Kennedy's death as being one event that those who are now over 30 would even remember the very place they were in at the time. This is an example of how surprise and periodic review reinforced the event in people's minds. People were generally so shocked at the event that each person reviewed the news over and over again with other people as they came in contact with them over the next few days. Shock and fear often have the effect of raising sensitivity levels thus indelibly impressing the incident on people's minds. In her discussion of emotion, I believe Halpern becomes confused with the identification of emotion both beneficial and detrimental. I differ in the

Halpern agrees that emotion is strongly involved in memory but she and I differ in relation to the role of fear and anxiety

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definition that Halpern uses to describe the effects of anxiety in relation to memory. I believe anxiety to be a condition where an individual faces a situation of unresolvable fear. Therefore, I see anxiety as being a condition which causes memory and recall to be suppressed to varying degrees as a result of the person facing perceived unresolvable fears. Halpern, on the other hand, perceives anxiety to have both positive and negative effects on individuals. She believes a little anxiety may actually improve performance where extreme anxiety will hinder performance. I see anxiety as being totally negative impairing concentration in degrees of severity therefore no amount of anxiety is going to have a beneficial effect as the existence of any amount of anxiety is depleting concentration, not enhancing it. What I do understand occurring where performance is increased is in the presence of controlled fear. The example that Halpern gives, of facing an examination, where she maintains that students face a degree of anxiety, I believe needs to be replaced by acknowledging that students are in fact experiencing a degree of fear, not anxiety for the actual examination itself is a procedure to solve the object of their fears, i.e. to get the exam over and done with. In this situation, fear elevates the sensitivity of the individual focusing him/her on the task of his/her allaying fears.

It is most commonly thought by many educationalists that fear and anxiety are interchangeable terms. However, in a clinical sense, fear is a positive emotion that continually protects individuals from doing harm to themselves, whereas anxiety is uncontrollable emotion with little rationality attached to it and having no strategies for resolution. Fear is a valuable tool for motivation where anxiety must be avoided at all costs. The misunderstanding of these two terms has led our educational policy makers to remove fear from education, believing that they are removing a negative emotion. This has taken away the tool for motivation and has inadvertently replaced the emotion of anxiety as many students have not been motivated to develop strategies to avoid the consequences of impending deadlines. An example of the difference between fear and anxiety can be seen in people crossing busy roads on foot. The sensible ones have fear and this makes them cross carefully. Those with anxiety are paralysed into inaction, never being able to leave the footpath. An educational example relates to examinations. By removing the public examination system from all years except for the final year of New South Wales high schools, we removed the motivation to achieve well but provide anxiety at the end of the school experience in that

Fear has positive values and has a role to play as an incentive whereas anxiety is a destructive emotion

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the individual has not learned how to develop strategies to avoid the possible adverse consequences of this particular fear.

The problem with considering emotion in terms of the level of arousal leads us to believe that there are minimum and maximum levels of arousal that produce efficiency or inefficiency. This then leads to the notion that a single label may be attached to the emotional function but referring to various degrees of intensity. However, I believe that the level of arousal is not quite as important as the ability of an individual to develop strategies to positively react to the cause of the arousal in the first place. An inability to positively react to a stimulus, I believe, can cause anxiety at a wide range of arousal levels. This view is verified by pilot training. The better a pilot is trained in emergency procedures the more clearly that individual is able to perceive a solution to an emergency problem. This does not mean that the pilot has not reached a high arousal level but, in reaching that level, is able to channel the elevated energy to pursuing solutions rather than amplified cyclic fear or anxiety. Therefore optimal performance in relation to arousal levels, I believe, has more to do with the social cognitive skills possessed by the individual. This is evidenced by various people commenting that they can either work successfully, or unsuccessfully, under various levels of pressure which in turn produces levels of arousal. Halpern's view of the effect of arousal levels compared to optimum performance, I believe, is therefore rather a simplistic view of the dynamics impinging upon people causing fear, anxiety and stress. It appears that Halpern views the levels of arousal as being the deciding factor of increased or inhibited performance (Halpern, 1989, p65). This, I believe, causes educators to be targeting incorrect factors in a learning environment dynamic. It is my belief that instead of reducing stimuli tapping high levels of arousal that an increased exposure to problem solving and overall strategy development teaching people the art of providing solutions in the face of high levels of arousal will produce not only greater performance but also greater achievement in personal perceptual intake. Therefore, many more new ideas generated by the learner will be the result. Arousal is the stuff of motivation. Strategy and self perception are the stuff of direction that avoids a drop off in performance. It is often said by sportspeople that the higher the arousal level the more creative they have become on the special day of their exhibited skill. The sportsperson will do better at the actual Olympic event than they will at training. Training has

Optimal performance, I believe, has more to do with social cognitive skills than the degree of arousal

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developed strategies to the highest level, but the ultimate in arousal produces the ultimate in performance. "Arousal, for an athlete, providing (s)he interprets the arousal as being positive, and that person has well developed strategies for coping with the cause of the arousal, such persons should have a high level of performance." (Trisha Leahy, Clinical Sports Psychologist, Australian Institute of Sport, phone conversation, 10th December, 1996)

Halpern, whilst she maintains that arousal levels determine increased or decreased performance, at the same time admits "one of the best ways to prevent or reduce anxiety is by establishing a personal history of personal test taking. If you practise the strategies for improving memory you may be able to reduce test anxiety to a more manageable level. (Halpern, 1989, p66) This observation pays credence to the concept that having a well defined set of strategies to avoid the consequences of our fears avoids cyclic fear or anxiety. I do not believe that the efficiency of learning has much to do with the level of arousal, as high levels of arousal with very well developed strategies produce good results. Does this mean the more practiced one is at a particular task the more passive one becomes? I believe the importance of critical thinking as related to the concept of emotion has been misunderstood. Thus, we believe that emotion is the controller of cognition rather than cognition being the controller of emotion.

I have reason to believe that cognition is the factor controlling anxiety and that the degree of arousal promotes motivation. Strategies developed at my Centre involve a high level of cognitive development in critical thinking and at the same time producing an environment of high level of physiological arousal. For example, in cognitively training individuals to effectively carry out learning and study procedures, clear critical paths of thinking have been provided to avoid the consequences of failure. To motivate individuals to carry out the procedures high arousal levels are produced by making the student painfully aware of the consequences of the failure to carry them out. This, in my experience, has increased performance rather than decreased it however students who have not been trained in critical thinking processes, faced with the same stimuli, will revert to cyclic fear or anxiety.

Since critical cognitive constructs are required, in my view, for optimum performance metamemory and metacognition are very important. Halpern states that metamemory

Halpern's belief that arousal levels determine performance is at odds with her statement that practising strategies for memory may be able to reduce test anxiety

Observations of clients gives me reason to believe that cognition controls anxiety and arousal promotes motivation

Halpern says metamemory is the difference between

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provides the difference between good and poor learners (Halpern, 1989, p68) therefore to be able to think about, and modify, one's memory techniques these techniques must have a defined structure otherwise there would be no features upon which one could work in order to improve memory. Bransford, 1979, in Halpern states that active learners are more likely to ask questions, seek clarification and plan their study and learning activities. Halpern cites a situation where college students who do not understand the mechanism through which they remember are unable to determine when or whether they have learned or not learned subject material. Many of them were surprised when sitting for a test that they did not know the information when they had believed that learning and memory had taken place. (Halpern, 1989, p69) A good student, on the other hand, before being tested would have a reasonable understanding of his/her status in the coming test. Halpern has thus acknowledged that structure needs to be given to our memory techniques such as mnemonics, rhymes, method of places, first letters of words are a number of definitive structures that she says can improve memory.

good and poor learners

Halpern's acknowledgment of an need for structure has led her to investigate existing structural approaches to memory that many people have used over the years. However, many of these techniques tend to be a distraction rather than being a complement to what has to be remembered. I prefer memory techniques that have usefulness in terms of sequential organisation. I also like using techniques that feature as a more subtle stimulus in order that the technique does not detract from the actual material to be remembered. For example, a method commonly used for remembering names is to pick a feature about an individual and associate it with the name of the individual. Mr Beavis was a name that I had particular problems in remembering. I looked for a feature that would help me remember this name. Mr Beavis had rather large and protruding teeth and so therefore I made up a little catchy jingle "Bucky Beavis". In a public meeting, becoming a little anxious about my presence in front of so many dignitaries, introduced Mr Beavis as "Bucky". This mistake was a direct evidence of what happens when the memory tool is a higher level stimulus than the thing that had to remembered. It is better to use tools that have directive features.

Some memory techniques have disadvantages

By direct features I mean, the way information is put together to create a heuristic image of the pathways that are taken to process the information. For example, when I want

The method I recommend to help memory uses a visual pattern associated with

Learn ideas first for topic.

Once ideas have been learnt then points and information are attached to each idea.

Categorisation of main ideas.

Categorisation of points

| SUBJECT: | TOPIC: | DATE: | NO: |
|-------------------------------|---|----------|-----|
| History | Influence of Rats on People | 10/12/96 | 1. |
| 1. Agents of Death | • Rats have killed more people than all the wars + revolutions. - 1/4 Europes pop. } 1605 - 100,000 in London | | |
| | • Rats transfer disease from dumps + sewers via fleas to people. | | |
| 2. Resilient to extermination | • Traps, predators + natural | | |


 © 1991, Australian Institute of Learning & Cognitive Development
If you need help with your study phone: (02) 9477-2211

Figure 2

Both direct and categorisation are used on this study card as a tool for creating learning efficiency. Visual layout can be a valuable cognitive tool for memory.

