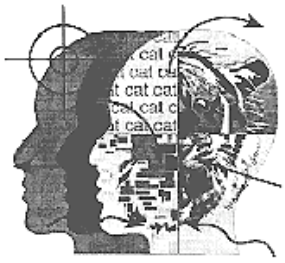

Knowing to the Power of Four

$K \times K \times K \times K = K^4$

The Integral Learning Model

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Teaching as an art and a science

Teaching is both an art and a science. We all know what good teaching is when we experience it. Since the early 1970's I have been attempting to understand and articulate what a good teacher does so that we can all learn how to be better teachers. My personal theory of learning and teaching has been informed and clarified by my own research and by the work of other learning theorists and commentators on learning, thinking and intelligence. Parallel to this research I have been developing a theory of learning from the 'chalkface'. The depth and richness of my current understanding about learning and teaching has developed from, and owes much to, my day to day work with many, many thousands of learners and teachers.

What learning do I value?

The critical question in designing education for learning, is *what is the nature of learning that we value?* Humans can learn in a variety of ways. We can learn like parrots, playing back like a tape recorder what we have heard. Humans can learn like robots - 'monkey see - monkey do' type learning carrying out actions without thought, or we can assume attitudes and beliefs without questioning them. Human learning has the capacity to be far richer than this. We can learn in a way that transforms; in a way that endows our experience with meaning; in a way that empowers us to adapt, to perform and to create.

I value learning that:

- develops **understanding and personal meaning**
- develops **competence through mastery** of skills and processes
- develops the learner's ability to **articulate and share their knowledge**
- enables the learner to **transfer** learning from one context to another in authentic life situations

What supports and enhances the learning?

This is an enormous field. For the purposes of this outline let me simply summarise a few of my key beliefs about learning and the implications of these beliefs in terms of learning design.

1. Learning requires moving outside our 'comfort zone'; it involves taking risks. Learners will not take a risk unless they have a secure base.

Although the **Integral Learning** design model focuses more on engaging and stimulating appropriate ways of thinking and knowing, it **assumes that the learning environment is supportive and yet challengin**g for the learners concerned.

2. Humans move towards experiences from which they gain a sense of self worth and achievement.

It is critical, in designing any learning that we think clearly about the readiness of the learner(s) and set challenging but achievable tasks. No design model can provide this information for a teacher. Any learning design should be viewed with your particular learners in mind.

3. Learner driven learning is more likely to be effective and meaningful.

In principle this means good learning design will maintain **ownership** by the learner, nurture a sense of agency and tap intrinsic motivation.

In practice this means:

- surfacing and connecting with students' experiential knowledge, their personal story knowledge.
- finding out what students know, what they want to know, how they want to learn and letting it influence your design.
- designing to include open ended aspects; aspects that require self expression; giving choice

4. Learning with meaning and understanding involves constructing and reconstructing meaning from our experiences.

The term 'constructivism' has been thrown around with gay abandon in educational circles. What does it really mean? ***Constructivism***

> *There is a belief shared by most psychologists who study human learning, that from birth to senescence or death, each of us constructs and reconstructs the meaning of events and objects we observe. It is an ongoing process, and a distinctly human process. The genetic make up of every normal human being confers upon all of us this extraordinary capacity to see regularities in the events or objects we observe and, by age two or three, to use symbols to represent these regularities.*
>
> *Joseph D. Novak (Novak 1992)*

Powerful human learning involves constructing and reconstructing our own meaning in the world. ***However this does not mean that an individual's learning should be limited by the bounds of the world they experience directly. Nor does it mean that the learner is left alone to construct meaning entirely unaided.***

The open discovery approaches of the seventies were misguided in the sense that they did not recognise that a part of the challenge for educators is to help individuals construct, for themselves, the understandings that other minds have discovered before them. Left to chance, or open discovery, my belief is that you would have to be Einstein, or Einstein-like, to discover what he discovered. In words written a long time ago. . .

> *The task of the teacher is not to put knowledge where it does not exist, but rather to lead the mind's eye so that it might see for itself.* *Plato*

In some schools, the swing away from a heavy emphasis on 'knowing about', and 'knowing what others know about', resulted in many students going through school without knowing vital facts–eg maths tables facts. You are limited and constrained in mathematical thinking and problem solving if you have to work it out, look it up, or use a calculator every time you want to process something like seven times four. The challenge for educators is to discern what facts, what procedures, what skills need be automated to ensure that further learning and thinking is not impeded. The learning secret is to ensure that those facts are only automated after deep understanding is in place.

There are many names and labels given to the constructivist notion of learning. They all have as key components - action or experience, reflection, intention to improve or enhance action, action, reflection, refined understanding, honed skills. The learning process is described as an ongoing spiralling process.

The essence of a constructivist approach is the construction of meaning by the learner. This does not mean that the learner is left alone to learn, nor does it mean that whatever meaning the learner makes is accepted. The role of the teacher is to decipher what meaning, what 'mental models' the learner is already thinking with and then to design experiences and 'nudge' processing so that the learner's 'mental models' are challenged, enriched, expanded and elaborated.

If we are left alone to process our experience (no talking to anyone else, no teacher intervention) the way we would process our world would be largely determined by our thinking or processing style and the mental models we had constructed previously through our experience.

Our Four Selves
Ways of thinking - ways of knowing

Educators have long been aware that students are different. A catch phrase of the seventies and eighties was 'we must cater for individual differences'. At an intuitive level, teachers know that students think differently, that they learn differently. The recent wave of interest in learning styles springs, I believe, from our desire to understand and describe those individual differences, to put a frame around them, to 'map' them and to respond to them in our teaching. However, we run the risk of the wave washing over us and past us like many another educational fad if we don't do more than we have done currently to be explicit about what we mean by the term 'learning style' and how the concept sheds light on the process of learning.

There is also confusion in teacher circles as to how different concepts are related. For example, how does Howard Gardner's model of Multiple Intelligences relate to learning style?. Responses given by teachers, when asked what the term means to them, range from: *"Some people learn better by seeing (visual), others by hearing (auditory) and others by doing (kinaesthetic)"* to *"Some students like to write poems as a way of expressing what they know while others enjoy work sheets or reading"*. In the United States of America, and increasingly in Australia, there are a multitude of models of learning styles being used. The situation in the United States appears more problematic to me as there are many vested interests marketing and promoting the learning style inventories and the associated professional development programs and there does not seem to be any concerted effort to show how the models relate to each other or if they do relate to each other. It is healthy to investigate and explore different models but at some point in time an effort needs to be made to find unity in the models, to draw out there common elements and to show how a unified model helps us refine and make distinctions concerning our understanding of the general process of learning. How do we find our way through the confusion to decipher what will help us help students learn more effectively?