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to remember information from a given topic, I like to visualise the ideas as having first priority but in a vertical orientation. This corresponds closely with the way ideas are presented in text and that is one paragraph under another. I then like to see points as being horizontal in relation to the ideas. But the points themselves related to one idea are vertical as this is the way points are built up in a paragraph, one under another. However, data associated with each point I perceive as having a horizontal relationship to points as data is mostly dealt with in sentences horizontally. In this memory technique, layout is very important which incorporates direction and categorisation. These are used to access information from a very small trigger, as in the ideas, to a much larger content as in the data. Associated with layout memory features such as symbolic representation as in varying font and icon styles such as bullets, asterisks, dashes and arrows.

cognitive skills of direction and categorisation

To memorise in this way, one first memorises all the ideas. Knowing the number of ideas is important. If one idea is missed on recall, the brain continues to search for it. To recall the ideas, first letter mnemonics are used to trigger all the ideas. For example, if the ideas were: Definition, Arrangement, Reaction and Target the first letter mnemonic will be "DART". In this way, the number of ideas is obvious and the first letter of each idea is a trigger for the entire idea. Once the ideas are easily recalled and visualised in a vertical orientation, the points are learned horizontally in relation to the idea. The points related to that idea are once again learned and visualised vertically if there are a number of points and then data is learned and visualised as horizontal to the point.

Learn how many main ideas, mnemonic is possible, ideas listed vertically, points listed horizontally

This figure illustrates how the cognitive skills of direction and categorisation can be used in a study card layout to assist learning and to enhance recall.

Figure 2 Using Direction and Categorisation to Help Learning and Recall

What causes memory to occur is a chain of cognitive functions that raise potentials in the cortex. These higher potentials are derived from the focus or concentration level that is directed on the task by the clear cognitive procedure. By possessing a particular study note layout sympathising with the process of text itself, it provides intense focus of the

Memory occurs because same cognitive functions are used to create notes as used to remember them

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meaning significance of each layer of text. Thus, the first task of searching for the main ideas provides the learner with a quick overall structure of the topic. Writing the ideas down in the study notes in the person's own words makes sure the idea is understood. To arrive at an idea a number of points must be classified and categorised. This forces the learner to become familiar with relationships and to understand what joins and what separates one idea from the other. By being forced to access meaning by writing the notes in one's own words it compels the learner to reduce the information to basic principles rather than retaining the expression of the original source. The failure to distil the information to basic principles is a self actualising mechanism warning the learner that this part of the information is not fully understood.

Laying out notes in a particular format assists learning and recall in that it produces visualisation of an anticipated pattern in particular sequence. At my centre, I have used the framework that is described in the chapter "Practising a new approach" to improve the memory-study techniques of at least 400 clients.

A conceptual description of the framework is that clients are first taught to access ideas which assists them to feel that they are succeeding. This boosts confidence and provides positive strategies for then accessing points which further produces positive emotions towards accessing the larger data. Having a procedure of recall enables one to practice the process over and over again so that it becomes a semi-autonomic process of the mind.

If recall is haphazard no particular strategies are reinforced and therefore efficiency is not achieved. In first accessing the ideas, the number of ideas is known thus this knowledge acts as a statistical trigger that if one idea cannot be remembered the mind knows that it must continue to search for it. This process becomes efficient as a greater sense of anticipation is developed. Further, memorisation is best served by applying the information from the study notes to specific thinking strategies that may apply to the topic at hand. These strategies could be analysis, criticism, evaluation. Such strategies are obtained by learning to answer questions as a part of the memory process. When information has been visited from the point of view of many structural thinking styles memory is much more certain than if learned by mere rote learning but in the illustration above the information is being memorised by enactive

This method has been successful with the clients who needed this kind of development, over 400 of them

Having a procedure of recall enables one to practice until it becomes a semi-autonomic process of the mind.

Efficiency is achieved by using a systematic way of remembering

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repetition.

A structured cognitive approach to memory retention, I believe, is far better than gimmicky techniques as it produces within an individual a learning and memory style. Such a concept can be understood as we consider the style developed by sportspeople that are cognitive approaches in thinking about their game and in the same way a learner can develop a cognitive style that produces more efficient learning in the game of education. I agree with Halpern that there needs to be developed cognitive constructs in the process of efficient memory retention but these constructs need to be more organically related to the procedure of the task rather than high profile stimulus features that run the risk of being the primary concept that is remembered. A memory style is much more effective than a memory gimmick in that it is used at all times and lends itself to “meta” improvement processes.

Structured cognitive approach to memory retention produces a learning and memory style

The memory framework that I have developed very closely attends to the prerequisites of successful learning and memory as outlined by Halpern. (Halpern, 1989, pp 48 to 63) The very first task is acquiring the information. It is by having effective and fast acquisition techniques that information is going to be learnt. If the acquisition process is too tedious, the arousal level declines and the processing procedure become a mechanical function rather than a cognitive one. The close correlation between the structure of text and my structure of learning and memorising, provides efficient and fast acquisition as accessing ideas first provides a very quick outline before delving into the intricacies of the data.

This memory framework deals with Halpern's pre-requisites for learning and memory

Attention, according to Halpern, is one of the primary determinants of what we know. What we attend to thoroughly, we will remember. Having a procedure that breaks the acquisition, learning and recall tasks into procedural parts generates focused attention as frequent goals are achieved. This is another feature of my memory procedure and that is the process has many segmented but sequential features.

My memory framework aids attention by providing multiple segmented but sequential features

Prior knowledge is very important in being able to learn. If our past experiences do not parallel what we are learning certain features of what we are learning may be harder to remember. Halpern cites an experiment where a question was asked about a girl they had read about in a comprehension test. The comprehension exercise focused on

My memory framework helps users to identify prejudices and inadequate prior knowledge

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the life style of this particular girl and it promoted her lesbianism. When asked how frequently she would go out with men, college students who had a tendency towards lesbianism remembered that she did not go out with men but those who were prejudiced against such life-styles could not remember. Whether in fact they did not remember due to the act of repression or dismissing something they did not agree with, or whether they did not empathise with the person in the story, is unclear but it is clear that prior knowledge and prejudice play a large role in our memory processes. In my memory process, the act of bringing everything to basic principles and then having to state it in one's own words thus highlights those areas where belief or a lack of prior knowledge prevents efficient information retrieval, as the inability to state something in one's own words highlights those areas lacking in background information. This leads the learner to obtain the appropriate background necessary for the concept to be remembered. If a prejudice is likely to interfere with memory it is my practice to encourage clients to address the issue rather than dismiss it thus having a positive approach to their beliefs rather than relegating certain issues to repressive practices.

Meaningfulness is another significant element in memory promoted by Halpern. She claims that things are harder to remember when those things have little internalised meaning to the learner. Halpern recommends that advance organisers be used to make information more meaningful to the learner. This is a process of obtaining a preliminary outline of the topic before the details are dealt with. The process of accessing ideas first in my memory study process does exactly that. It provides an outline when accessing the information for the first time and also provides an advance organiser when retrieving the information.

This framework of memory promotes meaning by accessing main ideas before detail

Organisation is another very important factor in remembering, according to Halpern. Again, in my learning-memory model layout and organisation are very important features and my observations confirm Halpern's belief. She also believes that classification of information is extremely important. In her book "Thought and Knowledge" p60,61 she provides two lists and invites the reader to learn both. In the list where the items are random it is much harder to learn than in the list where the items are classified and categorised even though it is the same information. Organisation through classification and categorisation are some of the main principles on which my memory-learning

My memory framework provides both layout and organisation

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model is based.

These principles upon which I have based my memory-learning model are also supported by Cherry, 1953; Moray, 1959; Treasman, 1964; Snyder and Uranowitz, 1978; Branford and Johnson, 1972; Bower and Clark, 1969 all of whom are quoted in Halpern (pages 45 to 63) for their personal research into various elements of memory retention and learning that have been cited.

Other researchers who support various elements of my memory framework

Relationship of Language and Cognition

It is argued by psychologists whether or not language controls how we think or whether it just influences our thinking (Sapir-Whorf hypothesis of linguistic relativity, 1960, in Halpern, p92). I see yet another dimension to this question. Could it be that language both influences thinking and that thought itself is not possible without language?

Psychologists ask whether language controls or merely influences our thinking

As far as thinking is concerned, I agree with Halpern that while language might not determine the precise thinking process that an individual engages in, nevertheless it is a powerful tool to either direct or misdirect thinking. The actual process of thinking, I believe, is a social process where those using the same language may construct many different thinking styles. (Halpern, 1989, p93) However, I do believe that without the ability to language that thought itself is extremely limited and perhaps impossible. What we do know is that without a sophistication of language individuals are not efficient and sophisticated thinkers. Each individual, I believe, develops individual styles of thinking even though that thinking process between one person and another may have many similarities. For example, if one encountered five people analysing something there is likely to be five variations of analysis but they would all have one thing in common and that is the process is one of pulling a concept apart and investigating its parts. Analysis for a mechanic may be quite different from a scientist in its intricacy and from one scientist to another each might have his/her own specific style. While language produces a great deal of flexibility in thinking, without language a dynamic thinking process is very limited as exemplified by animals, other than human beings, in the animal kingdom. No one really knows the full extent of this argument other than that language is a key to learning efficiencies.

Language has a powerful effect on thinking processes

Much of my work hinges on the improvement of language in

Much of my work is

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order to gain improved efficiencies in thinking and learning. It is a central tool to cognitive improvement and appears to have a central place in Halpern's development of critical thinking. It appears that Halpern supports the idea that the juxtaposition of words direct and construct individuals in developing ideas. Ideas are then able to be networked by relational or cohesional words to form concepts. The structuring of these ideas in words provides a vehicle for many to dissect, inspect, modify or reject that particular idea. The dynamic process of coining new words to refer to new phenomena demonstrates the flexibility of the human being's language processing.

based on improving language to gain improved skills in learning and thinking

Language enables the thinker to both use existing words and accepted linguistic meaning making procedures to construct concepts. However, words are not absolute in their meaning, they can take on shades of meaning according to the definitional context in which the writer places the words. Thus, the flexibility of language enables various concepts to be built and is able to indicate varying styles of thinking. For example, thought style can be indicated through language by the use of cohesive words and we can say such as "on the one hand our existing flag has historical significance but on the other it may not have current significance to the nation as it exists today". "On the one hand", "on the other hand" are cohesive phrases that have been used to direct the reader into a particular mode of thinking and this we call discussion. Discussion is a thinking process where the pros and cons are investigated in order to view both sides of an argument. Thus language has not only to convey contextual meaning but also has been used to direct the thinking style. Halpern has said "As speakers we select the words we want to use and produce them in a grammatically correct form. As listeners, we use the information in another's utterance in order to share the expressed thoughts. (Halpern, 1989, p88) It is this grammatical understanding that gives the listener cues as to the thinking process. For example if the speaker wants to emphasise relationships the *circumstance* model appears at the front of the sentence. If a command is made, the *event* model features at the front of the sentence. Description is featured by emphasising the *thing* model through placing it first in the sentence and also in expanding it in size. (M. A. K. Halliday, in *Living With English*, 1989, see appendix of this thesis). Halpern emphasises the fact that the sender

Thorough understanding of grammar is essential if the listener is to understand the speaker

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and receiver must share common knowledge of word meanings and grammar. 88, 89) Unless this common code of language is thoroughly understood difficulties in thinking and comprehension occur as all can only access information as each one is able to process the code. This has been validated through action research in my centre with over 400 clients. As language is improved it is noted that both thinking style and comprehension improve dramatically. Such students generally achieve top marks in their year having often come from a very low achieving classes in the school. Paul M³² is a student at a local Sydney high school who faced extreme difficulties at the beginning of Year 11. While he could decode text word by word he did not understand the grammatical construction that leads to meaning. After working with him throughout Year 11 he became a capable Year 12 student who was then able to attain 350/500 in the NSW HSC. Prior to Year 11 Paul M had never receive a mark for any exam above 40%. This is not an isolated case. It is in fact typical of 75% of the students who seek my help.

Margaret E Gredler

Margaret Gredler, in her book, *Learning and Instruction*, has made a study of educational theory from 1890 to the 1990s. This study has enabled the major theories throughout the years to be compared and contrasted. This compilation of theoretical research and educational outcomes enables one to understand how the various theories address particular educational perspectives. While no theory provides a complete perspective on learning each researcher has emphasised particular viewpoints. When all of these are juxtaposed it can be seen how each theory brings its special insight into the large web of learning theory Margaret Gredler states "The theories were selected because they each describe particular psychological mechanisms of importance to classroom learning. B. F. Skinner details the role of reinforcement in behavioural change, and Robert Gagne describes the internal processes and environmental conditions essential for different kinds of learning outcomes. Albert Bandura describes the ways in which human beings learn from observing the behaviour of others ... The other four theories in the text technically are not categorised as

Gredler's book is invaluable for its summaries of various educational theories

32 Paul M is included as a case study later in this thesis.

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learning theories. Nevertheless they have important implications ... Information processing theories focus primarily on the ways individuals perceive, organise, and then store information in long term memory. ... Lev Vygotsky's perspective is that of the unique role of each culture in determining the nature and level of thinking processes attained by the child. Bernard Weiner, on the other hand, presents the ways in which individuals identify the causes of success and failure." (Gredler, 1992, p7 to 10) Gredler states that learning is such a complex set of processes that no one theory can capture all the variables that are involved. She points out that the behaviourists assume that the environment is the primary agent responsible for learning. The cognitive theorists assume that the learner's mental processes are the major factor in learning while the interactionist perspective believes that behaviour, mental processes and environment are all inter-related. (Gredler, 1992, p10)

Many of the views I hold in my practice have parallels with interactionist perspectives, developmental interactionist theories and cognitive perspectives. Each one of the last-mentioned theoretical models reviewed in Gredler provide significant support for views that I have promoted in this thesis.

Many of my views parallel interactionist developmental interactionist theories and cognitive perspectives

Gagne's "Conditions of Learning" relate to the identification of five distinct domains. They are verbal information, intellectual skills, cognitive strategies, motor skills and attitudes. Gagne claims that each represents a different kind of performance required and each skill is learned in a different way.

Gagne identifies five domains in learning

Verbal information is Gagne's recognition that language plays an important role in the learning process. He believes that the larger body of knowledge is first learned as information and then it is internalised and reconstructed by internal intellectual skills and processes along with pre-existing knowledge.

Gagne recognises that language has an important role in learning

Intellectual skills involve analysing, rules that govern reading and writing. Intellectual skills, according to Gagne, are different to information in that information is knowing "that" and intellectual skills is the process of knowing "how".

Gagne says that information is knowing "that", intellectual skills are knowing "how"

Motor skills, to Gagne, are important in developing smoothness of action, precision and timing. Feed back is an important spin-off from the development of motor skills. It

Gagne says feedback is an important spin-off of motor skills

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is actual practice that is performed through motor activities that enable a learner to know whether (s)he has learned successfully or not.

Attitudes are considered by Gagne to be viewed from three perspectives. The first is a cognitive aspect, which is an idea or proposition. The second involve feelings that appear to accompany the idea and the third pertains to the readiness of an individual to behave in a certain way. According to Gagne attitudes are the most elusive factors in learning as it is not well understood how attitudes can be changed by the learning facilitator. However, there is one fact that is known. People learn when they believe that what is being learned is useful.

Gagne says attitudes have three perspectives; cognitive feelings and readiness to modify behaviour

Cognitive strategies were considered by Gagne as being different from verbal information and intellectual skills as he considered these *two* skills to be directly related to content. Cognitive strategies, on the other hand, were considered to be the learner's own thought processes. They include search and retrieval strategies, task specific strategies such as mnemonic systems, checking methods for mathematical procedures, general strategies such as problem approach which includes dividing a problem up into its parts, executive strategies which involve reflective thought and observation that allows the student to quickly determine which of a range of cognitive strategies should be used for a particular problem and in what sequence for the greatest efficiency to be achieved.

Gagne says cognitive strategies relate to the learner's own thought processes

While Gagne outlined the importance of prerequisite skills to learning according to Gredler this theory was developed to account for the psychological processes that he has observed in prior research. However, he tends to generalise rather than being more specific in how to utilise the knowledge of such cognitive skills. Gagne gained much of his practical experience working with American aviators in learning situations during the Second World and from 1962 to 1987 he used this expertise in developing efficient learning systems in schools. His work demonstrates that he had observed the necessity for pre-requisite cognitive and intellectual skills in order to perform efficiently. In his view, these skills could not be directly taught. It appears that much of Gagne's reservation that cognitive skills and strategies could, or could not be taught, revolved around the problem of introducing such teaching into a class room environment. It is my experience that it is impossible to deal with the multiplicity of variable needs that students have in

While Gagne's work has much to commend it my experience is that cognitive skills **can** be taught but, with the current educational climate, require a 1:2 class

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regard to their cognitive development in the class room. There is a definite need that both students and parents understand that cognitive skill, if not acquired throughout normal development, will require specialist assistance in a situation where the student and a bonded carer work with the specialist instructor on a one to two basis. (Gredler, 1992, p126 to 167)

Gestalt Psychology

Gestalt psychology was the beginning of the cognitive perspective. By cognitive perspective it is meant that learning and thought functions are viewed in this perspective as a constructed cognitive maps that direct an individual's actions. Tolman (p320) claimed that behaviour is not a matter of sensory input followed by reaction but is a result of an individual perceiving a goal and then determining a way of achieving it. He also reveals that people and animals learn a particular sequence of events that lead to goals. At some other time, an individual is able to recall that pathway and follow it. This is called a sign-Gestalt-expectation.