Multiple Intelligences

Howard Gardner has identified 8 separate human intelligences

- Logical-mathematical
- Visual spatial
- Linguistic
- Musical
- Kinaesthetic
- Interpersonal
- Intrapersonal
- Naturalist

And he is investigating metaphysical/spiritual intelligence. A person's intelligence profile represents how their unique mind expresses itself. But what underpins these different ways of responding and expressing oneself? Our individual intelligence profiles are an expression of our particular ways of filtering and processing information we receive – our learning style.

Dimensions of Learning Style

- **environmental preference**
  What sort of environment works best for you for learning?

- **sensory mode preference - AVK preference pattern**
  A - auditory
  V-visual
  K-kinaesthetic
  What do you pay more attention to when you are receiving information?
  - *what you hear?*
  - *what you see?*
  - *what you feel?*

  Or do you pay equal attention to all modes? Two modes?

- **thinking style preference**

- **dependent . . . . independent preference**

These dimensions tend to merge and overlap with personality styles, leadership styles etc. The dimension of learning style which is the focus of this workshop is **thinking style.**

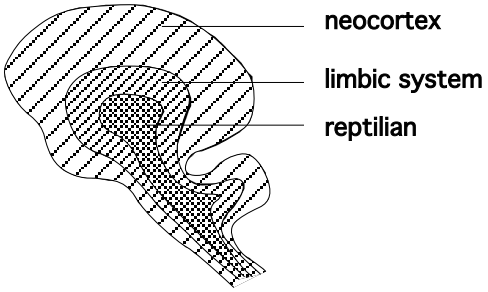
ACTIVITY

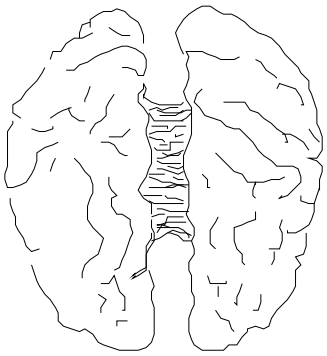
1. ***Discuss how you rate yourself on the above dimensions of learning style.***

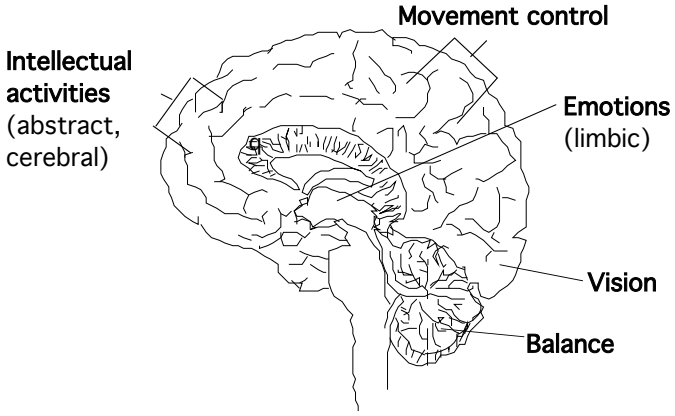
2. ***Reflect on a few students that you have taught….can you identify their strong intelligences and dimensions of their learning style?***

Understanding Diversity - Styles of thinking
Simplified anatomy of the brain

What is the Brain like Physically?







Basic Brain Anatomy

- three evolutionary levels
  neocortex - cerebral, intellectual activity

  limbic system - emotions
  regulatory centre
  memory

  reptilian - basic
  memory, instinctual

- two hemispheres

- two hemispheres of neocortex connected by thick bundle of nerve fibres - **Corpus callosum**

- two hemispheres of limbic system - connected by nerve fibres - **Hippocampal commissure**

- fibres connect the different levels of the brain and different regions of the brain - front and back, top and bottom etc

- functions of the brain tend to be localised

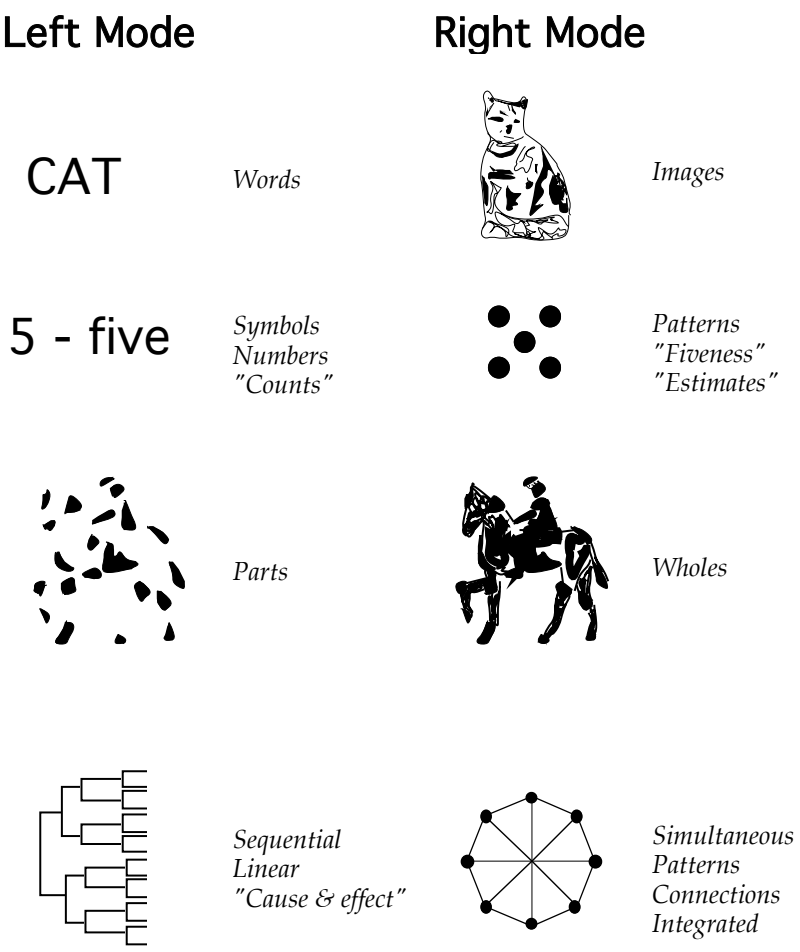
- when presented with a situation the local region specialised to perform the task is active (in some tasks multiple regions are involved) while other regions are in a resting state - the ability to call the appropriate brain activity into play is crucial to person's effectiveness as a learner and in 'doing'

Figure 1 Simplified anatomy of the brain

How we processes information

Humans have several different ways of processing information. The diagram below illustrates two contrasting modes of processing. They have become known as *'right mode'* processing and *'left mode'* processing due to different ways of processing becoming the subject of attention following the 'split brain research'. Not everyone actually uses the left side of their brain for analytical processing and the right side for intuitive processing. Left-handers especially may (or may not) have the location of the types of processing reversed. Moreover, brain processing is iterative and complex. Wherever and however it occurs, it seems that all brains do use two distinctly different forms of processing information - a holistic, pattern making process commonly known as **'right mode' processing,** and a linear, logical, analytical processing commonly known as **'left mode' processing.** Prior to the relatively recent neuroscience research we already acknowledged these different ways of processing and the propensity of individuals to process in different ways: *He can't see the wood for the trees!*

Differences in the natures of 'right' and 'left mode' processing are illustrated below.



Source: Adapted from Williams 1983, p.5.

Figure 2 Right mode versus left mode processing

Effective learning and operating requires that the ability to use both types of processing - sometimes in isolation and sometimes in tandem. Learning with deep meaning involves integration of multiple ways of knowing.

Metacognition - understanding preferred styles of processing and recognising when and how to consciously control thinking and processing is a large part of what learning to learn is all about. **Effective teaching** requires the stimulation of, and providing 'scaffolds' for the appropriate processing for the learning task.

'Brain Dominance'

In addition to having a preferred hand, preferred eye and preferred leg we also have preferred modes of thinking that Ned Herrmann termed **brain dominance.**

What's the basis for brain dominance?

How do we show 'brain dominance' or thinking style preferences and how does it affect how we learn, think, manage, communicate and solve problems?
Consider what we know about the brain physically and in terms of styles of processing.

- two hemispheres - characterised by different types of processing, one type analytical and sequential focusing on bits, the other intuitive, recognises patterns, holistic focusing on the forest.

- three evolutionary levels
  * cerebral cortex - rational, conceptual
  * limbic - emotional, 'doing'
  * reptilian - basic memory, instinctive behaviour, autonomic body control.

Put the ideas above together, Ned Herrmann developed a model of processing which involves sides [hemispheres] and levels. In an excellent book, *The Creative Brain,* Ned Herrmann (Herrmann 1989) has put these ideas together in what he calls the WHOLE BRAIN MODEL of learning, thinking and doing. On the one hand we have styles of processing which, following the split brain research of the fifties to seventies, were attributed to different sides of the brain - the one more analytical, logical, factual, sequential and controlled, the other more holistic, intuitive, spontaneous and free, AND we have at least two different sources of stimulation of processing corresponding to two different levels of the brain - the one more abstract, rational and conceptual [neocortex], the other [limbic] more to do with processing sensory and emotional information - doing and feeling rather than reflecting - Figure 3.

Herrmann's Whole Brain Model

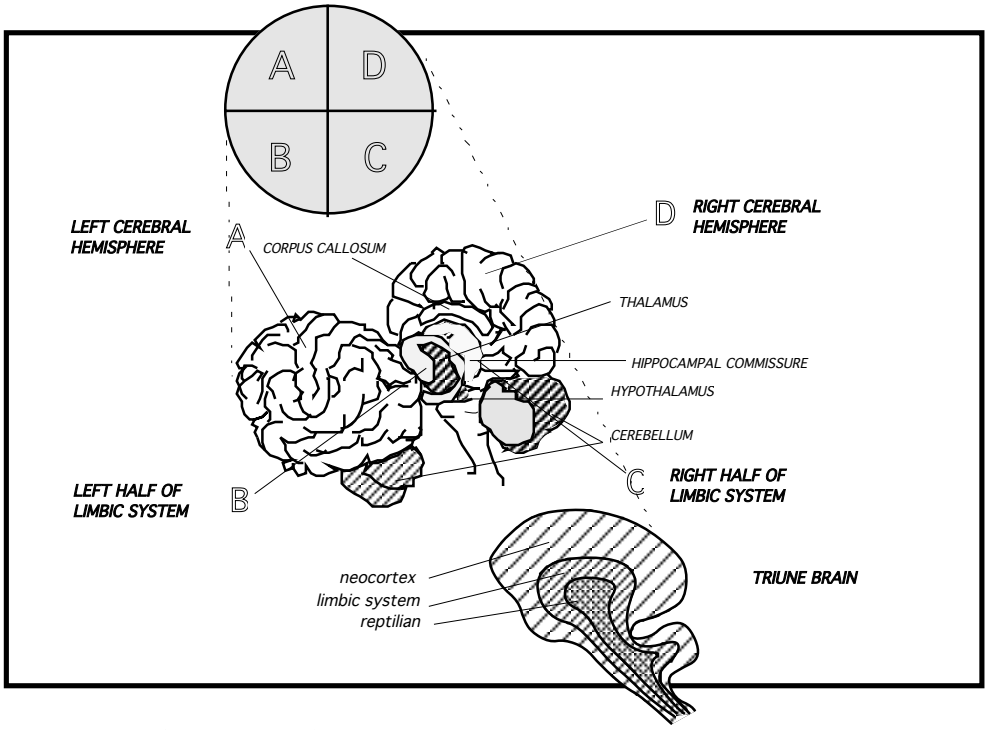
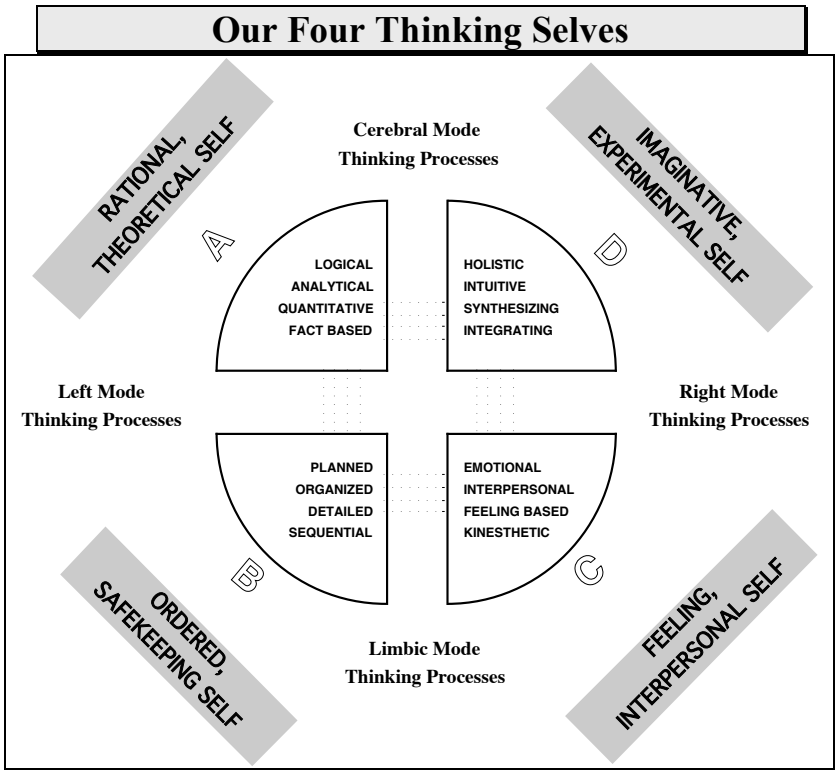