Gestalt psychology places thought between input and reaction

This theory provided new insights into problem solving and thinking. Problem solving was no longer viewed as mere trial and error as it had been in the behaviourists' model. In the Gestalt view, a solution to a problem was attained as a result of the neuronal system being sensitised to stimuli then these stimuli being subject to organisation within an existing cognitive map that then directed particular behaviour. This model of cognition allows for the selective acceptance of previous experience depending upon context and situation. Karl Dunker, 1926, (in Gredler, 1992, p58) demonstrates that problems are not only solved by previous experiential pathways but cognitive pathways can be built by the subject as (s)he perceives individual elements within the problem and is able to make connections between one element and the other. This, Dunker refers to as "productive thinking". An example cited by Gredler is the problem of tying the ends of two ropes hanging from a ceiling but being too far apart to draw the ends together without letting one go. In the room, there were a multitude of objects seemingly unrelated to the problem. Subjects were placed in the room with the instruction to tie the ropes together. It was observed that a great number of the subjects tested various approaches to the problem finding that it was not easily solved by drawing the ropes together. Many of the subjects looked for

Dunker demonstrated that problems can be solved by making cognitive pathways between the elements of problems

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properties and elements within the problem situation and through the processes of experimental clues established methods of achieving that particular goal. Some used poles to draw the other rope across to the required point in the room. Others used heavy weights such as a hammer, tied to one of the ropes and used the hammer as a pendulum to swing the rope until the other rope could be drawn across to the swinging pendulum. Thus Maier, 1931, (in Gredler, 1992, p60) illustrates how that seemingly unrelated elements within a problem situation can be perceived by the problem solver as partial solutions to a given problem at hand. The problem solver, in this case, is shown to be actively building procedural pathways that may or may not be used for future problem solving applications. With use such a procedural map is able to be analysed and improved. Here is evidence for the eventual notion of metacognitive functions of human beings.

The main focus that the founder of the Gestalt model had in relation to this approach to thinking was to replace the old stimulus response view of learning that led to mindless and senseless rote learning. Wertheimer believed that instead meaningful connections need to be established in order to reveal a meaningful result. Thus, learners are then able to understand the rationality of what they are learning. In this way, the learner is able to contemplate the appropriateness of the model being learned and has a chance to improve on it. (Gredler, 1992, p56,57)

The Gestalt model supports the understanding of cognitive function that I propose in this thesis. However, the Gestalt model, while describing the existence of cognitive maps, provides few clues as to how to directly use these cognitive maps in constructive thinking. Despite the apparent limitations of the model, it did lead educators to realise that learning must have purposeful pathways of understanding and demonstrated the importance of problem solving as a means of developing people's cognitive efficiency. While usefulness has been the catch cry for learning in past years, this I believe, has lead much curriculum development into extensive diversity. Information or data has become so voluminous that both teacher and student often run the risk of neglecting the associated thinking processes. Thus, the original intention of the Gestalt approach, I believe, was to cause educators to teach through logical pathways of cognition but in emphasising the need for usefulness and logic, and not attending to teaching cognition itself in a conscious manner, has in itself been an influence in the

The Gestalt model had significant doubts about the stimulus-response view of learning

The Gestalt model supports my proposals and it led educators to some valuable conclusions but it does not attend to the teaching of cognitive skills

Cognitive Developmental Emphasis Supported by Other Researchers

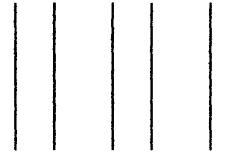
present education diversions we find ourselves experiencing. Wertheimer, according to Gredler, did not recommend specific teaching methods based on the Gestalt theory but encouraged teachers to provide information that would enable students to reorganise their cognitive maps with alternate information. (Gredler, 1992, p57) In my view, it appears that Wertheimer's approach to purely supplying a multitude of alternative views on any particular subject could conceivably have been one of the factors contributing to the blow-out of the teaching of information at the expense of attending to the development of thinking style. Thinking was not viewed in the past as something that is socially done but something that happens. Therefore, even the Gestalt theorists could have viewed their model in terms of describing what happens in thinking rather than how thinking can be developed or enhanced.

Max Werthiemer and Gagne have been mentioned because of their involvement with cognitive concepts when the behaviourist approach to psychology was the accepted framework. Werthiemer, the founder of Gestalt psychology, was not satisfied with the behaviourist view that individuals purely reacted to environmental stimuli. The phenomenon of the moving picture caused Werthiemer to understand that not only did the mind accept the stimulus but related it to structures and configurations in the mind. This insight led Werthiemer to understand that a great deal of construction occurred in the mind in order to interpret such experiences. (Gredler, 1992, p51,51) The construction of mind discovered by Werthiemer also can be tested by perceptions that people have about things they see. For example, four vertical lines paired in twos is seen by most observers as columns. Four lines, the first of crosses, the second of zeros, the third of crosses and the remainder of zeros is not perceived just as four lines of symbols but four columns. These, according to Werthiemer, are examples of the laws of perceptual organisation or constructs of the mind. From these brief examples, insight is gained into why Werthiemer considered the importance of investigating the cognitive constructions of mind that leads to the way people perceive their world. (Gredler, 1992, p54,55)

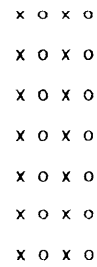
Werthiemer, founder of Gestalt psychology, saw that the mind places constructions on stimuli in order to interpret them

Chapter 4 Gestalt Psychology: The Cognitive Perspective

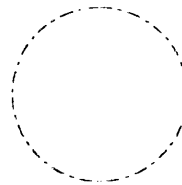
1. **Proximity:** The lines tend to be perceived as three columns or three sets of two lines.



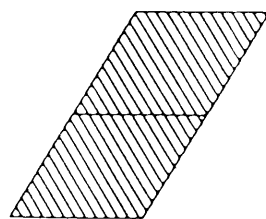
2. **Similarity:** Although the letters are equidistant from each other, they tend to be perceived as columns.



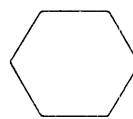
3. **Open Direction:** The figure on the right tends to be perceived as a circle although it is not a closed figure.



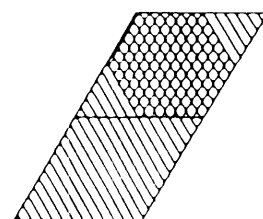
4. **Simplicity (total structure):** The total structure (a) is perceived, rather than the hexagonal figure (b) that is embedded in it.



(a)



(b)



(c)

Figure 3

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People construct in their minds the concept of what they see, as illustrated by the lines producing columns and the noughts and crosses producing the same concept.

Figure 3 Personal Construction of Concepts

Behaviourism promoted the idea that learning is the formation of association between elements where Werthiemer, in his Gestalt theory, claimed that learning is the organisation and reorganisation of sensory fields. Tolman (Tolman, 1932, in Gredler, 1992, p64) explains that learning is essentially the process of producing or developing cognitive maps that direct behaviour where the behaviourist view is that an individual experiences the environment through trial and error and creates a network of associations from those past experiences. Thus, in the behaviourist view, it is logical to conclude that experience, both positive and negative, must be accessed before learning can occur where in the Gestalt view the mind could construct tentative frameworks of thinking in order to validate or discredit a particular theoretical perspective. In other words, a person did not have to actually make mistakes to learn where in the behaviourist model a trial and error perspective assumes that all must make mistakes to learn. (Gredler, 1992, p68)

Some differences
between behaviourism
and Gestalt theories

The second world war became the largest field test that behaviourism had ever been exposed to. The complex training tasks that had to be achieved thoroughly in a short time began to challenge the existing behaviourist view of learning. "The recommended learning principles of reinforcement, distribution, of practise and response, familiarity did not lead to successful instruction" (Gagne in Gredler, 1962, p72). Instead, it was found that instruction on specific tasks enabled cognitive networks to be developed so that when the individual faced the practice cognitive pathways were able to be followed in order to carry out a particular function. This enabled mass teaching of principles and shortened actual practice where, in the behaviourists' view, an instructor would have to be present for the duration of training. Thus Gagne demonstrated the efficiencies that can be gained from a cognitive perspective over the behaviourist model. It is this degree of efficiency that was gained through Gagne's experiences that I believe has again been realised as cognitive psychology has entered the realm of viewing thinking procedures in terms of structural models. It is by instructing people how thinking

Gagne demonstrated
superiority of cognitive
over the behaviourist
model

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can work that efficient thinking can be more quickly attained. For example if a person understands the procedure that others within his/her society follow in order to analyse, the individual is able to conceptually practise that procedure until it becomes a construct of perception. This degree of learning can be understood by those who have learned to drive a car. At first the car is driven conceptually and each step is consciously taken. When experience takes over numerous other tasks become the lot of the conscious thought and actual driving becomes a semi-autonomic function. While driving is not the process of abstract thinking, the heuristic function of driving has a parallel to the abstract thinking process. In fact driving is a process of motor-integration, a cognitive process.

From 1975 there has been an increasing focus on cognitive psychology from a research perspective. Notable names such as Piaget, Bandura, Gagne were all forerunners of the modern concept of cognitive science that has been dominant in research since 1980. Although Vygotsky developed his theories in 1934 his theories became important to research related to reciprocal teaching. In 1985 cognitive psychology began to emphasise strategy construction and metacognition. By 1990 there was an increasing emphasis on social influence and motivational factors in learning. (Gredler, 1992, p77) Cognitive development and its importance to education and learning has had a long but chequered history and has only in recent years gained credence through the weight of evidence in neurosurgery and non-invasive methods of monitoring brain function. (Johns, in Open Learning Video Tapes)

Since 1975 there has been an increasing focus on cognitive psychology

Information Processing

The information processing theories are criticised by educators in that the theories dwell more on the constructs of thinking and information processing rather than the process of learning (Gredler, 1992, p 206, 207). In my view, thinking and the processes of information management are the prerequisite tools for learning. If an individual becomes proficient in thinking and handling information efficiently, efficient learning will most certainly follow. In my opinion, the present education system places too much importance on learning information that is often out of date before it is learned. While it is expected that the exposure to the information taught is going to help students develop thinking skills, in practice, for most students, it does not efficiently

Teaching information management skills and cognition has resulted in dramatic improvements in school performance for a high proportion of my clients

Cognitive Developmental Emphasis Supported by Other Researchers

occur. This, I have experienced through eighteen years of teaching and consulting. It is a personal belief, that it is thinking and information management that should be the main focus in education, and information should be the vehicle through which thinking is taught. The majority of students seeking educational help in my Centre, when tested, are found to be grossly deficient in cognitive skills. Once the skills of information management and cognition are taught, most of these students move directly to the top of their forms. Thus, it is my experience in remediating several hundred students that the lack of information management skills and cognitive deficits have been the major cause of the students learning difficulties. Gredler herself states that the teaching of strategies for encoding, recall and problem formulation and analysis are of equal importance to learning (Gredler, 1992, p 206, 208). I believe that the issue can be stated more emphatically. The strategies of the mind are prerequisite to learning information. Cognitive skills in my view are therefore more important than learning information at school. We should be equipping students to handle information and learn on a continuum. A great number of adults leave school at present and do not wish to actively learn again as they have been forced to learn without the skills to do so. Thus, learning has become a traumatic experience never to be repeated. In this way, the intellectual development within the community is dwarfed.

The underlying principles of the information processing model are aligned very closely to many of the approaches that I have progressively accepted and developed in my consulting over the years. The practices I have adopted have not been directly influenced by the research done by the information processing theorists. I have devised them by observing how text works and how thinking works in practice. After hundreds of successes, it appears that many of these principles pertaining to this model do work.

The only problem with many of the comments relating to theories such as information processing and others is that educators appear to seek a single theory that describes the functions of education and learning. In my view, many of the theorists become focused on particular aspects of cognition and learning. What each researcher observes is a particular facet of the learning process. If we endeavour to apply such theoretical approaches exclusively to the learning situation, one will find outstanding deficits in certain aspects of learning. Learning and cognition is such a complex function and there are so many facets to it that I believe it

What I teach fo-
information processing
results from observing
how text and thinking
work

Most people look for a
single theory to explain
all facets of the learning
process

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takes many views and many minds to explain their complexities. Therefore, on realising that these theories do only provide a partial view there are many valuable insights that each researcher has in the learning process. It is then on this basis that I can accept many of the features that relate to information processing and other theories presented by Gredler.

In the years prior to the information processing model, it was the belief that the mind was simply a bin for information. However, the information processing model portrays the mind as having active participation in modelling and modifying information forming personal conceptual constructs (Gredler, 1992, p172) In the early information processing model, it is supposed that information flowed through several stages of purposeful cognitive organisation. First, the sensory register accepted the stimuli, secondly, the short term memory store briefly analysed the data either accepting or rejecting it then working short term memory allows the data to be processed in order to form cognitive sign networks to then become installed as knowledge in long term memory. This early model was later added to in recent times to accept the concept of executive control processors. These processors are believed to keep track of incoming information and modify the kinds of critical pathways through which the information will be processed. It is this executive control process that I believe is responsible for administering information through the various models of thinking that we have socially learned.

The executive control process is responsible for processing information through different models of thinking

While the information processing theorists have two views on how knowledge is contrived and stored in the brain, that of the dual code and the verbal network model, either view leads one to the understanding that cognition is structured (Gredler, 1992, p 175, 176). In understanding the structural nature of memory storage in the brain the learner is more able to sympathetically align structured methods of collecting and synthesising incoming information in a physical motor sensory co-ordinating fashion to enhance learning and cognitive processing. For example, in my experience, drawing a spider diagram or a flowchart helps to build separate interpretive features into a related whole. Both the visual and the verbal interaction appears to not only help assemble structured frameworks but in my experience have a significant efficiency in learning the concept. As mentioned in Gredler p180, cognitive operations are believed to be governed by large organisations of knowledge known as schema. Schema, to the information

My structured learning/memory method works well. could it be because the brain processes knowledge in a structured way?

Cognitive Developmental Emphasis Supported by Other Researchers

processing theorist, appears to be an important cognitive construct that assists in “Top-down” pattern recognition. Higher order propositional schema in this view influence the way an individual processes “bottom-up” stimuli or data driven processing. This framework provides a rationale for developing thinking schema. Thinking schema, in my practical application, are critical pathways of handling and processing information. For example, one may develop a schema for analysing, commenting, evaluating or criticising. These schema are then able to be used through executive control processes to determine the way particular incoming information is processed. Such a model provides a plausible rationale for teaching thinking procedures and style.

Attention is considered to be the most important influence in producing efficient memory. Unless attention is directed by an executive process, the mind will flit from one stimulus to another. By conditioning the mind to always be engaged in active and structured mode of operation, attention is able to be directed efficiently to the most important stimuli related to that specific individual. For an active structure of mind to exist, schema associated with thinking style needs to be available for use. I believe the degree of intensity that a person has in attending to the environment depends upon the effectiveness of the philosophical schema that an individual has developed regarding that environment. Such critical cognitive pathways provide a base for executive control. Therefore, I do not see attention as a separate influence on memory but a biological function triggered by schematic framework produced by prior knowledge. This assists the individual to make the decision to attend.

I see attention as a biological function triggered by schematic framework of choices

The concept of schema, to me, is rather limited if it is considered to be the entire view of mind programming structure. Its form is rather static and provides a view of rigidity that I do not believe is a feature of the mind. I believe schema to be a framework of thinking that occurs within “a slice of time”. That means that a schema only exists as a static entity when it is used specifically at a particular time for a specific function or action. A second later the semiotic function of cognition might well have added another dynamic to that schema that could be quite significantly different from the first.

The concept of schema is rather limited unless it is considered true at only a particular time

In describing the nature of human memory information processing, theorists focus on the issues of learning how to learn skills.

I find that continuous attention is achieved when a student learns how to take charge of his/her thinking

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“... the primary assumption on which cognitive theorists agree is that successful learning depends on the learner’s actions rather than on events in the environment. An important goal is to develop in the learner a rich store of knowledge and effective strategies for making decisions about both his or her own learning and content related problems.” (Gredler, 1992, p192)

This statement verifies that cognitive theorists support the concept that there is an equally important need for students to be enabled to learn through learning appropriate cognitive strategies as there is a need for the information itself. In my view, students need to be made more aware of the importance that cognitive heuristics have in handling and remembering information. By this I mean, individuals should be encouraged to heuristically plan specific cognitive approaches for handling particular information. For this to occur, students need to be given an understanding that successfully carrying out a task does not just mean following the teacher’s instructions but by understanding the reasons for the teacher choosing the specific pathway of thinking. This provides students with the opportunity of perceiving alternative heuristic cognitive pathways. The active involvement that the student has in understanding the thinking process leads to depth of processing, in that well developed and well defined tools to cope, it encourages the student to pursue the topic apart from the teachers direction or encouragement. Students become enthused about what they can do well At the same time, the student is encouraged to modify the efficiency of the thinking process by recognising that the teacher does not have the monopoly on thinking style. In this scenario, the development of cognitive processing schema becomes a normal part of the students learning process. That, I believe, is directly responsible for triggering the biological processes that produce attention. It means then that well defined thinking procedures or thinking schema are a trigger that activate the bio-chemical forces producing higher levels of neuronal activity Thus, from my experience in consciously and deliberately teaching cognitive procedures to over four hundred students, I find that continuous attention is achieved when a student learns how to take charge of his/her thinking.

Since information processing research has been a relatively new field of research, this accounts for the effects of it not

Too soon to see effects
of information
processing research in

Albert Bandura's Social Cognitive Theory

Bandura places significant emphasis on how cognition is affected by the environmental setting in which the learner is placed. He assumes that learning is a three way process between the environment, personal factors and behaviour. Behaviour includes the cognitive processes carried out by the learner.

Bandura says learning depends on environment, personal factors and behaviour

Modelling is a key feature in Bandura's Social Cognitive Theory. (Gredler, 1992, p332) He believes that modelling such things as how the teacher is thinking about carrying out practical procedures is important to students so that they may develop the appropriate cues in their thinking process when they carry out the task. It is claimed that this process is particularly good for students with poor cognitive development. In my view this process is essential for all students, even if they have predevelopment in these cognitive skills necessary for any particular academic task. Students, at whatever level of cognitive attainment, need to understand the importance of metacognitively assessing their cognitive efficiencies against those of others, especially those of the teacher. As the teacher reveals the cognitive pathways taken for a particular task it is a good idea that not only the accepted cues are stated but also the reasons for rejecting alternative cues that might lead to a different course of action.