Figure 3 Herrmann's Whole Brain Model



Source: Herrmann 1989:64

Figure 4 Herrmann's Whole Brain Model

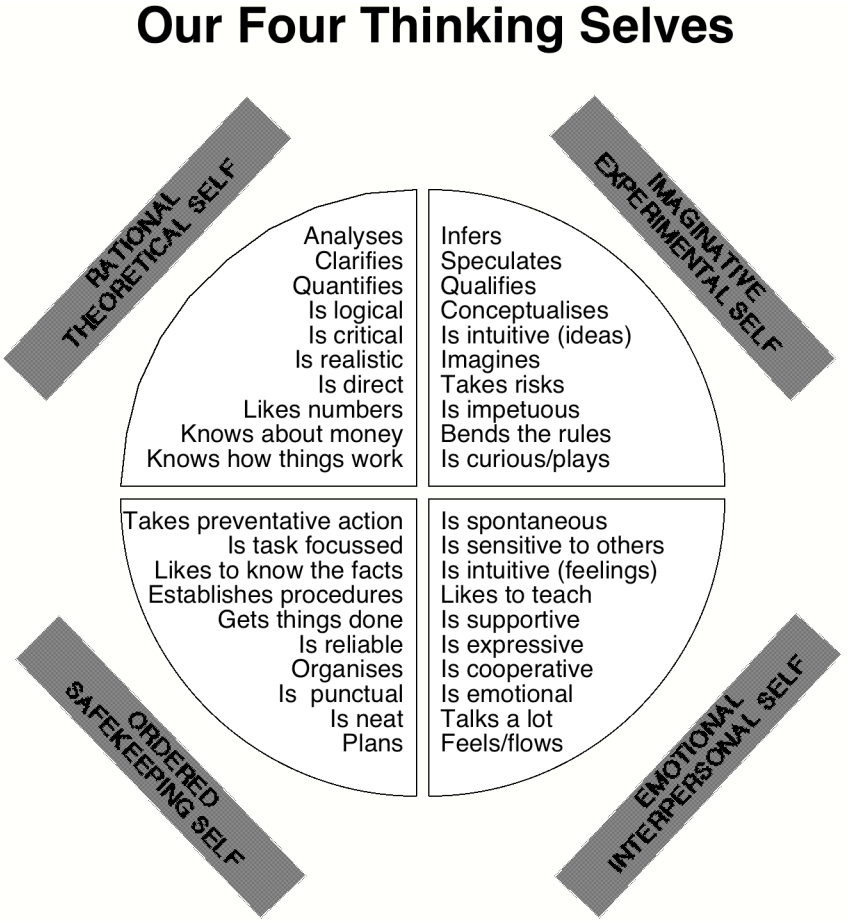


Figure 5

Herrmann calls his four quadrant model of brain processes a **metaphor** for how the brain processes information. Just as most individuals show a preference for handedness, he proposed that individuals differ in the way they favour or prefer different ways of processing, the different ways of thinking and knowing. Individuals show different brain dominance patterns or different thinking preferences, different thinking styles.

> ***Note:*** *The fact that some individuals prefers to process information or solve problems in certain ways* ***does not mean they are not capable*** *of using other modes nor does it mean they are unable to become more proficient in the use of the less preferred modes. The positive and optimistic thing about Herrmann's whole brain processing model is that it points the way to helping individuals understand themselves and others and indicates ways in which less preferred modes can be accessed and developed.*
> *It is important to distinguish between* ***'preference'*** *and* ***'capability'*** *'or 'capacity'.*

Determining your preferred thinking style

Ned Herrmann has developed an instrument [questionnaire] to determine your thinking style preference called the Herrmann Brain Dominance Instrument [HBDI]. The diagrams below represent the thinking style profiles of five different individuals. You can see from the patterns that person 1 is more left mode dominant and shows a particular preference for thinking for action, thinking for doing. Can you predict what this person would be like? Person 2 shows a fairly balanced profile with relatively similar preferences for each of the quadrants, while person 3 has fairly evenly distributed preference in the A, B and D quadrants with a stronger preference for the C quadrant. Can you predict what this person would be like?

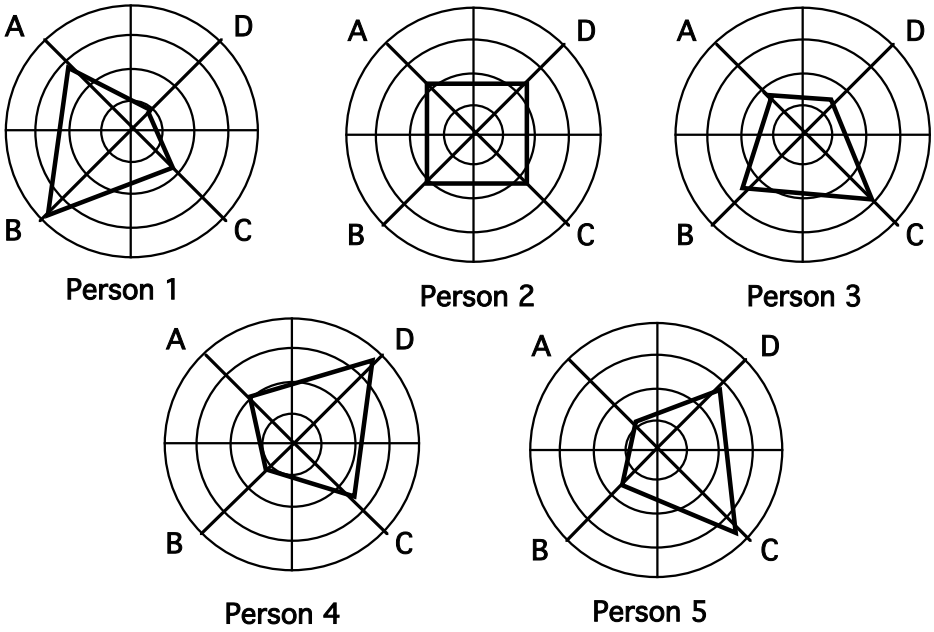
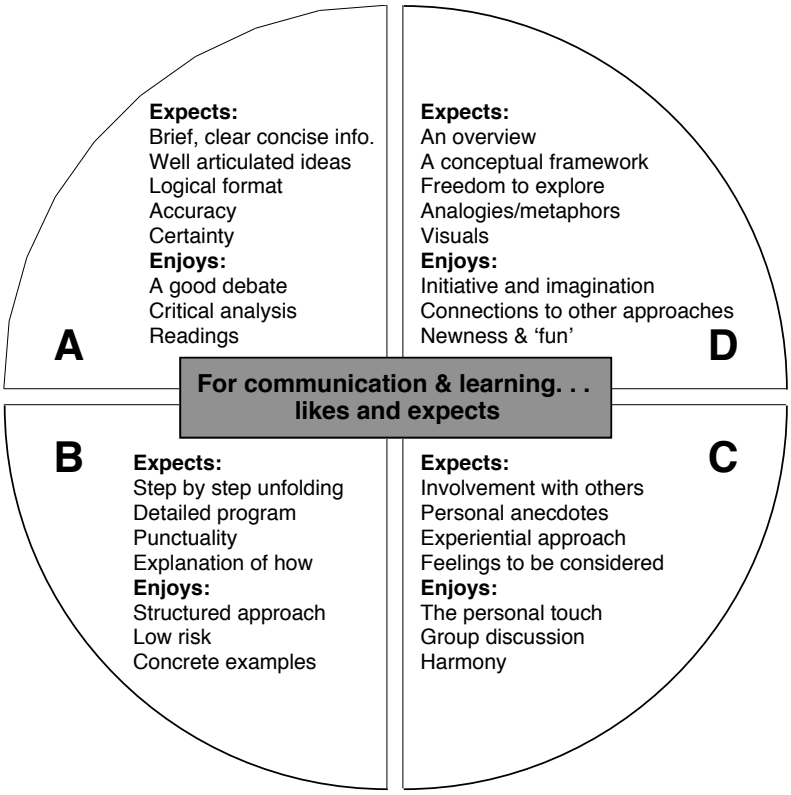


Figure 6 Herrmann Brain Dominance profiles for five individuals

Thinking style and learning

Our thinking style influences the sorts of activities and approaches we like and expect in learning **AND** not surprisingly, our thinking style influences our preferred teaching style.



.Figure 7 Likes and expectations for communication and learning

The usual conclusion drawn is that as teachers we need to provide activities in each quadrant for the learners who have strong preferences in those modes **BUT effective learning** involves applying the appropriate style of processing to the task. If a learner is highly inclined towards one mode of processing - one quadrant or one side of the whole brain model, or the limbic versus the cerebral, ***he/she will tend to approach tasks in that mode even when it's not the most appropriate mode - even when it's not likely to lead to success. The art of being an effective learner and 'doer' is having the ability to draw on the appropriate mode for the task. The art of being an effective teacher/designer of learning is to engage the learner in the appropriate thinking mode(s) for the task.***

Although, as the last diagram shows, different thinking preferences may result in different likes and expectations with regards to learning it is my contention that **effective learning** involves applying the appropriate style of processing to the task. If a learner is highly inclined towards one mode of processing - one quadrant or one side of the whole brain model, or the limbic versus the cerebral, he or she will tend to approach tasks in that mode even when it's not the most appropriate mode - even when it's not likely to lead to success. The art of being an effective learner and 'doer' is having the ability to draw on the appropriate mode for the task. The art of being an effective teacher is to engage the learner in the appropriate thinking mode(s) for the task.

Let's take creative writing for example. A student who has a strong preference for left mode processing and who is left alone to write a creative piece of writing tends to write in a very literal descriptive way. Someone with a strong right mode preference is automatically engaging processing that will bring forth images and emotion. The question becomes what strategies will be effective in engaging the person with a preference for left mode thinking in right mode processing. The diagram on the next page illustrates teaching strategies that stimulate various modes of processing.

The danger with this model is that you can walk away from it thinking *"Oh okay. If I use a variety of strategies from around each of the modes I'll catch all the learners eventually."* It's not as simple as that. It's not about catching them in their style, nor leaving them in their style. How do we help learners construct understandings that others have made before them? Unless you have a thinking style like Einstein you will never come to understand what he understood.

If the learning I value involves:

- developing **understanding and personal meaning**
- developing **competence through mastery** of skills and processes
- developing the learner's ability to **articulate and share their knowledge**
- enabling the learner to **transfer** learning from one context to another in authentic life situations

. . .then for each individual, **all modes of processing need to be stimulated and integrated regardless of personal thinking style.**

Truly effective learning, learning which can be transferred to new situations and communicated to others, will be known in the many languages of the brain and these ways of knowing will be integrated and coherent. Knowing will be an integration and internalisation of our experiences, our feelings, our imagination and our analysing and it will find expression in many modes of 'doing' from procedural application to a variety of creative forms.

Integral Learning

How can Hermmann's model of whole brain processing be integrated with our discussions about the nature of learning. In this section we will synthesise the elements we have discussed into a model of learning that I have called ***'Integral Learning'.*** Firstly, an activity to set the stage for the connections I wish to make.

Activity

Spend 20-30 secs thinking about the object mentioned.

- Share your thinking as richly as you can with those in your group.
- Note the various ways in which people thought about the object.

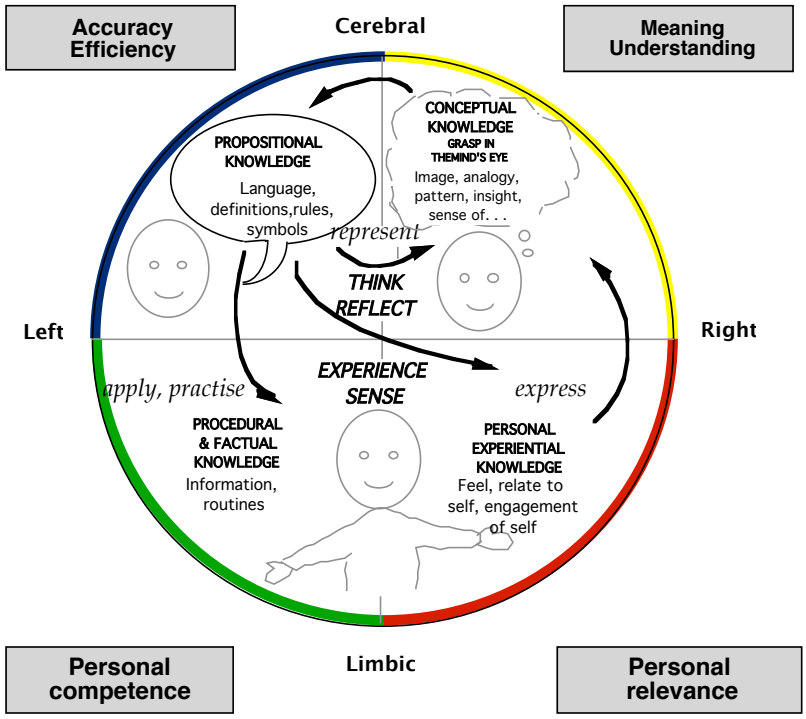
Typically, in a group of people, there will be demonstrations of ways of knowing, different ways of thinking. Some people will think about specific examples of chairs and perhaps start stating the facts, others will image the object, some will enter into story mode and think of a situation in which the object had meaning to them, others will focus on the nature or essence of the object while some others will categorise and define the object. Although individuals show preferences for the way in which they think about the object, it is likely that all individuals employed a combination of different processing modes in an iterative fashion.