It is more important for teacher to explain how (s)he decided than to merely announce it

Reading informational text is often a difficult experience for students. If teachers, throughout a child's schooling, modelled the strategic pathways of thinking that relate to efficiently and comprehensively understanding the text, few students would have difficulty in later educational experiences. A teacher in introducing any research topic where extensive use of text is needed, should direct the student to the introduction and the conclusion in order to obtain an outline of the chapter or article presented for research. From the basic ideas revealed in this part of the text, students can be encouraged to generate questions that would lead them to the most important information in the text. While this is a very simple strategy in dealing with over 400 students most had no strategy at all to deal with heavy

Observations of my clients has given me insight into teaching habits of at least 1000 teachers and the evidence is that very few indeed model this method of deriving meaning from non-fiction books

Cognitive Developmental Emphasis Supported by Other Researchers

content informational text. This simple strategy has often made the difference between a student being praised or denigrated for their subsequent performance. MC is a student just completing primary school and faced for the first time a large research assignment requiring information to be collated from a number of reference texts. Being a poor reader, this was an almost impossible task for him. His only strategy for reading was to start reading at the beginning of the article or chapter and then proceed to the end. By the time he reached the end of the article he could not cope with the amount of information that the article presented in order to comprehend it. In a matter of minutes, I modelled for him the above strategy then I guided him through the process a number of times. The next week MC, with little assistance from his mother, was able to collate all the information he required for his assignment. The difficulty that had been encountered was directly related to insufficient modelling of strategies by the teacher or parent.

Modelling is very important to Bandura for developing motor integration skills. Many complex motor skills are unable to be successfully taught except by direct modelling. If taught in any other way the instruction would become so complex that the main point of a particular activity could be lost. For example, teaching golf, water skiing and tennis depends largely on the individual monitoring kinaesthetic feedback such as balance, pressure, direction and force. Such concepts are almost impossible to consider in words.

Modelling alone appears to be less effective than combining it with some degree of verbal instruction. (Schunk, 1986, in Gredler, p331). Zimmerman and Rosenthal (1974) state that verbalisation during modelling should bring out only the most important and outstanding cues as reference points for the action being learned. (Gredler, 1992, p331) In describing Bandura's theory Meichenbaum and Goodman (1971) point out the importance of "self-talk" in rehearsing models that are not yet internalised. It is suggested that after taking notice of a particular modelled activity students need to undergo several phases of self-talk i.e. imitation of the model with the verbal guidance of the modeller, then the performance of the task while verbalising aloud throughout each stage, followed by practising by whispering and then finally practising using silent speech. (Gredler, 1992, p331)

Modelling, however, is not confined to overt motor skills such as in sport but is also needed in teaching students how to learn. These are cognitive issues that Gredler states are important to education. Transfer of learning is the central

Modelling is essential for learning complex motor skills

Teachers must model how to learn

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issue of Bandura's theory. He indicates that it is more important to attend to the cognitive skills associated with tasks so that elements of that task can be transferred to other applications. (Gredler, 1992, p335)

Efficiency in learning is therefore obviously tied to cognitive development. It also highlights the importance of emphasising cognitive development at school so that a greater transfer of learning occurs between school and the workplace. At present, with emphasis on information, many students perceive learning to be a waste of time as transfer is not developed fully enough to become obvious to the learner.

Efficient learning depends on cognitive skills

Vygotsky

The outstanding feature of Vygotsky's work is that he was the first to make a distinction between human and animal behaviour. Most of his contemporaries, such as Pavlov, were behaviourists utilising animals within laboratory situations investigating behaviour and then extrapolating this behaviour to human beings. With this approach to research, Vygotsky disagreed and stated "humans are more than a leather sack filled with reflexes and the perceptions of chickens, the mental operations of apes and the child's first words cannot be reduced to the common denominator of structure". (Vygotsky 1924, in Gredler, p263) Vygotsky claims that human beings are different in three ways:

Vygotsky makes a distinction between animal and human behaviour

- Historical experience
- Social experience
- Active adaptation.

Historical experience is like behavioural tradition that families hand down from generation to generation. Historical experience appears to be handed down through modelling of behaviour and attitudes that are passed from one person to another through a number of generations. It is often said by people that particular families can be identified by their manner. Vygotsky, in observing such phenomena maintains that human experience is much broader than the innate instincts of animals.

Historical experience is handed down by modelling

Social experience is the process of people intellectually and cognitively networking across the community. Each one of

Social experience is spread by recounts

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us, he says, can live off the experiences of others and very nearly know the experience to the extent that it is almost as if the person had been there and experienced it as well. For example, a traveller shares the experiences of a world trip showing pictures and slides. The viewers, through language and visual interpretation, are able to intellectually experience the adventure. This vicarious experiential development, in Vygotsky's view, is one of the major elements that distinguish man from animals.

descriptions, pictures and suchlike that allow people to understand the experiences of other people

The third, and equally important, distinguishing factor differentiating man from animal is the way each adapts to the environment. Vygotsky points out that animals engage in "passive adaptation" to the environment and merely use it. Human beings, on the other hand, participate in "active adaptation". That is human involvement with the environment is to change it so that it suits the needs of that human social context. Mankind has the ability to imagine and create what is in the imagination.

"Active adaptation" of the environment is much more extensive than the "passive adaptation" by animals

Vygotsky called upon psychology to turn away from endeavouring to view human behaviour through animals and to take up the challenge of researching the attributes that are uniquely human. "Such attributes as self awareness, categorical perception, self regulated behaviour and logical behaviour" (Gredler, 1992, p263) are but a few of the human attributes that Vygotsky observed and said that "psychology will have failed in its major task if it is unable to explain the formation of these uniquely human behaviours".

Vygotsky says psychology must turn away from explaining human behaviour in terms of animal behaviour

Vygotsky's theories were firmly based upon the premise that language was the key to understanding human behaviour. Vygotsky said "Words are social stimuli that make it possible for an individual to know himself as one might know another." (Vygotsky, in Gredler, 1992, p264) He believed that language provided the basis of individual thoughts and as a result he claimed that to understand human thought one must thoroughly understand social experiences generated through language.

Basis of Vygotsky's theories is that language is the key to understanding human behaviour

Vygotsky disagreed with his fellow psychologists regarding psychological testing. He refuted the idea that a child's developmental level could be assessed on the basis of tasks the child could carry out. What is being measured, Vygotsky claimed, is the development that the child has attained at that point. It has very little bearing, he maintained, with the child's ultimate potential. In the light of this concept, it makes it essential that teachers understand this fact so that

Vygotsky believes, as I do, that tests of ability measure the current ability, **not** a future potential

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tasks and exercises will be designed to enable the child to continue developing its capabilities. (Gredler, 1992, p282, 283)

So often it happens in the class room that the teacher “waters down” the task set for a student when the teacher believes that student has reached the limit of his/her learning capacity. This view is often encouraged by the belief that an individual’s current demonstrable attainment forecasts the child’s ability in the future. As a result, teachers often make no attempt to develop a strategy of improvement that will finally lead the individual to the same standard of development as expected of those considered to be more capable. This, I believe, is the danger that Vygotsky perceived in traditional ability testing.

Teachers “water down” tasks for students who are having difficulty but what those students need is the cognitive skill needed to master the full task

An outstanding premise in Vygotsky’s theory is that signs and symbols that are used in any particular culture are the basis for cognitive development. However, the mere teaching of information using these signs and symbols, in Vygotsky’s mind would do little in developing cognition. According to Vygotsky “All that is accomplished is empty verbalisation and parrot like repetition of words that is usually disguising a vacuum.” (Vygotsky, 1934, in Gredler, 1992, p286) This supports my view that merely learning information and assuming that young people will attain cognitive development as an indirect by-product is a fruitless and wasteful exercise. It is even more fruitless today as the validity of information is changing so rapidly that more than 50% of disillusioned students who attend my center for remediation express the view that the content of learning at school is already out of date at the time it is being taught. This matter, in my experience, is a serious impediment to improving the motivation of disillusioned students. Time is constantly in short supply in schools ,as elsewhere. By drastically reducing the amount of information taught, time could be made available for the modelling and development of cognitive skills without having to meet unrealistic curriculum deadlines.

Learning information is a poor substitute for learning cognitive skills

Two techniques arise from Vygotsky’s principles. The concept of scaffolding and reciprocal teaching. Scaffolding is the process where a teacher and student share activities involving complex mental processes. In the first place, the teacher assumes greater input as the student observes. As the student becomes more comfortable with the concept, the teacher gradually transfers more control to the student. Thus, the teacher controls task elements so that the learner

Scaffolding helps students avoid practising error models

is going to avoid failure. This process assists students to avoid programming error models of cognition regarding particular tasks being learned. This, today, is known as situational cognition or the apprenticeship method of teaching. While this approach is significantly more advanced in developing cognition in students, Vygotsky warns that even this method does not guarantee the transfer of complex mental functions. A certain element of the transfer rests with the student's will. (Gredler, 1992, p288)

Reciprocal teaching is a process where a teacher models to the class understanding that the better students are going to obtain the modelled skills more quickly. The teacher then calls upon the better students to assist modelling to the students finding the new concepts difficult. In this way, both the teacher and students who have been able to learn more quickly are able to provide modelling and feedback for each other. This method is a process, according to Vygotsky's theories, where complex mental functions are able to be taught between teacher and student through the teacher scaffolding the student until the mental functions are internalised then the student is able to use signs and symbols to monitor and regulate his/her own thinking. (Gredler, 1992, p289, 292) The vast majority of students who come to my centre respond well to the processes of scaffolding and reciprocal teaching.

Reciprocal teaching allows some students to model processes to other students

Vygotsky highlights two important considerations in his theory. First, the signs and symbols of a culture, which is language, should not be left to chance. Secondly, that the curriculum should be designed so that mental development is the primary focus rather than the content. "In other words, the content should contribute to the development of complex mental functions in order to remain in the curriculum." (Gredler, 1992, p291)

Vygotsky says language cannot be left to chance and that mental development is the primary focus of education

Vygotsky supports many of the notions that arise from my personal theoretical platform as revealed by my theory loading. First, he supports me in the concept that man is unique and does not have a direct experimental relationship with animals. Secondly, he supports the concept that cognition is a social phenomenon developed through language. Thirdly, Vygotsky alludes to the importance of modelling as a means of transferring cognitive principles to learners. Both scaffolding and reciprocal teaching are methods that have been used successfully as a part of my consulting method. Finally, I agree with Vygotsky that individual performance is only the measure of capabilities

Vygotsky supports many of my proposals for improved education

that a person has reached at that point. As a result my approach to cognitive development is to first enhance the individual's languaging skills so that the individual has a more sophisticated approach to languaging. While developing a more sophisticated languaging base through scaffolding and reciprocal teaching methods I model cognitive skills while dealing with personal social issues that require solution for that individual. Thus the increased languaging allows the individual to work through the issues and model on paper the thinking styles used to arrive at social solutions. Little by little I transfer the responsibility of manipulating the cognitive function to the individual as (s)he is able to cope. However, more recent developments in cognitive research have revealed many of the details left incomplete by Vygotsky due to his ill-health. Recent research information obtained through neurosurgery and neuropsychology have validated many of the insights that Vygotsky promoted. For having so few tools with which to work I believe Vygotsky possessed uncanny insight into the workings of the human mind. Today, we also have validation resulting from non-invasive neuronal research done by Dr Peter Gluzgrugh University of Alabama, USA. Channel Nine Network, Sydney, 28 May, 1995.

Edward de Bono

Edward de Bono, a medical doctor, over many years has perceived the value of developing critical pathways of thinking through symbolic language. de Bono's most notable achievements have been in the CoRT Thinking Program (de Bono, 1991, *The Six Action Shoes*, p xi) conducted in Venezuela through the public school system. It has met with such outstanding success that de Bono's skills have been sought in many places in society. It is de Bono who invented the term "lateral thinking" that has become a powerful tool for the business world. His concepts became accepted by IBM, Du Pont, Prudential, Merck, Nestle and British Airways to improve the efficiency of their organisations. With such weight of corporate support there is little chance that these ideas would be anything other than successful. This is evidence that in a practical way these concepts are successful but do not necessarily guarantee their theoretical underpinning. However, it does provide evidence that metacognition is a valuable and valid tool for thinkers to use.

de Bono's work produced outstanding success in both schools and corporate situations and it provides evidence that metacognition is a valuable and valid tool for thinkers to use

de Bono uses imagery to provide the qualities that he wishes

de Bono uses imagery

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the thinker to visualise. For example, so a businessperson can be sure to think about a single decision from a wide range of perspectives, de Bono has used the imagery of different coloured hats to take on various cognitive attitudes to decision making. The white hat indicates an objective look at data and information. A red hat legitimises feelings and hunches. A black hat indicates negative logic, judgement and caution. A yellow hat indicates positive logic, feasibility and benefits. A green hat, new ideas and creative thinking and the blue hat to indicate the need for control of the entire thinking process. (de Bono, 1991, *The Six Action Shoes*, p3 to 7)

to focus attention on key concepts

In training people to think, using this imagery, de Bono uses physical hats that board members will actually put on to remind them of the boundaries of thinking at that particular time. Much waste of time in large organisations comes from people thinking different ways at the one time. Thus, each person is discussing the matter from many viewpoints through varying cognitive processes causing individuals to misunderstand the mode in which a particular speaker is thinking. The hats cause all to consider the topic precisely from the one point of view. It also causes all individuals involved to employ a wide range of thought processes. Quite often individuals will favour certain processes of thinking to the exclusion of other beneficial modes of thought. Thinking hats visually limit each participant to a particular thinking style causing the individual to feel embarrassed if (s)he were to break the boundary rules. After conditioning for a period of time, the cognitive process is programmed into the individual's mind thus making unnecessary the use of the original teaching prop. This example reveals the benefits of visual and tactile aids in programming critical pathways of thinking resulting in particular action pathways. This process occurs in nature without us even thinking. If a young child is caught in a less than ideal situation and exposed to the emotional effects of a thunderstorm that child will, throughout its life, in a greater or lesser degree fear thunderstorms. For example, a young child related to me was placed on the pot for the first time. Just as she passed her motion into the pot there was a huge clap of thunder. This conditioned the child to avoid this function and become a chronically constipated individual. This condition has no physiological basis but is believed by the paediatrician to be a direct relationship to the external stimulus of the thunderstorm. Experiences similar to these are widely observed in the community. (Dr Delochary, Ryde, NSW) It would be interesting to know how many of our attitudes in

de Bono uses visual tactile stimuli to help establish critical pathways of thinking

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life are predetermined by influential stimuli within the environment. What Edward de Bono is using here are visual tactile stimuli to program the mind in the same way.

Visual images are very often useful to program the mind into abstract processes. A good example of this is de Bono's comparison between the concept of "water logic" and "rock logic". Rock logic is definitional logic where "water logic" is contextual logic. De Bono gives the example "A rock does not change in shape to suit its surroundings. Water has no shape but it adjusts to the container. A truth is very often a truth only in a certain context. Water logic emphasises the importance of context. If you have a lump of rock in a glass ... the rock is either in the glass or out of the glass. With water you can lose some water from the glass and yet water is still in the glass – it does not have to be either/or." (de Bono, 1994, Water Logic, p8, 9)

A truth is often a truth only in a certain context

An example of water logic can be found in golfing rules. "A ball is deemed to have moved if it leaves its position and comes to rest in any other place." (Rules of Golf, The Royal and Ancient Golf Club of St Andrews, 1988, p14) This rule implies that if a ball leaves its position and comes to rest in the position from which it started, then that ball has not moved. While the ball has been subject to motion it has, from the point of view of water logic, been able to satisfy both views at the one time, and that is that it has not moved even though it did. While movement appears to be distinctly different from remaining still, both points of view are logical and can be held logically but in harmony with one another at the same time.

In golf a ball might "move" yet "not move"

A child may be told not to move. (S)he jumps up and down on the spot. The parent chastises the child for moving but the child protests that (s)he did not move. Both parent and child are right. However, an argument is bound to occur and both may feel justified in their position. For anyone who practices water logic, both parallel logical frameworks are appreciated and observed. Whereas the mother who chastised the child in this example is obviously working from the position of rock logic. The stress of the situation could have been avoided by appreciating and laughing off the difference between the two thought frameworks and then set new boundaries for the request. By careful explanation of what she meant, the mother will expand the child's knowledge and thinking pattern so the child will then include another definition of "not moving". A great deal of conflict has been caused in the world by failure to employ

Water logic tells both sides they are right – semiosis at work – better understanding and definitions needed

WATER LOGIC

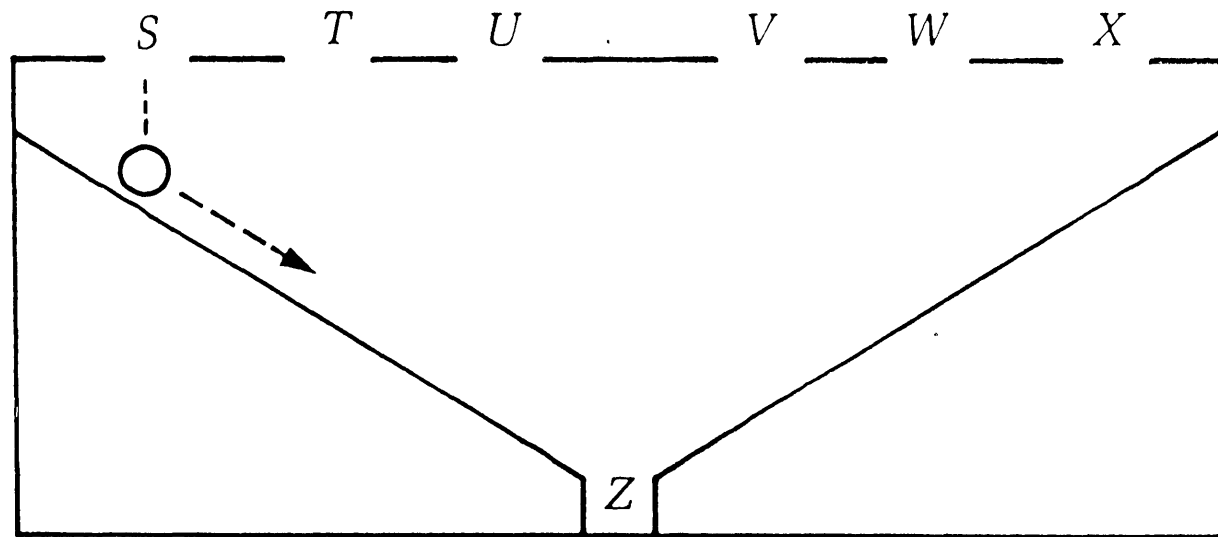


Fig. 22

Page 39 Water Logic

Edward Debono

Figure 4

Edward Debono's concept of "Water Logic" demonstrates how many different interpretant inputs can, through fluid logic, end up assisting to develop the same concept but from different points of reference.