It is my contention that, left alone to learn, individuals will develop ways of knowing that are an expression of their own thinking styles. Particular thinking styles lend themselves to particular ways of knowing. A person with a strong preference for C and D quadrant processing will engage in creative writing far more easily than a person strong in A and B quadrant processing and the style of the creative writing will naturally be more emotive and imaginative. Someone strong in A quadrant thinking will connect with and use symbolic language systems (as in Mathematics) far more readily than someone with a lower preference in this processing mode.

However, it appears that **regardless of preferred processing style**, learning occurs most readily and most effectively when whole brain processing is engaged, and in particular when the process of learning moves from experience to reflection on experience so that a "pattern" or framework allows the learner to grasp the meaning of the learning in the mind's eye and finally learning moves on to a facility to use language, rules, laws, principles for accuracy and efficiency in thinking, doing and further learning. The language is a symbol for what's grasped in the mind's eye which in turn is a mental representation of what has been experienced. The task of the teacher then is to "nudge" the processing so that all thinking modes are engaged regardless of style - Figure 9.

Integral Learning

Appropriate mental processing for learning - integration of experiential knowledge, imagination, understanding, information, clarification and action



Human learning is deepened and amplified by integrating our multiple ways of knowing.

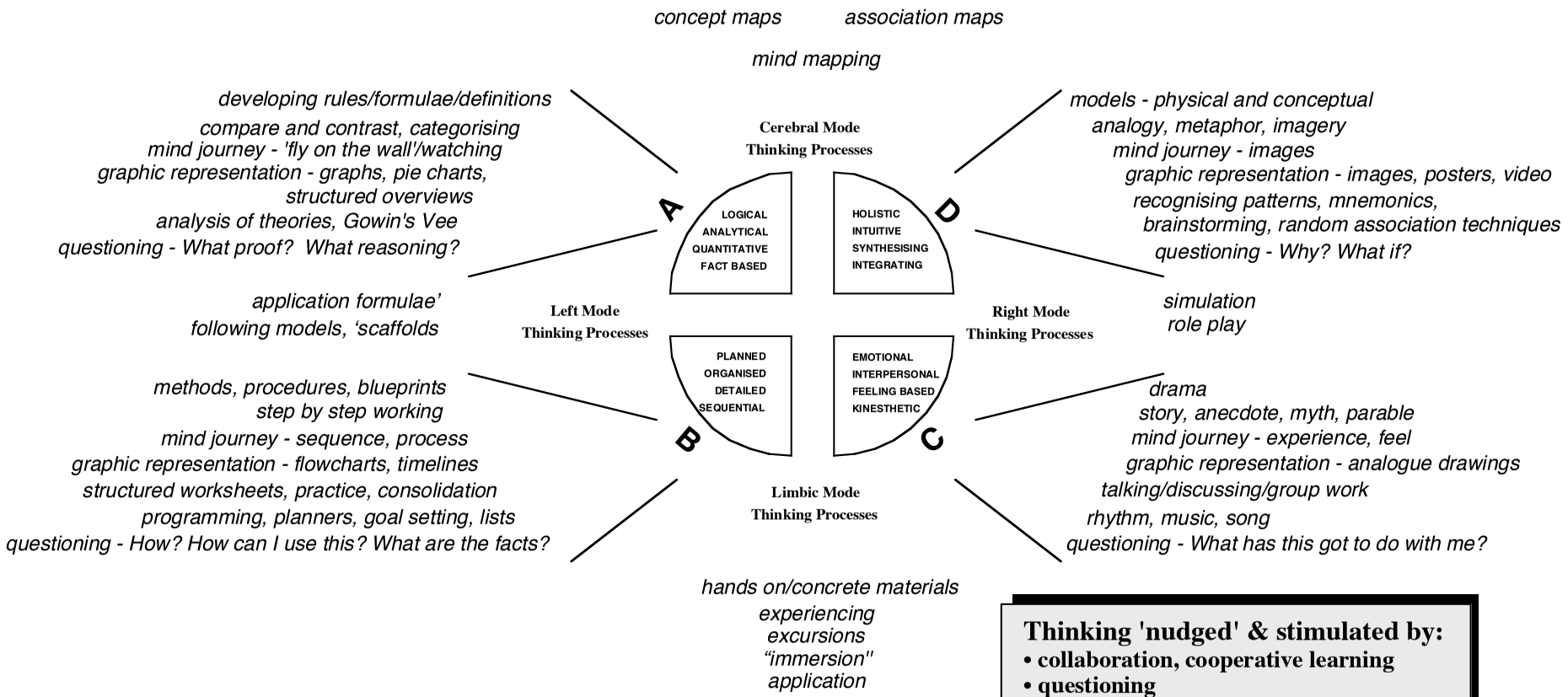
Teach to ENGAGE and INTEGRATE all modes of processing regardless of personal thinking style.

Figure 9 ***Integral Learning*** - A whole brain model of learning [Atkin 1992 b]

Note: *My approach is somewhat different to other people working with learning styles and instructional design. Some people say "Teach to all the styles by varying your strategies and you will eventually reach everyone." My point is that the most powerful human learning occurs when we stimulate and integrate all our ways of knowing – knowing to the power of four!*

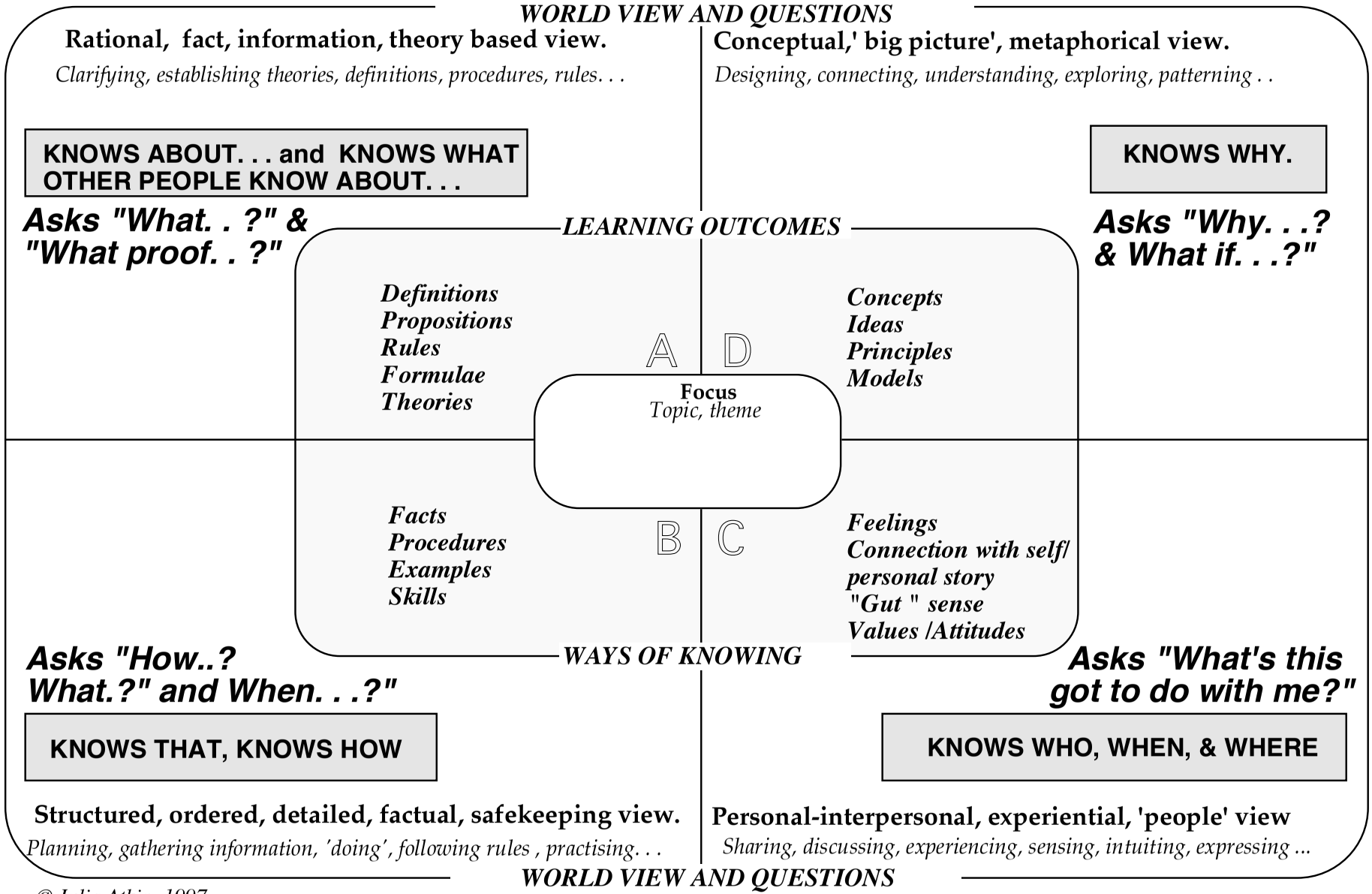
In the process of doing this you will also be affirming individuals because you have addressed their preferences, however, it is not sufficient to "know" something only in your preference. Truly effective learning, learning which can be transferred to new situations and communicated to others, will be known in the many languages of the brain and these ways of knowing will be integrated and coherent. Knowing will be an integration and internalisation of our experiences, our feelings, our imagination and our analysing and it will find expression in many modes of 'doing' from procedural application to a variety of creative forms.

Strategies to Promote Integral Learning



Thinking 'nudged' & stimulated by:

- **collaboration, cooperative learning**
- **questioning**
- **posing problems, challenges**
- **design process**
- **games**
- **predict -observe-explain**
- **teaching, re-presenting eg multimedia**



Designing for Effective Learning - Key points:

Effective, meaningful learning requires:

- **engagement and willing participation by the learner**
  - *not all learners are intrinsically motivated*
  - → *need strategies to engage and motivate*

- **a supportive learning environment that challenges, inspires and encourages**

- **active and appropriate processing in the learner's mind**
  - *learners have different processing/thinking styles*
  - → *need strategies to stimulate various processing modes*
  - → *need to teach – explicitly & implicitly – thinking*
  - → *need to 'learn to learn'*

- **Effective learning is characterised by:**
  - *felt personal meaning*
  - *that learners 'get it' – they can image it, understand it, see the pattern, grasp the essence*
  - *being able to express understanding in multiple ways including-*
    - *verbal/symbolic language – the efficiency and precision of definitions, propositions, rules, symbols*
    - *images*
    - *transfer-use in new situations*
  - *mastery*

The first step in designing for effective learning – using the 'Mu' dictionary to articulate the concept in four ways of knowing

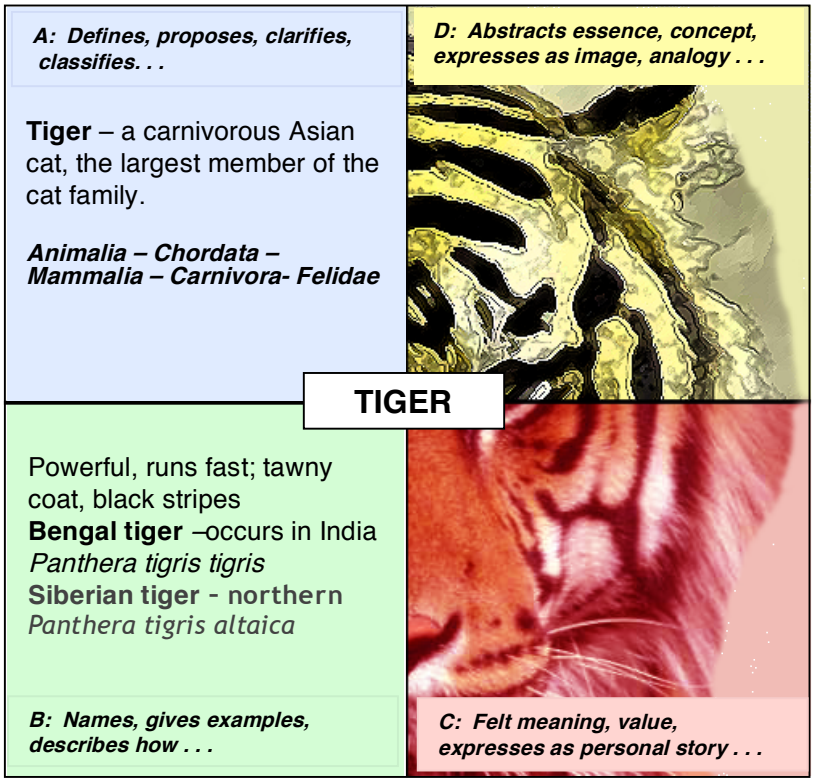
What is a 'Mu' dictionary? Why a **'**Mu' dictionary? Have you ever looked up a dictionary definition of a term and been none the wiser for your trouble? One of the shortcomings of a traditional dictionary is that the verbal, propositional definition of a term does not always convey meaning. Take the definition of **'positivism'** for example:

> ***1 a****: a theory that theology and metaphysics are earlier imperfect modes of knowledge and that positive knowledge is based on natural phenomena and their properties and relations as verified by the empirical sciences.*

Whether the term **'positivism'** now has meaning for you will depend on how much meaning the words used to define it have for you. The actual meaning each of us takes away from the propositional definition will depend on the meaning we initially ascribe to each of the words used to describe the term. 'Shared meaning' and 'felt meaning' are not guaranteed.