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the principles of water logic. (de Bono, 1994, Water Logic, p xi) In viewing the conflicts of war through water logic, we can appreciate how both sides could consider that their cause is logical and that both could consider that God is on their side. If water logic were to be used in negotiation between the opponents it has the effects of two participants being able to understand the logic of the other to provide movement towards a conclusion dissimilar to either premise. Water logic is not tied to a particular condition but allows context to lead towards a relevant framework. In this way, conflict is avoided and can be an important tool in the development of cognitive skills in that the conclusion leads to an ever growing example of possibilities for any one premise. It does not cause an individual to lose in favour of another but causes both to change.

de Bono's diagrammatic representation of water logic illustrates how many different interpretant inputs can lead to the same result.

Figure 4 de Bono's Illustration of Water Logic, Different Interpretants Lead to Same Conclusion

The traditional Greek rock logic cannot handle contextual variance and therefore has a tendency to create confrontation as contexts change. The unbending nature of this logic alienates rather than drawing those at variance together in order to seek new directions. As a result of rock logic arguments, one individual wins and another loses and neither has advanced his/her position beyond that which (s)he had already attained whereas the application of water logic advances both towards a new view. This concept has considerable potential for enhancing cognitive development in both home and school learning environments. Water logic draws on the collective perceptions of all who are present within any particular interactive group. This is evident in the previous example of mother and child's perception of "not moving". Both mother and child, as a result of the interaction, have logically advanced their view of movement. Each has understood the view of the other and each has accepted the logic of the other thereby creating a new concept of "not moving" for both of them. This is cognitive development in action between parent and child.

Rock logic produces winners and losers.
water logic can produce win-win solutions

Donald Cunningham

Donald Cunningham's concept of semiotics has some interesting parallels to Edward de Bono's water logic. Cunningham describes semiosis as symbolically as a "can of worms". Each time one looks into the can the relationship of one worm to the other has changed. This, Cunningham says, is like the ever changing cognitive structures of the mind. de Bono's concept of "self organising jellyfish" (de Bono, 1994, Water Logic, p42-49) parallels with Cunningham's worm concept in that both agree that cognition occurs through continuous juxtaposition of "interpretants", as Cunningham refers to the way stimuli are perceived and recorded by a person's brain, and de Bono refers to these additional units of perceived information as "potential states". These two descriptions indicate that cognition is a dynamic and ever building process throughout an individual's life. Cunningham promotes an additional concept that our knowledge of the world is obtained through signs or signals and since the juxtaposition of each individual's signs or signals will differ from those of other people's therefore our concept of objects within the world can never be the same as the view of others, or of reality itself. (Cunningham, Educational Psychology Review, volume 4, number 2, 1992, p169) The view of our world, through Cunningham's eyes, is a combination of the physical world and the "cognising organism", mankind. He says that it is uniquely human that mankind can create signs that go beyond one's immediate experience. He points out that it is in our mind that we create religions, organisations, schools and governments. What makes this possible is the existence of language. Knowledge, says Cunningham, does not consist of objects or entities that we acquire but knowledge is better thought of as a process of building network structures that are mapped from one's own experiences and continuously are in a state of change. Thus, we construct our knowledge dynamically. The difference between Cunningham's semiotic model and educational psychology is that educational psychology is dualistic, accepting the separation of knowledge from the knower but in semiotics knowledge can only be developed by the knower. Thus Cunningham uses the analogy of a laboratory to describe the function of the mind in building its own experiences (Cunningham, 1992, p179) He says that our jobs as educators is to provide models of the knowledge construction process which then requires teachers to guide these students' attempts at using those processes. The knowledge construction processes that

Cunningham says that a uniquely human quality is the ability to create signs that go beyond one's immediate experience

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Cunningham refers to is the variety of codes we can use to represent experience. I believe that cognitive procedures and codes provide an individual with the ability of developing knowledge in a variety of ways. Cognitive pathways and processes enable a person to have control of incoming stimuli. It also provides the individual with a structure of thinking that can be modified for specific purposes in the knowledge building process. While Cunningham does not identify with the cognitive sciences as such his views parallel with mine in that teachers need to be guiding students into developing the mechanisms through which knowledge can be built. Providing cognitive tools will certainly provide students with the ability to see that multiple perspectives may be brought to a single problem and all may have validity. This changes the way learning needs to be approached, says Cunningham. Learning is no longer a private act but needs to occur in a social setting where listening is not the sole tool of learning but dialogue becomes the norm of classroom teaching. Here students need to be enabled to think and then bring to the learning table the variety of experiences gained through their knowledge building. (Cunningham, 1992, p181)

While Cunningham agrees that educationalists need to concentrate on the tasks of teaching students the constructional skills of knowledge, or the cognitive skills that assist the mind to put concepts into action, he admits that he is unsure of exactly what a teacher needs to do and how much. When to let students struggle with the knowledge construction process and when to assist them. Cunningham says he personally finds the role of consultant or collaborator rather than being the source of knowledge uncomfortable because he says "I truly enjoy being in control". (Cunningham, 1992, p109, 191) Cunningham's discomfort is shared by many school teachers. The expectations of pupils and of the public generally see the teacher's role in the traditional fashion. While I advocate strongly that teachers take this new role of consultant or collaborator, we must all recognise that it will take considerable effort to change public attitudes to make it feasible. The change needs to start at home as the home is the first step in a child's education. It is in the home that many of the early cognitive skills "fall through the cracks" of social understanding that pertains to children's education.

Cunningham asks whether teacher should be in control or be merely a collaborator

Cunningham provides plausible imagery for the way that knowledge is developed. He also supports the notion that it is the cognitive processing capacity that is important for

How can we change public attitudes to bring about changes in the

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students to develop rather than being inundated with information. However, the dilemma exists, how can such a complex problem with educational perception the way it is, be changed from a system that has been indelibly internalised for so long.

education system?

Part of the problem is the well entrenched belief that intelligence develops until near the end of teen age years and from then on can never be further developed. Parents, and teachers, who see children doing badly at school often think the child has reached the limit of his/her ability and accept that as inevitable. The children themselves, often believe the same. These adults often see faults in the education system yet have enough faith in it to blame lack of progress on the child rather than on the system. I believe the impetus for change would be sparked by proving that intelligence is in fact capable of being developed throughout life and that past failure to cope is not a final sentence of lifelong inabilities.

To change educational systems we need to prove that "intelligence" can be improved throughout life

Chapter Conclusion

Donald Cunningham, in his semiotic model, claims that not any one person is able to view the world and the things within the world as it really is. This means that no one person is ever going to be able to see the entire perspective on any one issue. However, I have noticed, in this research project, how many theorists and educators endeavour to establish a single theoretical model that can be the ideal model for learning and cognitive development. The reality is that each model is flawed in some way but what is sad about this is that another model replaces it, also flawed, and the previous model falls into disrepute and is largely discarded for the new one. If we are to take Cunningham's advice, we must all acknowledge that each model provides unique features of the entire picture. As educators it is our task to study the varying viewpoints of the theorists and to work out where each of the features fit the large picture of learning. I believe that many theories have features that pertain to specific stages of the learning process as a person progresses through his/her learning life. Some theoretical notions apply at different stages that a person goes through when learning something from basic principles as an adult. However, the problem is that as each new theory comes along, in many cases there has been a tendency for authorities to discard the old theory thus losing its better parts. For example, with the introduction of the "Whole Language Approach" the concept of grammar was discarded. In later years, we found that it was a tremendous mistake. It was enforced to the extent that registration of an entire school (Peninsula High School, Warriewood, NSW) was withheld until the teaching of grammar was discontinued. Each theorist is an intelligent individual who practises scientific research techniques, and each is no fool, but however, in the heat of the

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moment, we tend to treat those in the past as being ignorant. If we really believe that no one person is going to establish the complete model of learning and cognition, we need to be collecting and identifying the interpretant features that are useful for specific applications and thus providing ourselves, as educators, with a wide range of tools with which we can work in specified applications. While many of the former researchers, due to the lack of experimental evidence, drew poorly established conclusions much of the observation is extremely valuable as these researchers reported what they actually saw. I view these theories as tools that we may have on a shadow board. Just because we buy a modern and more efficient tool, it does not mean that it is wise to discard the old ones. For example, if I were to buy an air nail gun to replace the inefficiencies of my hammer, I am certainly not going to throw my hammer out as it has applications in one off situations that an air nail gun is not going to be able to efficiently fulfil. The attitude of discarding many of our previous tools, I believe, has caused education to appear “gimmicky” and unprofessional. We seem to reel from one fad to the next. While taking on some marvellous efficiencies, we have a tendency to discard some of the old efficiencies in which more modern notions are deficient.