'Mu' is a Japanese term, which is connected to the Greek concept of *'Arete', which* implies a respect for wholeness or oneness. **'Mu'** thinking rejects ***'either-or'*** thinking in favour of ***'both-and'*** thinking. A *'Mu'* dictionary attempts to express meaning in four different 'ways of knowing': propositional, factual, personal/experiential, conceptual. It attempts to develop greater 'felt' meaning through the use of personal story and greater 'shared' meaning through image and analogy. It also aims to develop precision and 'definition' in its true sense; i.e. *the action or the power of describing, explaining, or making definite and clear.* The assumption behind the approach of a 'Mu' Dictionary is that deepest understanding emerges from the integration of these four 'ways of knowing' – K^4.

The *Mu* Dictionary for **'tiger'** shown below is incomplete.



KNOWING ABOUT – PROPOSITIONAL KNOWLEDGE

How can I define this?
How can I describe it?
How can I explain this to someone?
Is there a Rule?
Formulae?

UNDERSTANDING – CONCEPTUAL KNOWLEDGE

How can I express this as an image?
What's an analogy for it?
Make a model
Illustration

Mu Dictionary Definition

Examples
Labels
Facts
Methods
Instructions
Methods
Skills

KNOWING EXAMPLES, KNOWING HOW
FACTUAL PROCEDURAL KNOWLEDGE

Stories
Poems
Attitudes, feelings
Can I express this musically
What am I going to do with what I know and can do?

SO WHAT? WHAT'S THIS GOT TO DO WITH ME & MY LIFE?
PERSONAL STORY KNOWLEDGE

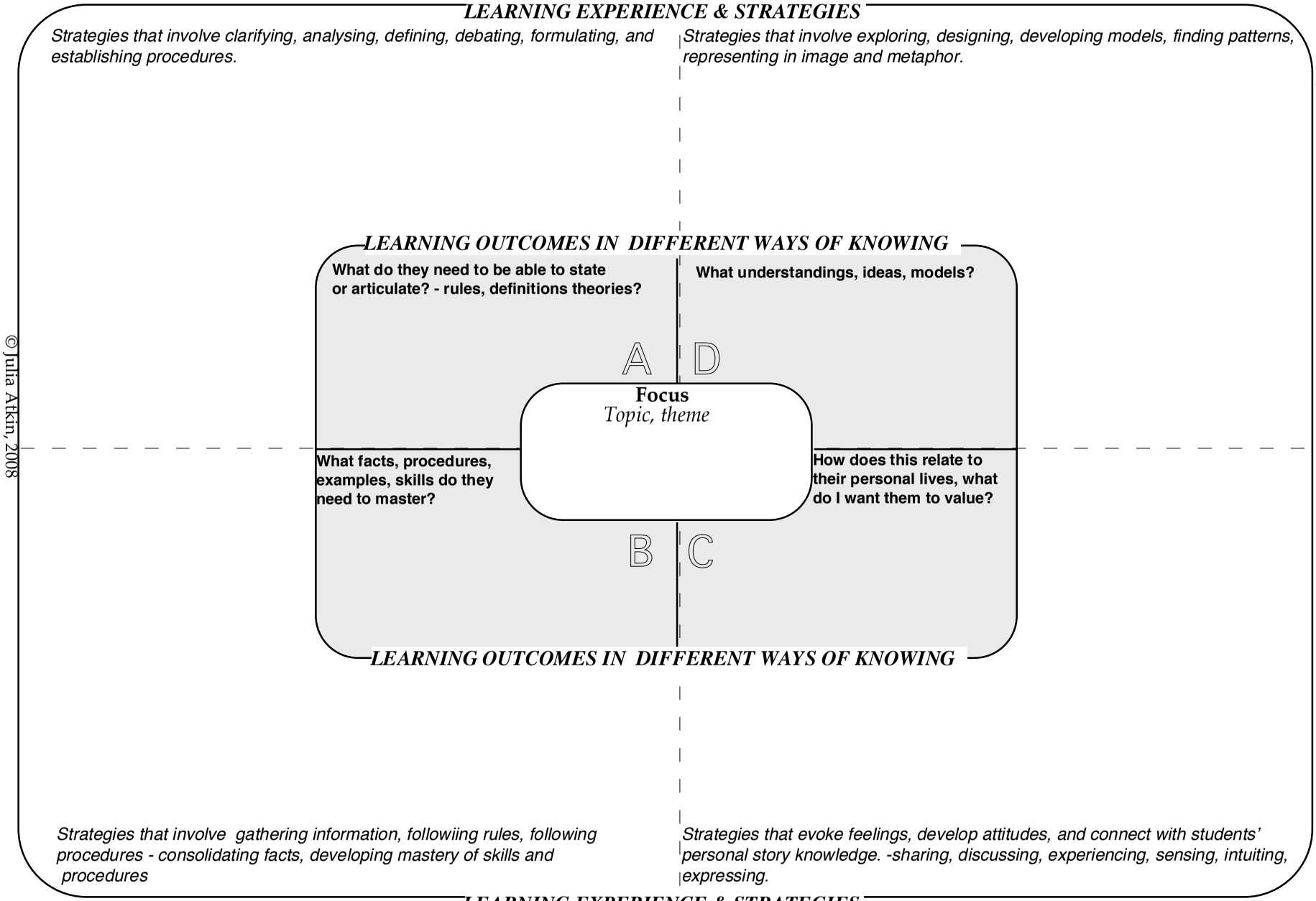
KNOWING ABOUT – PROPOSITIONAL KNOWLEDGE

UNDERSTANDING – CONCEPTUAL KNOWLEDGE

KNOWING EXAMPLES, KNOWING HOW– FACTUAL , PROCEDURAL KNOWLEDGE

SO WHAT? WHAT'S THIS GOT TO DO WITH ME & MY LIFE?
PERSONAL STORY KNOWLEDGE

The second step – designing strategies to help learners' develop each way of knowing.



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The papers listed above elaborate on these notes. They can be obtained in pdf form from http://www.learning-by-design.com

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